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Economic and financial analysis of large scale closed cooperative swine production under uncertainty in Iowa

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Economic and financial analysis of large scale closed cooperative swine production under uncertainty in Iowa

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CHAPTER 1

INTRODUCTION

There has been a marked change in livestock production over the past twenty years. One of those changes is a decrease in the number of farms with livestock. In 1978 over three-fourths (78 percent) of Iowa farms sold livestock products. Nine years later in 1987 just over two-thirds (69 percent) of Iowa farms had livestock (Duffy, 1992). With recent changes in legislation regarding farm business organization, it is now possible for groups of smaller farmers to form a large scale production operation.

The swine industry is undergoing a rapid and profound change. An industry that was once comprised of many smaller diversified farmers throughout the corn belt has now become increasingly concentrated, specialized, and more capital intensive. While 70% of the nation's hogs are still produced in the corn belt states, production in other states is growing rapidly and the once small production farms in the corn belt states are disappearing (Lawrence et al., 1995). Evidence is seen by looking at the trend in the number of farms with hogs in the United States (US) over the past 17 years. In 1980 there were 667,000 farms with hogs and in 1996 there were only 158,000, a decline of approximately 75%. Another ongoing trend is the increase in the number of hogs on each farm also depicted in Figure 1.1. Over the 17 year period from 1980 to 1996, the average number of hogs on each farm in the US went from 97 in 1980 to 357 in 1996, an increase of 268%. The trends nationwide are also being experienced by Iowa swine producers. The movement towards fewer swine production farms with an increasing hog inventory is shown in Figure 1.2. Farms with an inventory of 1000+

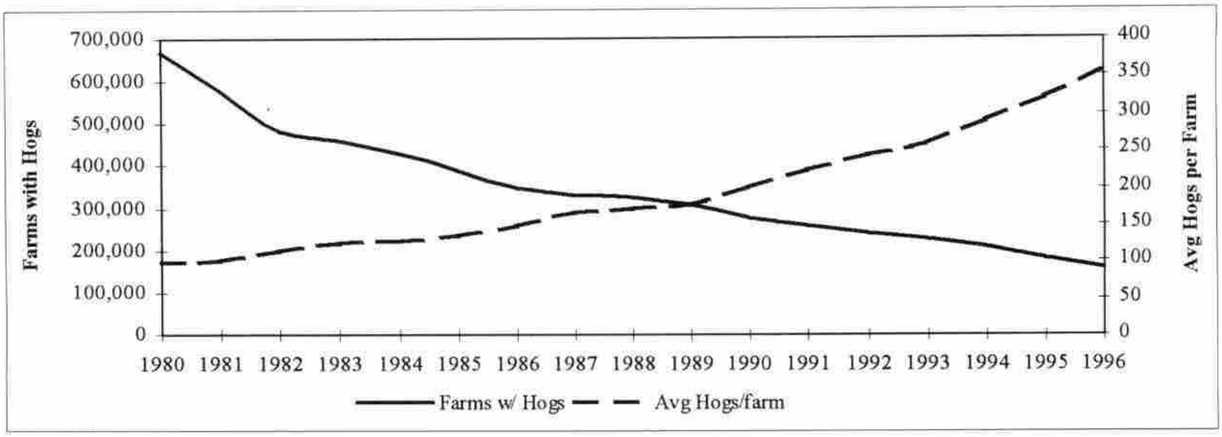

Figure 1.1 Farms with Hogs and Average Hogs per Farm in the United States, 1980-96

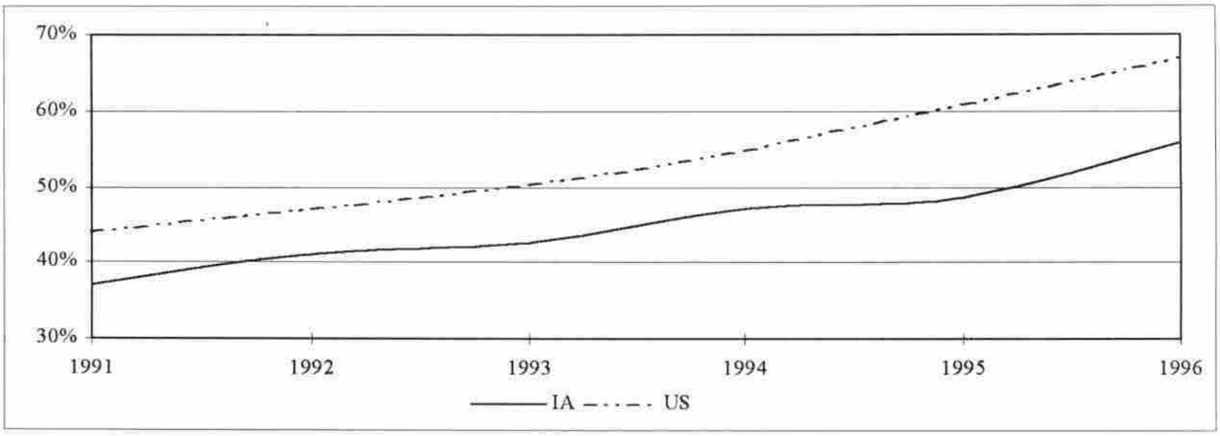

Figure 1.2 Percent of Total Hog Inventory on Farms with 1000+ Head, 1991 to 1996

head have been accounting for larger percentages of the total US and Iowa hog inventories over the five year period 1991 to 1996. At the same time operations with 1 to 499 head have lost their percentage of total US and Iowa hog inventories. Nationwide operations with 1 to 499 head have held a decreased amount of the total US hog inventory, down approximately

40% from 1991 to 1996. In Iowa operations with 1 to 499 head have also held a proportionally lower amount of the total Iowa hog inventory down from 32% in 1991 to 19% in 1996, a decline of over 40%.

It is important to identify what has caused the major changes seen in the pork industry over the last 15 years. Purdue Cooperative Extension (Boehlje et al., 1995) has highlighted a few of the factors driving the change in the pork industry:

- High annual average rate of return on capital in hog production for farms on Iowa State University records, over 25% since 1980.
- The industry is highly technical and technologically dynamic. These technologies are health enhancing, cost lowering and risk reducing, allowing greater concentration of animals.
- Much of the new technology cannot be fully implemented using the existing physical and human resources in traditional hog production areas.
- Major economies of scale exist in hog production.

The movement of hog production to larger, highly capitalized, intensely managed operations has enabled many of the larger producers to reduce costs, given the potential for improved pig health, and reduce the overall risk associated with hog production. While these newer technologies have become increasingly popular for producing hogs, a large portion of these operations are being built outside the corn belt states. These changes will likely continue and their impact has the potential to reach beyond the pork industry into related agribusiness and rural communities (Lawrence et al., 1995). The potential implications seem largest for Iowa agribusiness because of its high level of coordination with pork production starting with the grain industry all the way down the line to the processing and packing plants.

Effects on Iowa Swine Producers

Iowa has long been the leading hog production state in the US. But since 1991 Iowa's percentage of the US breeding herd has declined from over 24.8% to 18.8%, a decline of over 31%, while North Carolina's share has increased by over 140% from 6.1% to 15% of the total US breeding herd, see Figure 1.3. Much of the hog finishing is still performed in Iowa, over 20% of total US finishing, where corn is less expensive but farrowing operations have moved

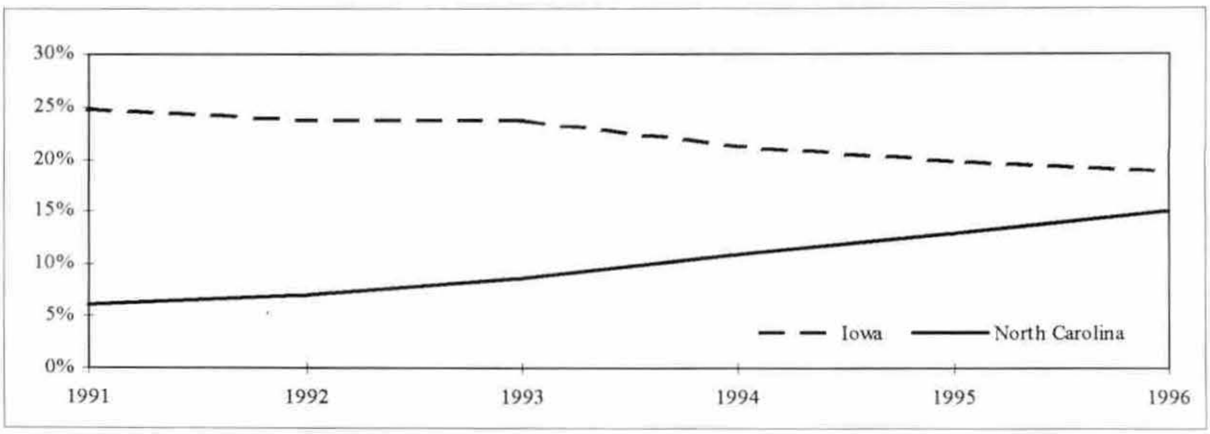

Figure 1.3 Percentage of Total United States Breeding Herd, 1991 to 1996

out of Iowa. While it is not assumed that North Carolina will continue expansion at the rates observed over that past 15 years, other states, such as Oklahoma, Colorado, Missouri, and Texas, that have not been traditionally hog producing areas have began to supply hogs to be finished are looking to increase their share in total US hog production. Many factors have contributed to these changes including differences in environmental regulations, changing consumer's tastes and preferences, production technologies used, management systems and even the willingness of producers to adapt in different regions of the US.

Hog production operations in North Carolina are intensely managed operations that exploit increasing returns to scale technology by having large numbers of genetically uniform hogs on each farm. In 1996 North Carolina averaged 1550 hogs per farm compared to 581 hogs on Iowa farms. It is apparent that the location of hog production operations, especially farrowing, are no longer sensitive the location of grain production when cost reducing technologies are used in grain deficit areas. This could have a large effect on corn belt farmers who rely on marketing grain through local livestock production operations.

Farms in Iowa have traditionally raised livestock in addition to grain farming as a means to provide an alternate source of income for the farm operation. In more recent years, fewer grain farmers have relied on their own livestock production as a means to market a portion of their own grain production. Over the past 17 years Iowa has experienced a decrease in the number of smaller hog production operations. The newer more efficient production technologies enable producers to bring a higher quality hog to market, but these technologies generally require large scale and more total capital. The ability of the independent grain farmer to acquire adequate financing for such an operation could put additional strain on the other activities of the farm by adding increased levels of debt on the operation. The increased level of overall debt could make the entire farming operation more sensitive to adverse price movements and variations in production.

An additional concern for the individual grain farmer is the allocation of management time between the grain and the livestock operation. The increased managerial responsibilities of each operation will compete for the farmer's time and clearly both activities require high levels of management to ensure success. The limitations on an individual farmer seem to prohibit them from successfully adding and maintaining a profitable hog production operation.

Objectives

This research will be aimed at identifying opportunities for grain farmers in Iowa to participate in a large scale joint swine production operation. Specifically it will evaluate the suitability of alternative business structures for joint swine production. The four different organizational structures that will be evaluated are: S-corporations, limited partnerships, limited liability companies, and cooperatives. After identifying the most suitable organizational structure, the risks, returns, and tradeoffs will be evaluated for the participating grain farmers by simulating a large scale joint swine production operation. The performance of the large scale joint hog production operation will be analyzed with different levels of equity capital contributed by the participating farmers. And subsequently, the effects on the individual farmer will be analyzed with different levels of risk and varying portfolio combinations. The expected level of returns will then be estimated to provide farmers with the benefits of participating in a large scale joint hog production operation.

CHAPTER 2

ALTERNATIVE BUSINESS ORGANIZATIONAL STRUCTURES FOR JOINT LARGE SCALE SWINE PRODUCTION

In order to effectively determine if large scale joint swine production is useful for a group of smaller farmers in Iowa, different business organizational structures need to be considered. After a group of farmers become interested in a joint production agreement, they must decide the type of business under which they are to be classified as for tax and legal purposes. There are different business organization structures and each have distinctly different tax and legal ramifications that need to be considered.

Evaluating Alternative Business Organizational Structures

To analyze the potential for joint production the suitability of four alternative organization structures was evaluated. The alternative organization structures considered were S corporations, limited partnerships, limited liability companies, and cooperatives. All of the organization choices above are highly complex and require expert consultation prior to implementation. Each may be an appropriate form in specific circumstances faced by a specific group of farmers. In so much as taxation, liability, flow of profits to members, and treatment by the state corporate farm laws are important there is no universal best form. A few key points from each of the organizational structures were used to differentiate them from each other and used to determine which structure best suited a large scale joint hog production operation in Iowa

S Corporations

Tax-option or S corporations were created to preserve all corporate characteristics expect for the calculation and payment of taxes. The net income of the S corporation after all deductions, including salaries to shareholder-employees, is channeled to the shareholders in actual dividend distributions or on paper at the end of the corporation's tax year (Harl, 1996a). This permits the corporation to avoid taxes at the corporate level in most cases. The tax liability of the corporation is essentially transferred to the shareholders who must pay tax on their share of the income whether or not they receive the income or leave it in the corporation. Taken from Harl (1996a) four brief characteristics used to define S corporations are:

1. The corporation must have only one class of stock outstanding, no preferred stock is permitted.
2. No more than 35 shareholders[1].
3. All shareholders must be individuals, estates, grantor trusts. Stock may not be owned by a partnership, trusts other than grantor trusts, or another corporation.
4. All shareholders must consent to the election by the corporation.

Business entities which appear to have the above characteristics are considered to be S corporations and are treated as one for taxation and liability purposes, and are subject to the corporate farming laws.

[1] After the research was nearly complete the Iowa law was changed and the maximum number of shareholders in a S corporation was increased from 35 to 75.

Limited Partnership

The standard partnership is an arrangement between two or more people to conduct business for profit as co-owners (Harl, 1996b). However, it does not provide limited liability for the partners and this is unacceptable to most potential members. Limited partnerships are an alternative without this disadvantage for some of the partners. To be classified as a limited partnership there must be two classes of members, general and limited. Each general partner has unlimited financial liability for the partnership's liabilities and is permitted to be directly involved in managing the partnership. This allows general partners' personal assets to be used in settling partnership obligations. The limited partners' liability is limited to their investment in the partnership, but they are not permitted to participate in management. If limited partners are found to be participating in the partnership's management they lose the limitation placed on their liability.

The partnership passes ordinary income (losses), and capital gains (losses) back to the partners, both general and limited. Each partner includes their percentage of income (or loss) on their personal tax returns, and the partnership as an entity has no tax liability. One concern that is largely unique to a limited partnership is the possible income tax treatment as corporation (Harl, 1996b). If the limited partnership has more "corporate like" than "non-corporate" characteristics, it could be treated like a corporation for tax purposes. This would require different calculations for tax due and passing income (losses) to partners. Furthermore it is uncertain whether or not this tax treatment might bring into question the status of the limited partnership with respect to corporate farming laws. Harl (1996b) gives characteristics that distinguish corporate from partnership tax treatment.

1. Continuity of life (limited partnerships generally do not posses).
2. Centralized management (limited partnerships generally do not have).
3. Free transferability of interests (limited partnerships usually do not posses, but rather this depends on the policies of the specific partnership).
4. Limited Liability (limited partnerships usually do not posses).

Limited Liability Company

One of the more recently permitted organizational structures is the limited liability company (LLC). The LLC has the limited liability of a corporation, and if properly structured, is taxed as a partnership for income purposes (Harl, 1996b). Under the Iowa corporate farming law LLCs are required to have at least two members and not to exceed more than 25 members in total. The members can be of any legally recognized entity. There is a restriction under Iowa law that disallow LLC's engaged in ownership of farmland or farm operations to have a corporation as one of it's members. For income tax purposes the LLC is treated as a partnership unless it has more corporate than non-corporate characteristics (Harl, 1996b). The characteristics are the same as the limited partnership previously given. Like the Limited Partnership, the LLC is subject to corporate farming law's restriction on participation in more than one authorized farm corporation.

Cooperative

The cooperative structure gives it's members the opportunity to pool assets together for greater profit potential and still maintain limited liability. The cooperative is structured to be governed by it's own members. Iowa law mandates that in a cooperative each member has the ability to cast one vote, regardless of the level of equity ownership. There are several types of a cooperatives in use today. Some of the more common types found are supply, marketing, and production cooperatives. The cooperative tax structure allows for a direct flow of benefits from the cooperative to it's members. A more or less complete tax code for cooperatives has developed over the past 75 years and there is currently a cooperative classification that allows for a complete tax exemption. To qualify as a *tax exempt farmers' cooperative*, the cooperative must meet certain criteria established under Internal Revenue Code section 521. For additional exemptions in downstream activities 521 gives additional exemptions. The income tax treatment is similar in some ways to the other organizational structures analyzed. The cooperative passes income (losses) back to it's members in a percentage equal to the level of business conducted with the cooperative over the fiscal year ended or it can also retain the income (loss). Income is usually passed back as net savings or dividends and must be at least 20% cash for qualified distribution[2]. The remaining percentage may be passed back as additional equity.

Summary of the Alternative Organizational Structures

In Table 2.1 seven characteristics of the alternative organizational structures are summarized. Each of the characteristics are used to determine if the business is operating in the correct manor according to Iowa laws. For example, the responsibility of management decisions by hired, elected, or by the owners differentiate each of the four structures listed. For cooperatives, Chapter (CHR) 501 cooperatives are listed. Traditional cooperatives have similar characteristics except for the exemption from the corporate farming law and the estate

[2] If non-qualified distributions are made using "non-qualified written notices" there is no cash payment due to farmers and no farmer tax liability at the time of the distribution.

Table 2.1 Alternative Organizational Structures

	S Corp.	**Limited Liability Company**	**Limited Partnership**	**CHR 501 Cooperative**
Management Decisions	Elected directors and officers selected by directors	Manager is usually elected	Usually general partner	Elected board and hired management
Limited Liability	Yes	Yes	No for GP Yes for LP	Yes
Flexibility in Taxable Year	Little	No	No	Yes
Effect of Passive Loss Limitation Rules	Shareholders may or may not participate	Members may or may not materially participate in losses	LP deemed not to materially participate	May use losses to offset farm income regardless of participation
Exempt from corp. farming law	No	No	No	Yes - # of operations Yes - # of members

Source: Harl (1996a)

tax priority rule. Traditional cooperatives do not qualify for exemption from the corporate farming law for it's members.

Selecting an Organizational Structure

One of the most important aspects of all of the above organizational structures is their status under the Iowa corporate farming law. The corporate farm law prohibits farmers from being members in more than one authorized farm corporation. Given the diversity that is needed to successfully operate a farm business today it may be necessary for many members to participate in more than one authorized farm corporation. Under the current corporate farm law only IA CHR 501 cooperatives are exempt from the restrictions on participation in authorized multiple farm corporations.

An additional aspect of the cooperative structure is the tax benefit of taking returns based on corn and not on invested capital. If the returns are paid based on the corn delivered and there is no dividend on invested capital, no unallocated retained capital and no non-member business then the cooperative's net margins are not taxed at the corporate level. Technically under these circumstances there is no corporate net margin. The farmer must include the added corn income received as a value added payment though, and there will be a self employment tax applicable on the value added income.

Motivation of Producers to Organize as a Cooperative

Farmer motivation to join or form a cooperative is vitally important in determining cases in which a cooperative may or may not be beneficial. Forming or joining a cooperative will broaden the base of a farm's activity since it is a form of integration. Agricultural cooperatives usually extend the farmer's business backward into input supply or forward one or more levels into marketing (Cobia, 1989). Members may also have other rational reasons for participating a cooperative: cooperatives can provide access to input or output markets that Investor Oriented Firms (IOF) can or will not; and cooperatives may reduce unique risks faced in agricultural production (Condon, 1987). It is accepted that the primary motivation for farmer participation in a cooperative is to improve their well-being, usually defined as income (Cobia, 1989).

Where growth in size or scope is necessary, horizontal integration may be a motivation through joint production. If major economies of size exist, there may be an incentive to increase output of a given product or service rather than to expand by extending the firm vertically into marketing or input production (Cobia, 1989). An additional reason may be the reduction of short term producer price risk through pooling (Cobia, 1987). The large scale hog production cooperative has potential to benefit its members by reducing the risks associated with large scale production, increasing output cost effectively, capturing profits from other levels in the input supply and output demand chain, and improving the coordination of activities among the individual farmer-members.

Reduction of Risks

Members may also view the cooperative as an institution for reducing the unique risks faced in production agriculture (Cobia, 1989). Cooperative associations provide opportunities for the member-patrons to reduce risks through risk pooling and risk sharing. Pooling and sharing are inherent in the cooperative business form since profits are distributed as patronage refunds (Cobia, 1989). The cooperative for joint swine production can reduce the individual farmer's risk from what it would otherwise be had the individual farmer established a large scale hog production operation on their own. The cooperative will market corn for the farmers through livestock, and thus rely on the swine market for its income. This provides the grain farmers with an opportunity to diversify their own farm businesses. The farmers no longer rely entirely on the corn market for revenues. The cooperative also reduces the impact felt by the individual from the possibility of business failure. If one farmer were to establish a large scale swine production operation, that farmer could bear the entire amount of risk individually. In the joint production cooperative, there are additional members who assume a portion of the risk. For example, some newer technology large scale swine production operations cost approximately $6 million, and assuming that 40%, or $2.4 million, of the operation was equity capital and the rest was financed with debt, an individual farmer could lose the entire $2.4 million of equity invested. If the equity risk is spread among a number of cooperative members, the per farmer loss would be significantly reduced. In the case of the cooperative, the farmer-members would not lose all of their assets if the large scale production operation was not successful. With the reduction of risk there is a lower expectation for reward, but the ability of the cooperative members to participate in other farm business opportunities could enable them to further diversify their unsystematic risk.

Economies of Size

It is generally accepted that there is a required amount of fixed capital associated with the operation of a farm. Some of the necessary requirements for large scale hog production are site preparation and building construction, specialized breeding technology, enhanced genetics, and environmental stewardship. Expanding the size of an operation doesn't necessarily imply a proportional increase in total fixed costs. The average total costs are expected to decrease as the size of the operation increases for many firms serving farmers (Cobia, 1989).

For example, the addition of a multiplier herd to an existing swine production operation can improve the potential net income of the operation. The fixed cost of the operation such as management are spread over greater volume, and larger operations use less labor per unit (Cobia, 1989). The developments in the swine industry over the last 15 years provide a strong indication that larger scale swine production operations have significant economies of size. Empirical evidence can be seen in North Carolina, the fastest growing pork production state over the past 15 to 20 years. In North Carolina the average number of pigs per farm has increased over 200% in the last 15 to 20 years. North Carolina has been able to shift pork production out of the corn belt region by producing hogs at low cost due to the size and management of their operations. Cooperatives can help farmer-members gain these economies of size.

Capturing Profits from Another Level

The motivation for farmers to organize as a cooperative may arise from the farmer's desire to engage in another profitable farming business. What prevents many farmers from entering additional businesses is that the volume used or produced on a single farm is too small to match an efficient input supply or production operation (Cobia, 1989). With the average rate of return on capital over 25% for hog production (Boehlje et al., 1995), it is not surprising that the swine industry has become increasingly concentrated and more capital intensive. The market signals are clear. There is an excessive rate of return to capital investments in the hog production industry compared to the adjusted average return on investment for other locally owned agribusiness firms of 8.3% in 1995 (Ginder and Baumler, 1997). Rational economic agents would choose to invest in hog production to capture some of these high potential gains. Many grain farmers in Iowa market their corn to hog producers and if these customers were lost so would a portion of their demand. Grain farmers are already in the supply chain for hog production and it does not seem unreasonable for them to go further into the chain. The organization of a cooperative could result in higher profits to the organizers' capital, which would be returned to the farmers in the form of more favorable prices (Cobia, 1989).

Coordination of Activities

Coordination of production and processing by means other than market transactions alone offer the possibility of adding value to the production resources (Cobia, 1989). Through the coordination of production, an operation can reduce the uncertainty of obtaining production inputs and at the same time benefit those who supply the inputs by providing them with a guaranteed buyer for their product. This is being seen more and more in production agriculture with the increased use of contract production. Assuring the production operation a guaranteed stock of inputs, feed in the case of a hog production operation, will allow it to operate at lower cost levels. In the large scale swine production cooperative where members deliver corn, there could be a scheduled delivery arrangement that would enable the hog production operation to operate more precisely than if the members were to deliver the corn at their own discretion. Additionally, the cooperative will be coordinating the genetics, feed, and production of the hogs. This will aid in disease reduction, uniformity of the hogs produced, and give the cooperative the ability to alter its output in a short amount of time through the use of different genetics.

Cost Effectiveness of Joining a Cooperative

An important aspect of the coordination of activities is determining its cost effectiveness. It may be the case that an individual farmer is financially and managerially able to operate a large scale swine production operation, but it is most likely the case that it isn't an optimal and efficient allocation of his efforts. One way of evaluating the question of cost effectiveness is to use a game theory framework. Staatz (1987c) demonstrated that these efficiencies are represented in game theoretic terms by superadditivity of the profit function and subadditivity of the cost function.

Superadditivity of the profit function shows that a single coalition of all the players can always guarantee itself a higher level of payoff than can two or more disjoint suballocations that in total involve all the players (Staatz, 1987c). Extending superadditivity to the case of the joint production cooperative, shows that the cooperative will achieve a greater payoff than if all the individual farmers were to operate independently, or in smaller subgroups. This additional payoff is attributed to the coordination of certain activities by the cooperative. Subadditivity of the cost function shows that it is cheaper to provide some services to the cooperative rather than provide it to the individual members or in subgroups of members (Staatz, 1987c).

The establishment of a cooperative to reduce costs can greatly increase the farmer's net income. Subadditivity and superadditivity do not guarantee that a farmer will participate in a cooperative but rather show that their participation in the cooperative can benefit them[3]. The cooperative realizes additional savings because the cost function is subadditive and also realizes additional revenue from the profit function being superadditive. These additional savings and revenues are passed back to the farmer members in the cooperatives in the form of net savings. The net savings are incentives for the farmer to join the cooperative rather than operate individually. It is subadditivity of the cost function that makes joint provision of a service to a group more economical than providing the service to individual sub-units of the

[3] Indeed it is often observed that farmers, for a variety of non-economic reasons, do not join organizations that could benefit them.

group (Staatz, 1987c).

The farmer uses capital and labor to produce output, and each farmer has a fairly fixed output level in the short-run. In order to expand output, the farmer must increase the amount of capital or labor or both used in production. Also, it is likely that farmers located in the same geographic location have similar expectations about price, and that their marginal cost of producing additional units of output is increasing at an increasing rate, then increasing the amount of capital used could lower the marginal cost of production. In the case of hog production, it can be shown that smaller producers could look to merge their capital stocks with other producers to increase total capital stocks and lower each other's marginal cost. The incentive to form a cooperative would depend on whether or not the joint operation can make as much or more money than the individual operations. If transaction costs are assumed not be significant, it can be shown that farmers would benefit from forming a cooperative under the following circumstances :

1. If optimal output is superadditive with respect to capital, and capital and labor are used in fixed proportions.
2. If optimal output is superadditive with respect to capital, and adding capital increases the amount of labor used.
3. If optimal output is neither superadditive nor subadditive with respect to capital and adding capital decreases the labor used in production.
4. If optimal output is subadditive with respect to capital, and adding capital decreases the amount of labor used.

Comparison of Closed and Traditional Cooperatives

Cooperatives have been used in the agricultural for many purposes in the past. Cooperatives have provided market access for farmers and helped other farmers stay on top of current trends in the agricultural sector. As the structure of the entire agricultural sector changes the role farmers want and expect their cooperatives to play is also changing. In order to more appropriately serve local farmers, new cooperative structures are being considered. Ways that cooperatives can be used to solve problems farmers are now facing, such as, vertical coordination through the producer channel and providing newer technologies and production methods that are extremely capital intensive are being explored (Ginder, 1995a).

It will be useful to compare traditional open cooperatives and closed cooperatives.

> The *traditional open cooperative is* easy to join, and operates at market prices on a buy - sell basis. Member's equity is built through net savings retained as allocated patronage refunds. There is no volume or activity commitment and capacity is open to all members without regard to the amount of investment the member has made. Finally, it is easy to exit the traditional open cooperative without significant penalty or immediate financial consequence to the farmer.
>
> The *closed cooperative* requires that a cash investment be provided by the joining member before using the cooperative. The prices for goods sold or purchased from the cooperative are calculated using a formula or modified market price, and the closed cooperative usually does not operate on a strict buy-sell basis. There is usually a legally binding membership contract that specifies an exact volume requirement per contract period and guaranteed capacity utilization is usually provided with an equity unit. The cooperative's net savings are not a major source of equity. By specification of the membership contract, exiting could be difficult. Exiting members must sell their equity and rights to capacity to an eligible member in order to exit (Ginder, 1994).

Closed and open cooperatives differ substantially on four organizational characteristics: equity acquisition, equity retirement, value of equity dollars, and sources for additional growth for expansion.

Equity Acquisition

In the closed cooperative, equity acquisition is usually required up front and in cash, and is typically assessed in direct proportion to the amount of use (Ginder, 1994). The traditional cooperative acquires a minimal portion of equity through the sale of a share of stock to the members. In many cases cash may not be required up front and even the voting share of stock may be earned through patronage refunds. The amount of equity members hold in a traditional cooperative is not defined. It usually varies a great deal from member to member and is not directly tied to the members right to use the cooperative. In a closed cooperative the members are required to hold equity in direct proportion to the level of use. There is a strict contractual agreement specifying the level of activities or business that must be done with the cooperative and it is directly related to the amount of equity that a member contributes. The equity levels are equal for similar shares of stock. Acquiring additional equity within the closed cooperative requires that a share of existing stock be purchased from an exiting member. If the capacity of the cooperative is expanded additional shares of stock may be issued[4] (Ginder, 1994). The traditional cooperative creates additional shares of stock and sells one share to new members. It also creates additional equity by retaining patronage refunds from net margins and there is the primary source of capitalization.

One of the features of the closed cooperative that differentiates it from a traditional cooperative is the transferability of stock. The proposed closed cooperative structure allows for the original members (or subsequent owners of the stock) to resell their shares at any time as specified in the by-laws and in the original contract. Along with the stock the obligation to

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[4] Ultimately, acquiring additional equity must conform to the by-laws of the cooperative.

deliver or perform under the original contract is also transferred to the buyer. The market for these shares depends upon the profitability of the cooperative. If the cooperative is able to earn substantial net savings to be repaid to the members, then the stock may be resold for a premium to the original price. However, it may be resold at a discount if the cooperative under performs. The traditional cooperative does not require a specified level of members use through a contract as the closed cooperative does. The closed cooperative specifies the amount to be delivered and when the members must deliver. More generally, it uses a uniform marketing agreement to specify the level of performance and the time of performance of the members.

Equity Retirement

In the traditional cooperative, equity is usually retired (at the discretion of the board) on some annual basis according to the cooperative by-laws and the policies of the board of directors. The basis for equity retirement may be annual revolvement, or it may be based on percentage of an equity pool, or tied to the age of existing members, or it may be written in the cooperative by-laws according to some special circumstances The amount of equity to be retired is usually based on the performance of the cooperative and the goals and allocation decisions of the board. The closed cooperative typically does not directly retire the equity contributions made by the members. It does pay back directly to the members the net savings or profit earned by the cooperative and usually in cash. This payment is typically made to the closed cooperative members at the end of cooperative's fiscal year after expenses and sales for the fiscal year have been calculated.

Although the closed cooperative does not retire it's equity, the members may end or terminate their association with the cooperative. Members the closed cooperative may sell there shares to other potential members. Traditional cooperatives usually have little permanent equity, which is not subject to retirement by the cooperative (Staatz, 1987a). Some cooperatives may take longer periods to retire equity. Although it is nearly always an organizational goal to retire equity, the time and rate is not under the direct control of the individual members. Whereas in the closed cooperative structure, there is usually little or no commitment to retire equity. The closed cooperative will pay out all of net savings directly to the members as patronage refunds. No direct payment will be for equity retirement.

Value of Equity

There are two ways to measure the value of equity, either in nominal or real terms. In a traditional cooperative, equity has a constant face value, or nominal value, as issued, and there is an obligation for the equity to be redeemed at the face value (Ginder, 1994). This provides the patron with nominal value. Alternatively, the closed cooperative structure has no obligation for the redemption of equity and the issued equity has a variable value (Ginder, 1994). As the operating performance of the cooperative changes, the closed cooperative's equity value also changes. But in the traditional cooperative the redemption value of it's equity does not.

To obtain the real value, or inflation adjusted nominal value, of equity in the closed cooperative structure, the equity needs to be sold. The selling price will depend on cooperative performance, the cooperative's financial position, assessment of assets, and outlook for future potential earnings. From this, it is evident that there is continuous change in the real value of equity in a closed cooperative. In a traditional open cooperative the patron may receive a lower real value if the equity is not redeemed as promptly, but the nominal or face value doesn't change (Ginder, 1994). Adjustments in nominal value are made only in extreme cases (e.g. catastrophic losses, or dissolution), but the real value will decline in all open cooperatives between the time it is issued and the time it is redeemed.

The real value of equity in traditional cooperatives is a function of the amount of time it takes for the board to redeem the equity issue, not the face value (Ginder, 1994). Equity that is revolved promptly has a higher real value than equity revolved after a longer period. The time value of money erodes the face value over time. The closed cooperative's real value of equity depends solely on the performance of the cooperative and whether there is strong demand from new members to purchase existing shares.

The traditional cooperative is faced with the investment versus equity question. It may choose to invest in cooperative assets for growth or it may retire out the existing equity to keep the member's equity percentage at a fairly constant level. Investment decisions compete directly with decisions to send cash back through equity retirement. A decision to invest and defer equity retirement erodes real value.

In contrast the closed cooperative's owners real value improves with investment and growth (Ginder, 1994). The cash retiring members receive comes from new members who purchase the equity of the members who exit. This gives the board the incentive to use internal sources of cash to expand the fixed asset base for growth.

The member of a traditional cooperative is faced with the uncertainty of not knowing exactly when their equity will be retired. The member of the closed cooperative is in direct control of their equity. At any given time, the closed cooperative member can resell their share(s) and recover their equity interest at it's current market value. The board of an open cooperative must make a trade-off between using internally generated funds to retire equity or using the funds for growth by augmenting fixed assets (Ginder, 1994).

Sources for Additional Equity Growth for Expansion

If the closed cooperative desires to expand capacity it must issue more stock and the right to use the added capacity to raise additional equity. When the traditional cooperative expands capacity it must use funds generated by retaining net savings that may be allocated to current patrons in order to acquire more equity capital. The retention of unallocated equity is viewed completely different in the closed cooperative when compared to a traditional cooperative. Members of traditional open cooperatives usually view the retention of unallocated equity as competitive with the member's benefits.

In contrast the closed cooperative members view retention of unallocated equity as consistent with member's benefits since it is positively reflected in market value of existing member's equity (Ginder, 1994). There is an incentive for members to invest new or additional equity in a closed cooperative if the performance is better than other investments. The return on investment from the closed cooperative can be directly compared to other investments, such as a mutual funds. If the closed cooperative provides a better return for a similar amount of risk, then the member would like to invest more money where there is a higher return. In the traditional cooperative, there is no incentive for existing or new members to invest directly even if the performance is good since they have access to the cooperatives facilities, goods and services without regard to the amount of equity they contribute (Ginder, 1994).

CHAPTER 3

METHODOLOGY

To determine whether closed cooperatives are a viable alternative for farmers in Iowa, this research will assess the feasibility of establishing closed cooperatives in Iowa for the purpose of producing hogs on a large scale, state of the art 2400 sow operation was analyzed. Twelve specific hog production operations were defined for analysis. There are two main production categories, farrow-to-finish and farrow-to-wean with contract finishing.

The farrow-to-finish operations are setup as a three site production operation with the hog production operation raising market hogs from the farrow stage all the way through the finishing stage at which time the hogs are sold as market hogs. All of the facilities are owned by the hog production operation in the farrow-to-finish operations.

The farrow-to-wean with contract finishing operations also raise market hogs but after the hog has been weaned from the sow, at approximately 18 days of age, it is placed in a rented nursery facility until it reaches approximately 60 pounds. The hog is then moved to a rented finisher facility. The rented facilities do not include labor, manure handling, utilities and other operational expenses. See Appendix A for a complete listing of all expenses incurred and paid by the hog production operation. The breeding and gestating and farrowing facilities are the only buildings owned by the hog production operation in the farrow-to-wean with contract finishing operations. The finisher facilities are contract rented for the year on a pig space basis.

In the farrow-to-finish and farrow-to-wean operations a seed stock multiplier herd was added to each. The farm operations with the seed stock multiplier herds select gilts at the end of the finishing stage to be sold at a premium to other operations. In these operations the select gilts consume the normal amounts of feed, care, and medication throughout all stages of production. Under the production classifications there are four different hog production operations: farrow-to-finish, farrow-to-finish as a multiplier herd, farrow-to-wean, and farrow-to-wean as a multiplier herd.

In each of the four types of hog production operations the level of equity contributed was varied over three set levels for comparison, low, medium, and high equity contributions. The equity levels for the farrow to finish operations were based on a percentage of total construction costs, breeding herd costs, and cash needed to pay for three months operation at full capacity. The equity structures were based upon current banking requirements for minimum equity contribution percentages required for operations of this type. After consulting with TEAMPork of Iowa State University (ISU) Extension, it was determined that lenders for this kind of operation typically require a minimum equity contribution for total construction costs of 30%. As indicated in Table 3.1 the minimum equity contribution for the breeding herd is 40% to 50%, and the minimum equity contribution for operating cash is 65% to 85% of 3-months operating cash requirement. Table 3.1 shows the equity required for farrow-to-finish operations. The equity structure used is shown in percentage terms for construction, breeding herd, and three months operating cash respectively in column one. The cash requirements associated with each equity structure are shown in the remaining columns to the right with the total equity required in the last column on the right.

Table 3.1 Equity Positions and Requirements for Farrow to Finish Operations

Equity Structure	Construction	Breeding Herd	3 mths oper.	Total Equity
30-40-65	$1,922,029	$321,360	$809,250	$3,052,639
30-45-75	$1,922,029	$361,530	$933,750	$3,217,309
30-50-85	$1,922,029	$401,700	$1,058,250	$3,381,979

The farrow-to-wean with contract finishing operations were handled differently. There was not a large fixed cost in this operation when compared to the farrow-to-finish operations, but there were substantially higher variable costs associated with paying annual contract finishing fees on a monthly basis. The farrow-to-wean with contract finishing operation's equity structure typically had a higher equity contribution requirement for the three months operating cash contribution.

Table 3.2 shows the equity structure used and the cash requirements for each of the farrow-to-wean with contract finishing operations. As in Table 3.1 the first column shows the equity requirement as a percent of total equity required for construction, breeding herd, and 3-months operating cash respectively. The remaining columns show the dollar amount required for construction, breeding herd, and three months operating cash for each of the three equity structures analyzed. The total dollars associated with each structure are shown in the far right column. The farm operations that utilize contract finishing pay $32.00 per nursery space per year and $34.00 per finisher space per year. In the farrow-to-wean operations the cooperative must supply the needed dietary and health inputs required for the finishing stage and pay for all operational expenses incurred in the nursery and finishing stages. The contract finishing

Table 3.2 Equity Positions and Requirements for Farrow to Wean Operations

Equity Structure	Construction	Breeding Herd	3 mths oper.	Total Equity
30-40-100	$692,460	$321,360	$1,450,302	$2,425,602
30-45-117	$692,460	$361,530	$1,696,853	$2,712,323
30-50-133	$692,460	$401,700	$1,928,902	$2,984,542

operations are renting a pig space only and must provide all other inputs needed for the nursery and finishing stages.

In Table 3.3 the twelve operations analyzed are listed. The first set of letters denote the production classification of the operation, farrow-to-finish (FTF), farrow-to-finish as a multiplier herd (FTFMH), farrow-to-wean (FTW), and farrow-to-wean as a multiplier herd (FTWMH). The second position denotes whether or not the hog production operation owns the finishing facilities (O), or contracts the finishing of their hogs (C). In the third position the level of the equity contribution is given as low (L), medium (M), or high (H). See Appendix A for a more detailed specification of the individual farm setups.

Table 3.3 Closed Cooperative Operations Analyzed

Operation	Low Equity	Medium Equity	High Equity
Farrow to Finish	FTF.O.L	FTF.O.M	FTF.O.H
Farrow to Finish as a Multiplier Herd	FTFMH.O.L	FTFMH.O.M	FTFMH.O.H
Farrow to Wean with Contract Finishing	FTW.C.L	FTW.C.M	FTW.C.H
Farrow to Wean with Contract Finishing as a Multiplier Herd	FTWMH.C.L	FTWMH.C.M	FYWMH.C.H

To effectively evaluate the performance of a cooperative hog production operation a swine production model incorporating financial and biological parameters developed by ISU Extension's TEAMPork was employed. The key stochastic variables in the model were: farrowing rate, pigs weaned per liter, nursery mortality, and finisher mortality. Using a large swine production database (PIGChamp) maintained by University of Minnesota, each variable was modeled and estimation techniques were used to determine the production from each farm analyzed.

The performance of the proposed hog production operations was evaluated empirically using the following procedure. Biological data were collected from the PIGChamp database and price data were collected from the United States Department of Agriculture, Agricultural Marketing Service (USDA AMS). A computer software program called BESTFIT®[1] was used to analyze the data and determine parameters of the sample data distributions. The results from BESTFIT® were used in @RISK®[2] to perform a Monte Carlo simulation. The simulated data was then used in the Swine Feasibility Analysis (SFA) model to generate returns for each of the proposed hog production operations. The returns from the SFA model were used in a Minimization of Total Absolute Deviations (MOTAD) model to estimate an efficient Expected Income-Mean Absolute Income Deviation (E-A) frontier for the proposed hog production operations.

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[1] BESTFIT® is a registered trademark of the Palisades Corporation. BESTFIT® is distribution fitting software that finds a statistical distribution function that best fits a data set.
[2] @RISK® is a registered trademark of the Palisades Corporation. @RISK® is risk analysis and modeling software that is designed to be used in conjunction with BESTFIT®.

Data Collection

For this study two main types of data were collected: biological production data and price data. The biological production data were taken from the actual production records of farms located in the Midwest, and the price data were actual prices received or paid by Iowa farmers over a sixteen year period from 1980 to 1995. The biological production data were obtained from the PIGChamp database at University of Minnesota and the price data were obtained from USDA AMS.

Farm Data

PIGChamp tracks the performance of various hog production farms across the Midwest and identifies the results by size and location. The biological variables used in this study were the farrowing rate, pigs weaned per litter, nursery mortality, and finisher mortality. Biological variables were based on longitudinal data from a single operation rather than cross sectional across several farms. This more effectively captured the nature of large scale swine production and production risk. With cross-sectional data, it was not possible to assure that the same farm would be included in each sample. The PIGChamp database was screened for farms in the upper Midwest (Iowa, Minnesota, and Illinois) with more than 600 sows. Thirteen farms that met this selection criterion were used to identify relevant production selections. Each of the thirteen farms had four years of monthly data on file which provided 52 monthly observations of the biological production variables used.

The data for all thirteen farms was pooled together to create a larger data set. Prior to pooling the data multivariate tests were performed to determine whether or not the data were generated by similar processes and if pooling the data was acceptable or not. Nine variables were selected from each farm's PIGChamp records and compared with each other. The nine identifier variables selected were: farrowing interval, average weaning age, cull rate for sows, average non-productive sow days, farrowing rate, preweaning mortality, number of sows, average parity, and total farm death loss. Each farm's monthly observations were averaged to obtain yearly average values for each of the nine identifier variables.

Two sets of tests were performed to determine if the mean and variance of all farms were statistically identical. First, to determine if the mean values of the nine identifier variables were statistically the same a multiple analysis of variance (MANOVA) test was performed. Under the MANOVA framework as specified in Morrison (1990) the null hypothesis tested was that all the multivariate means are identical. The alternate hypothesis for the MANOVA test was that the multivariate means are not identical. The test statistic used, Wilks' Lambda (Λ_W), was developed in Morrison (1990) and shown to be distributed as a F statistic. The computed Λ_W for the nine identifier variables was 0.1009. The associated F statistic was 0.8167 with 108 degrees of freedom in the numerator and 238 degrees of freedom in the denominator. The *p-value* was 0.8840, implying that the null hypothesis was acceptable at just outside of the 0.10 significance level. This showed that the processes that generated the nine identifier variables had statistically identical means.

To determine of the variance structure of the all farms was identical, discriminate analysis was used to test the null hypothesis that covariance matrices are not homogenous against the alternate hypothesis that the covariance matrices are homogenous. As outlined in Morrison (1990) the test statistic used was distributed as a chi-square (χ^2) variable. The computed χ^2 value was 0.0000, with 540 degrees of freedom the associated *p-value* was

1.000. Since the χ^2 value is not significant at the 0.01 level, a pooled covariance matrix can be used, and the null hypothesis was rejected in favor of the alternate hypothesis. Both the MANOVA test and discriminate analysis indicated that the processes that generated the nine identifier variables are statistically identical at acceptable significance levels.

Price Data

The price data used to determine the distributions of the uncertain variables (i.e. corn, soybean meal (44%), sows, barrows and gilts, feeder pigs, and weaner pigs) in this paper all came from the Iowa State University Extension publication, "Iowa Farm Outlook". Each dataset represents the most appropriate price of the Iowa agricultural product used in the model. It is important to keep in mind that these are cash market prices from markets either in or in very close proximity to Iowa. This assured that the prices used reflected the prices Iowa farmers were actually paying or receiving over the past sixteen years. All price data used was in nominal values.

Grain Prices

The prices for corn and soybeans are monthly averages that Iowa farmers received in the respective year. These prices were collected and computed by the Iowa Department of Agriculture and Land Stewardship Agricultural Marketing Division, Des Moines, Iowa. The prices for corn and soybeans are given in dollars per bushel of the respective commodity. The prices for soybean meal are quoted in dollars per ton for 44% protein soybean meal at Decatur, IL. The soybean meal prices used from January 1985 to September 1988 are mid-month prices, and the prices from October 1988 to present are monthly averages. The prices are reported by the Wall Street Journal, Oil Crops, ERS, USDA, and Feed Outlook.

Livestock Prices

The sow prices are the monthly averages of the five terminal markets in the Midwest. They are Omaha, Sioux City, St. Joseph, St. Paul, and Sioux Falls. The barrow and gilt prices are for US # 1-2's, 230 to 260 pounds at the Iowa-Southern Minnesota market. The prices for feeder pigs are the Iowa average feeder pig price for US # 1-2's, 40 pounds. The contract specifications were changed and from March 1995 on the price is for US 1-2's, 50 pounds. All livestock prices are published weekly by the USDA AMS.

Weaner Pig Prices

Prices for weaner pigs, 14 to 20 days of age, are not readily available from an established market. Because there is no organized market for weaner pigs (unlike that for barrows, gilts, feeders, and sows) obtaining a price series was more difficult. To establish prices for weaner pigs a pricing model developed by Dr. Lawrence of ISU Extension was used. The spreadsheet based model calculates the price for weaner pigs based on the live hog futures price 26 weeks in the future. All the price determination is being done as ex-post forecast, so we are able to construct accurate weaner pig prices based on the assumptions. In the pricing model it was assumed that it takes 26 weeks for a weaner pig to reach market, and that the weaner pig represents 65% of the total price for a market hog. With these two assumptions, price series for the future cash price 26 weeks out were generated. The price series was then multiplied by 65% to obtain a price the for weaned pigs. The formula is as follows,

$$WPPH_{26,0.65} = C_{26WCP} * \rho_{26WFP}$$

$WPPH_{26,0.65}$ is Weaner Pig Price per Head for the assumptions that the weaned pig will go to market in 26 weeks and the value of a weaned pig is 65% of a market hog,

C_{26WCP} is the live hog futures price 26 weeks in the future, and

ρ_{26WFP} is the percentage that a weaned pig is of a market hog.

Statistical Distribution Analysis

To incorporate uncertainty into the production model, the statistical distributions for the key price and biological variables used in the model were calculated. The price variables were assumed to be distributed log normal. In Osborne (1959) it was shown that stock market prices are distributed log normal. It was presumed that these results could be extended to commodity prices. The biological variables were modeled using the beta distribution because of it's flexibility. That is the probability density could take on a great variety of different shapes (Freund, 1992).

BESTFIT® was used to analyze the production and price data. Among other functions BESTFIT® can be used to estimate the parameters of specified distribution given data[3]. It uses the goodness-of-fit as the measurement of the probability that the input data was produced by the specified distribution. BESTFIT® then finds the parameters that maximize the goodness-of-fit for the given distribution.

[3] BESTFIT® uses five steps to determine the parameters that best fit the data set. Taken from the User's Manual: 1. Data is converted into a distribution, 2. Maximum Likelihood Estimators are computed and used as a first guess at the parameters of the distribution, 3. The parameters are optimized using the Marquardt-Levenberg algorithm, 4. The goodness-of-fit is measured for the optimized function, 5. All results are then compared and the one with the lowest goodness-of-fit value is considered the best fit. The final results can be used as inputs to @RISK® to generate samples from the specified distribution.

Data Generation

After the distributions for the uncertain production and price variables were identified by BESTFIT®, @RISK® was used to generate five years of input data, on a monthly basis, for the SFA model. A key feature of @RISK® is that it permits the correlation structure among variables to be estimated and used in the data generation process. After approximating the correlation structure among the monthly price and biological data it was used as input for data generation in @RISK®. Appendix C gives all the input variable parameters and correlation matrices. Each set of draws was used as input data for an iteration of the SFA model and the results were stored. This process was repeated 100 times for each of the twelve hog production operations identified in this study. The 100 data input samples generated were used in each operation. This ensured that each operation faced the identical uncertainties in biological and market outcomes.

Swine Feasibility Analysis Model

The computer simulated production model used was developed by ISU Extension to model production, pig flows, cash flows, and provide financial statements for pork producers. Using the SFA model, the costs of production were easy to compute, along with detailed pig flows, for given assumptions about the hog's diet and the facility setup. The SFA model depends largely on the user inputs. This flexibility allows the model to be applied to many different types of swine farms. There are six main sections in the SFA model: 1. Data Input, 2. Growth Curve Analysis, 3. Pig Flow calculations, 4. Financial Analysis, 5. System Sensitivity Analysis, and 6. Statistical Comparisons to Database Records.

Data Input

The actual data input sheets required for the SFA model are included in Appendix A. The data input covers four main areas: Start-Up Costs, Diet Inputs, Production Inputs, and Financial Inputs. When the model calculates the Start-Up costs the user inputs any existing facility valuation. This allows the model to calculate production on a existing farm or for a new proposed facility. Since it can be used with an existing operation, with records, it is possible to compare actual performance to what the SFA model computes as potential performance. Building and equipment costs can be entered either in as dollars per pig space, or as total costs. The data input also requires that the construction schedule be entered, along with the delivery schedule for any new breeding stock that is purchased.

The single most important stage in the data input are the Diet Inputs. This section determines the growth curve for the hogs, the amount of feed needed, and the pig flows within the operation. The three main types of diets used in the SFA model are: breeding herd diets, nursery diets, and grower-finisher diets. The user is free to specify the diet ingredients, in what percentages they are used, and the length of time (in days) that each diet should be feed to the hogs. The output from this section provides the user with the total requirements of feed needed for the operation being analyzed.

The Production Data Input section allows the user to further customize the model. The user can specify present production statistics for their operation, or can use estimated statistics to perform a "what if" scenario analysis of production. Although the Diet Inputs section is the most vital input section, the Production Data Input section is also very important. The Production Data Input section is responsible for such outcomes such as how fast hogs flow through the system, how many hogs make it out of the nursery, and the success in the breeding of the sows, etc. See Appendix A for a complete listing.

The last section in the Data Input is the Financial Information input. This section has a large impact on the profitability of the farm. Additionally, production costs are determined by the prices specified for diet inputs and breeding requirements. Loan information is required and non-feed variable costs are also needed.

Growth Curve

The calculation of the growth curve by the SFA model determines the number and flow rate of pigs. While it is not the focus of this paper to argue the best way to determine the growth curve, it is essential to state how the SFA model determines the growth curve for it's calculations.

The growth curve is computed based on the average daily gains for barrows and gilts. The SFA model assumes that the weight of a weaned hog is twelve pounds and the weight of a market hog is 265 pounds. With the starting and ending weight established, the SFA model computes the average daily gain for each diet based on the ingredients specified by the user. It then computes the weight gained on each diet based on the average daily gain of pigs while eating that diet. The length of time on the diet is therefore a critical input from the user. From these calculations the SFA model computes, for each hog type, days in the swine facility, consumption per day, feed cost per day, total cost, the cost per pound of gain, weight exiting the diet, and total gain on the diet.

Pig Flows

Once the growth curve has been calculated, and the diets specified, it is possible to calculate the monthly pig flows. The SFA uses the facilities data on the number of rooms and crates, and the square footage for each, in calculating the flow of pigs through the operation. Depending on what was specified by the user, the SFA model computes pig flows based on either a constant pig flow or a constant sow herd size. This feature allows a producer who has entered a contract for the delivery of a specific number of hogs to properly plan for seasonal variations in production. When determining the pig flows the SFA model takes into account the death loss in both the nursery and the finisher, and the farrowing rate entered by the user. The model also generates estimates of the number of boars and gilts which must be purchased to replace animals lost from death or culling of the breeding herd.

Financial Analysis

The SFA model provides an extensive financial analysis of the swine operation. The Financial Analysis is comprised of eight sections; Enterprise Budget, Start-Up Budget, Cash Flows, Summary Line of Credit (LOC), Income Statement, Balance Sheet, Ratio Analysis, and Net Present Value calculations. These outputs are generated, break-even price levels are highlighted, costs are broken down, and financial requirements are given as part of the Financial Analysis.

There are two main budgets types in the SFA model: (1) Enterprise and (2) Start-Up Budgets. The Enterprise Budget breaks down the operation into revenues from production, feed costs, variable costs, and fixed costs and gives the break-even price of hogs needed for the swine operation being analyzed. There are two Start-Up Budgets, one for Land, Buildings, and Equipment and another for the Breeding Herd. The SFA model assumes that the Land, Buildings, and Equipment will be purchased by equity contributions first, and then long term loans, ten to twenty five years in length. It assumes the cost for the breeding herd is to be covered by short term loans, three to ten years in length.

The Cash Flows for the operation, during start-up and steady state production, are computed and given in monthly reports for the first four years with an annual summary. After the fourth year annual reports are given for the remaining ten years of operation. The Cash Flows have three main categories: Revenue/Income from all sources, Expenditures/Costs, and Net Cash Flow. The Summary Line of Credit (LOC) is tied directly to the cash flows statement. When there is a negative net cash flow for any month, the LOC is automatically accessed for the amount of negative cash flow, unless there is a positive cash balance sufficiently large to cover the amount of the monthly negative net cash flow.

In addition to the cash based accounting records there are also accrual based accounting records. The SFA model generates an income statement and balance sheet to aid in analyzing the swine operation. The income statement follows the operating revenues and expenditures and generates income before and after taxes. Along with the income statement, the cash coverage ratio and the times interest earned ratio are reported. The balance sheet follows the current, intermediate, and long term assets and liabilities, and the equity capital from year to year. Additional ratios computed are the current ratio, debt to equity, return on assets, return on equity. The model also computes projected trends for the current ratio, working capital, ownership equity, and the asset turnover ratio.

The final section in the Financial Analysis is the NPV calculations. The profit margin and return on investment are computed based on the net cash flows and the value of future cash flows are discounted at an assumed inflation rate, 6%, 8%, and 10% to a potential range of NPVs. Also reported are the payback period and the internal rate of return, the rate that makes the NPV of the investment zero.

System Sensitivity Analysis

Incorporated into the SFA model is a section that analyzes some key dependency relationships. They are 1. conception rates and litter sizes on gross margin, 2. corn and soybean meal prices on gross margin, and 3. market hog prices on net income and net cash flow. These relationships are analyzed to determine the effects, if any, when a significant change occurs. The range of values for corn prices used could be set at $2.20 to $3.20 per bushel and the range of prices for soybean meal could be set at $180.00 to $260.00 per ton. The effect on gross margin, in this example, can be evaluated on a per head basis, or on total gross margin for the entire operation. For example, if there is a change in corn and soybean meal prices, how will it affect gross margins.

Statistical Comparisons to Database Records

The final section in the SFA model ranks the swine operation being analyzed against four major swine operations databases. The databases included are Iowa State University Swine Enterprise Records (1994 Summary), Pig CHAMPS (Regionalized 1995-95 Summary), Swine Graphics Enterprises, and Pig Tales (1994 Summary). The comparisons are based on breeding, farrowing and weaning performance, breeding herd population, and growth performance. The SFA Statistical Comparison to Databases reports the farms actual performance and the rank as a percentile score to the four databases used.

In Appendix B the actual results from the SFA model for all farm operations are listed. It was the case in two iterations that the cash generated by the operation was not significant enough to cover the principle and interest payments on the intermediate and long term loans. In both cases, the observations were treated as outliers and not included in the calculations. It would be the case that the bank holding these loans would have liquidated the operation prior to the fifth year.

Production Under Uncertainty

After defining the farm operation and specifying the potential activities that the hog production farms could undertake, it was necessary to determine what specific activities the closed cooperative would undertake. Portfolio theory was used select the best hog production operations.

Portfolio Theory

Setting up the problem more explicitly, assume that there are $i=1, 2, \ldots, n$ activities choices. The closed cooperative could choose activity 1 or any of the other *(n-1)* operations, but only one of the total *n* operations. Each of the *n* operations will produce an income, or return, for the cooperative. Using r_i to represent the level of income from the i^{th} operation, r_i will be a random variable that is a function of the operation choice. The cooperative needs an estimate of r_i to be able to accurately analyze all the operation choices. Letting μ_i stand for expectation of r_i, μ_i will be the expected income value from the i^{th} operation choice. In addition, σ_{ij} represents the variance-covariance of gross returns from operation choice i and farm choice j. When farm choice i equals farm choice j, we have $\sigma_{ii} = \sigma_i^2$, which is the variance of the gross return from farm choice i. Finally, the farmer has x_i assets, again $i=1, 2,$

..., n, from which a portfolio may be constructed.

It was then possible to define some statistics concerning the cooperative's choice of operation. First, defining net return as:

$$R = \sum_{i=1}^{n} x_i r_i \tag{3.1}$$

and expected net return as:

$$E = \sum_{i=1}^{n} x_i \mu_i \tag{3.2}$$

The variance of the expected net return:

$$V^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \sigma_{ij} \tag{3.3}$$

Using equations (3.1) through (3.3) it is possible to construct a feasible set of "risk-return" combinations from which the cooperative may choose. This can be done by minimizing V with a given level of E:

$$\min V^2 = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \sigma_{ij} \right) \quad s.t. \quad E = \sum_{i=1}^{n} x_i \mu_i \quad , \quad \sum_{i=1}^{n} x_1 = 1 \tag{3.4}$$

or by maximizing E with a given level of V:

$$\max \quad E = \sum_{i=1}^{n} x_i \mu_i \qquad s.t. \quad V^2 = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \sigma_{ij} \right) \tag{3.5}$$

Solving the constrained optimization problem yields an equation in expected net returns-variance (E, V^2) space. It is usual to present the frontier in the mean-standard deviation plane instead of the mean-variance plane (Merton, 1972). Using the mean-standard deviation space permits the use of well developed and defined utility functions. This equation yields the efficient portfolio frontier that combines minimum variance with a given expected income or maximum expected income with a given variance. Restating the above problem in Expected Net Returns-Standard Deviation (E, V) space:

$$\min \quad V = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} x_i \, x_j \, \sigma_{ij} \right)^{1/2} \qquad s.t. \quad E = \sum_{i=1}^{n} x_i \, \mu_i \quad , \quad \sum_{i=1}^{n} x_i = 1 \tag{3.6}$$

or

$$\max \quad E = \sum_{i=1}^{n} x_i \, \mu_i \qquad s.t. \quad V = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} x_i \, x_j \, \sigma_{ij} \right)^{1/2} \tag{3.7}$$

Only those portfolios on the efficient frontier are efficient in the sense that they constitute combinations having maximum expected income for given variance, or minimum variance for given expected income (Anderson, Dillion, and Hardaker, 1971). The efficient portfolio frontier is the set of feasible portfolios that have the largest expected return for a given standard deviation (Merton, 1972). According to Markowitz (1959), an efficient portfolio *P* must meet the following three conditions: (1) *P* is a legitimate portfolio; (2) if any legitimate portfolio has a greater expected return, it must also have a greater variance of return than the portfolio *P*; and equation (3) if any portfolio has a smaller variance of return, it must also have a smaller expected return than the portfolio *P*.

In determining the correct mix of risk and return for each and every cooperative, all possible utility functions will not be maximized, however it may be more practical to determine the set of efficient portfolios, list them, and let the farmer choose from the combinations of risk and returns (Anderson, Dillion, and Hardaker, 1977).

Solving for the Efficient Portfolio Frontier

There are two main mathematical procedures used to solve the problem faced in portfolio analysis. One is Linear Risk Programming and the other is Non-Linear or Quadratic Risk Programming. Linear programming is widely recognized as a method for determining a feasible profit maximizing combination of farm enterprises with respect to linear fixed farm constraints (Hazell, 1971). Common to all methods of solving this type of problem is the form of the solution. Stochastic dominance techniques are appealing, because their application requires very few restrictive assumptions about the decision maker's utility function. It is acceptable to assume that utility is an increasing function of income and decreasing function of risk (Berbel, 1990). Given this flexibility, solution techniques based on stochastic dominance techniques were used in this study.

Minimization of Total Absolute Deviations (MOTAD)

There have been few practical applications of quadratic risk programming in agriculture. One reason is the requirement for large amounts of data. There has been some work to develop linear programming models that take into account net revenues as a stochastic variable (Anderson, Dillion, and Hardaker, 1977). One of these models uses the mean absolute deviations in place of variance as a measure of risk (Hazell, 1971). Hazell (1971) introduced MOTAD as an alternative model that closely parallels the quadratic programming approach, but without the need for a non-linear programming algorithm (Anderson, Dillion, and Hardaker, 1977). The linear programming model can be stated as a minimization of n variables subject to technological constraints and a parametric constraint on expected net returns (Anderson, Dillion, and Hardaker, 1977).

Hazell (1971) also demonstrated that an equivalent but possibly more direct approach might be to use the mean absolute value of negative deviations about the mean. From equations (3.4) through (3.7), it is apparent that the expected return would be maximized subject to constraints, with the use of the sum of negative deviations. Following Hazell's (1971) measure of risk-absolute negative deviations from mean expected income:

Max Expected Income

Subject to:

	Technical Constraints
and/or	Resource Constraints
and	Deviations Constraint

The use of expected income-mean absolute value of negative deviations (E-A) criterion has an important advantage over the (E-V) criterion because it leads to a linear programming model in deriving efficient (E-A) farm plans (Hazell, 1971). Hazell (1971) also demonstrated that the MOTAD model may have considerable potential as an alternative computational procedure to quadratic programming in deriving the efficient (E-V) farm plans, when quadratic programming code is extensive or not available.

Setup of the MOTAD Model

Using Minimization of Total Absolute Deviations MOTAD) to find the optimal portfolio combination, the model is of the following form:

$$\text{Max } E = \sum_{i=1}^{n} x_i \, \mu_i \qquad (9)$$

subject to:

1. $\sum_{i=1}^{n} a_{ki} x_i \le b_k$ for $k = 1, 2, \ldots, m$

2. $\sum_{i=1}^{n} \mu_{ri} x_i + y_r \ge 0$ for $r = 1, 2, \ldots, s$

3. $\sum_{r=1}^{s} y_r \le \lambda$

4. $x_i, y_r \ge 0$ for all $i = 1, 2, \ldots, n$ and $r = 1, 2, \ldots, s$

where:

x is the cooperative's assets,

μ_i is the expected income from the i^{th} operation choice,

a is the technical requirement of activity i for resource or constraint k,

b is the level of resources or constraint k,

m is the number of constraints and resource equations,

y is the absolute income deviations,

s is the number of states of nature or observations,

λ is the maximum allowable deviations from the mean income,

n is the total number of activity choices.

The development of this model closely follows those developed in Anderson, Dillion, and Hardaker (1977), Hazell (1971), and Tauer (1983). The model will provide an efficient E-A frontier with the choices for the specified levels of absolute deviations. The MOTAD models evaluated in this research are of the general form:

Max (Expected Accumulation after 5 years)

Subject to:

1. Hog Production Constraints
2. Activity Constraints
3. Financing Constraint - second models only
4. Deviations Constraint

The results from the SFA model were then used as input for a General Algebraic Modeling System (GAMS) program that solved the constrained minimization problem of the MOTAD model. This was done for all twelve proposed closed cooperative hog production operation alternatives.

CHAPTER 4

MODEL SPECIFICATIONS AND RESULTS

Following the methodology outlined in the previous chapter, four main farm models were analyzed. The first model was the cooperative model which identified those farm operations that maximized expected income for given levels of expected risk. The second model was a modified version of the first cooperative model. In the second cooperative model financial constraints were imposed on the farm operations. Specifically the amount of equity capital available to the cooperative was limited at three levels: $3 million, $3.125 million, and $3.25 million. After analyzing the situation faced by the cooperative, the individual farmer's case was analyzed using two assumed situations. In the first farmer model the number of shares that should be purchased to maximize income for given levels of risk was analyzed. In the second farmer model financial constraints were imposed on the amount of money an individual farmer had available to purchase shares in the cooperative. The farmer financial constraints evaluated were: $50,000, $100,000, and $250,000.

Following the MOTAD analysis the actual payments made to the farmers and their empirical distributions were calculated on a per share and per bushel basis. The distributions of the per bushel payments were compared for significant differences among the operations.

Initial Cooperative Model

The initial run of the cooperative MOTAD model was constrained by a maximum number of activities in the portfolio of only one hog production operation. The theoretical implication of this restriction is that over all activities, the MOTAD model might not be able to achieve an optimal solution because it cannot combine investments into a portfolio with more than one hog production operation. In this research , the hog production operations were treated as mutually exclusive investments. Restricting the model to select one and only one hog production operation resulted in the selection of the activity that minimized negative variations from mean expected income levels, while providing the highest expected income. This was a desirable outcome for the purposes of the study.

Operationally, having each hog production operation as a mutually exclusive event may coincide with the actual setup of the hog production operations. This would not allow the farmer-members to be invested in more than one type of hog production operation specified in this research. While this may seem restrictive it probably reflects actual conditions most accurately. At the present time farmers would typically not have multiple opportunities to join a number of closed hog production cooperatives. Currently there are a limited number of projects already in existence which in many cases have recently been formed and would not have a large number of shares available for purchase from existing shareholders. In other cases the closed cooperative for hog production has not been formed and it is unlikely that a producer would participate in organizing more than one cooperative in a relatively short period of time.

Another constraint in the model limited the number of pigs put into the finishing buildings to less than or equal to the number of pigs produced. This constraint ensures that contract finishing buildings are exclusively dedicated to pigs from the cooperative who produced them. This constraint was imposed to assure the cooperative all the pigs in the finishing buildings would be single sourced and that there was no co-mingling of genetics from other suppliers in the finishing buildings. Using single sourced pigs significantly reduces the potential for the introduction diseases into the finishing buildings.

The initial MOTAD model was setup to determine which farm operations would be optimal at different levels of risk, and to determine the expected cash accumulation after five years of operation. Figure 4.1 shows the estimated efficient frontier from parametrically running the model with respect to λ, the expected deviations from mean income. Table 4.1 shows the corresponding levels of risk and expected income for Figure 4.1. The model did not select a hog production operation until the \$200,000 expected deviation level (λ) was reached. At \$203,776 expected deviations, the model selected the FTWMH.C.M. Then, by allowing a slight increase in λ, \$204,011, the model selected FTFMH.O.M. And at the higher levels of λ, above \$204,011, the model selected the FTFMH.O.H operation. All the hog production operations selected were those that had either medium or high levels of equity. This implied that the farm operations with access to even slightly greater amounts of capital could much more effectively or better meet financial obligations without worrying about the uncertainties in cash generation by hog production.

Table 4.1 Initial Cooperative Model Estimated Frontier

Farm Operation	Expected Deviations from Mean Income (Risk)	Expected Cash Accumulation after 5 years of operation
FTWMH.C.M	$203,776	$1,908,280
FTFMH.O.M	$204,011	$3,228,830
FTFMH.O.H	$208,115	$3,506,029

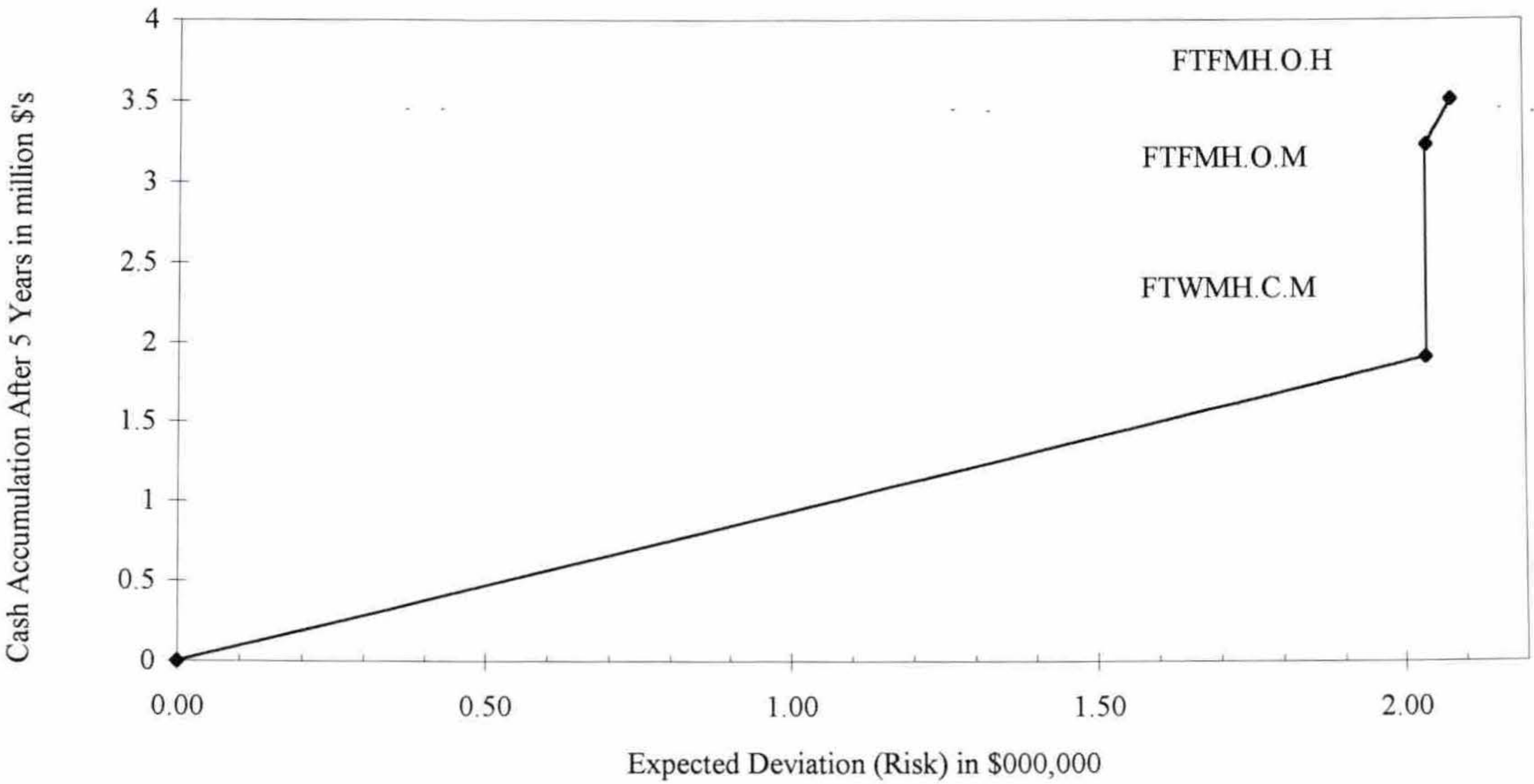

Figure 4.1 Initial MOTAD Model, Constrained to Select Only One Operation

The cooperative MOTAD model solved for the efficient frontier given the restrictions. Comparing the MOTAD analysis, negative deviations from mean expected income, with mean-variance analysis shows similar results.

Figure 4.2 shows the mean-variance graph of the initial cooperative model. The graph also shows the relative risk-reward tradeoffs of the proposed hog production operations. The same three hog production operations, FTWMH.C.M, FTFMH.O.M, and FTFMH.O.H, that form the initial cooperative model efficient frontier also form the efficient frontier on the mean-variance graph in Figure 4.2. This supports Hazell's (1971) position that the mean absolute value of negative deviations from the mean are an alternative measure of risk to using a variance based risk measure.

Second Cooperative Model

The initial cooperative MOTAD model was run a second time to analyze how the selection of a hog production operation would change when a limit was placed on the amount of capital investment that could be made. An additional financing constraint was imposed, limiting the amount of investment capital available to three levels: \$3 million, \$3.125 million, and \$3.25 million. All of the base run constraints used in the first model were included in the second cooperative run in addition to the new financial constraint.

Figures 4.3 through 4.5 show the plotted estimated frontiers for the second cooperative model and Table 4.2 summarizes the estimated efficient frontiers for the financially constrained cooperative models.

In all three financially constrained models the first farm operation selected by the model is the FTWMH.C.M. When investment capital was constrained to \$3 million, the

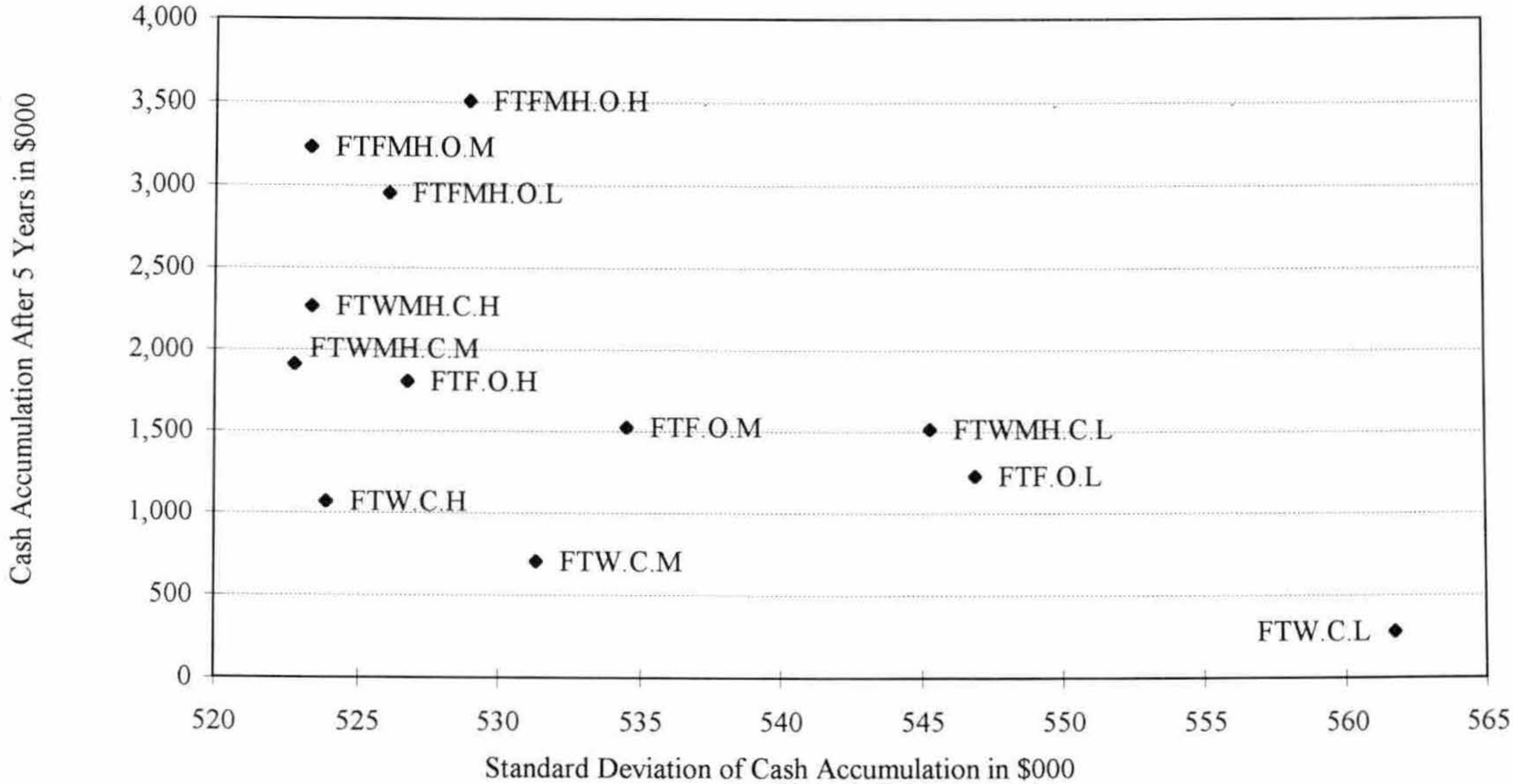

Figure 4.2 Cash Accumulation vs. Standard Deviation of Cash Accumlation for All Farm Operations

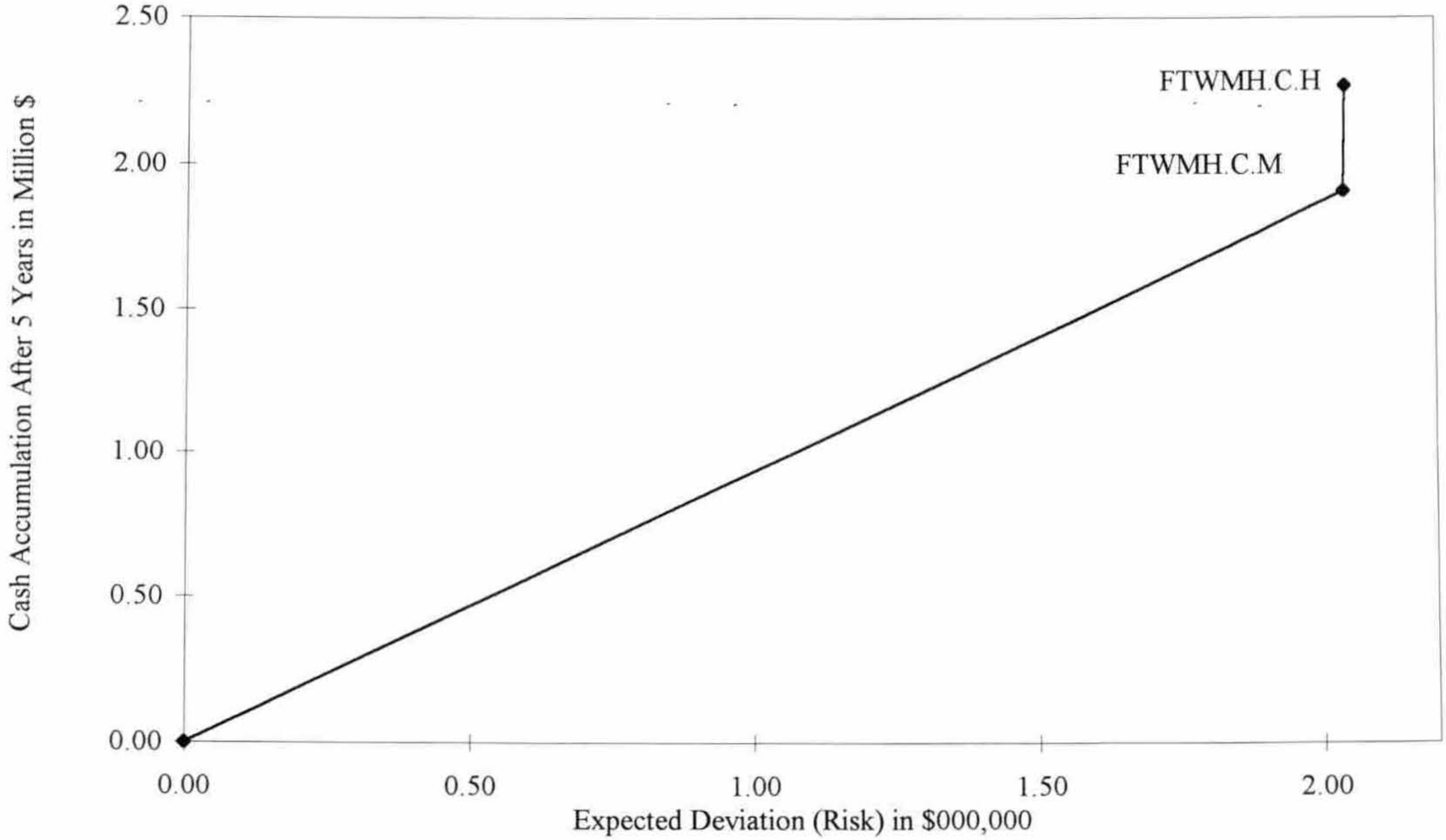

Figure 4.3 Initial MOTAD Model with Financial Constraint of $3 Million for Equity

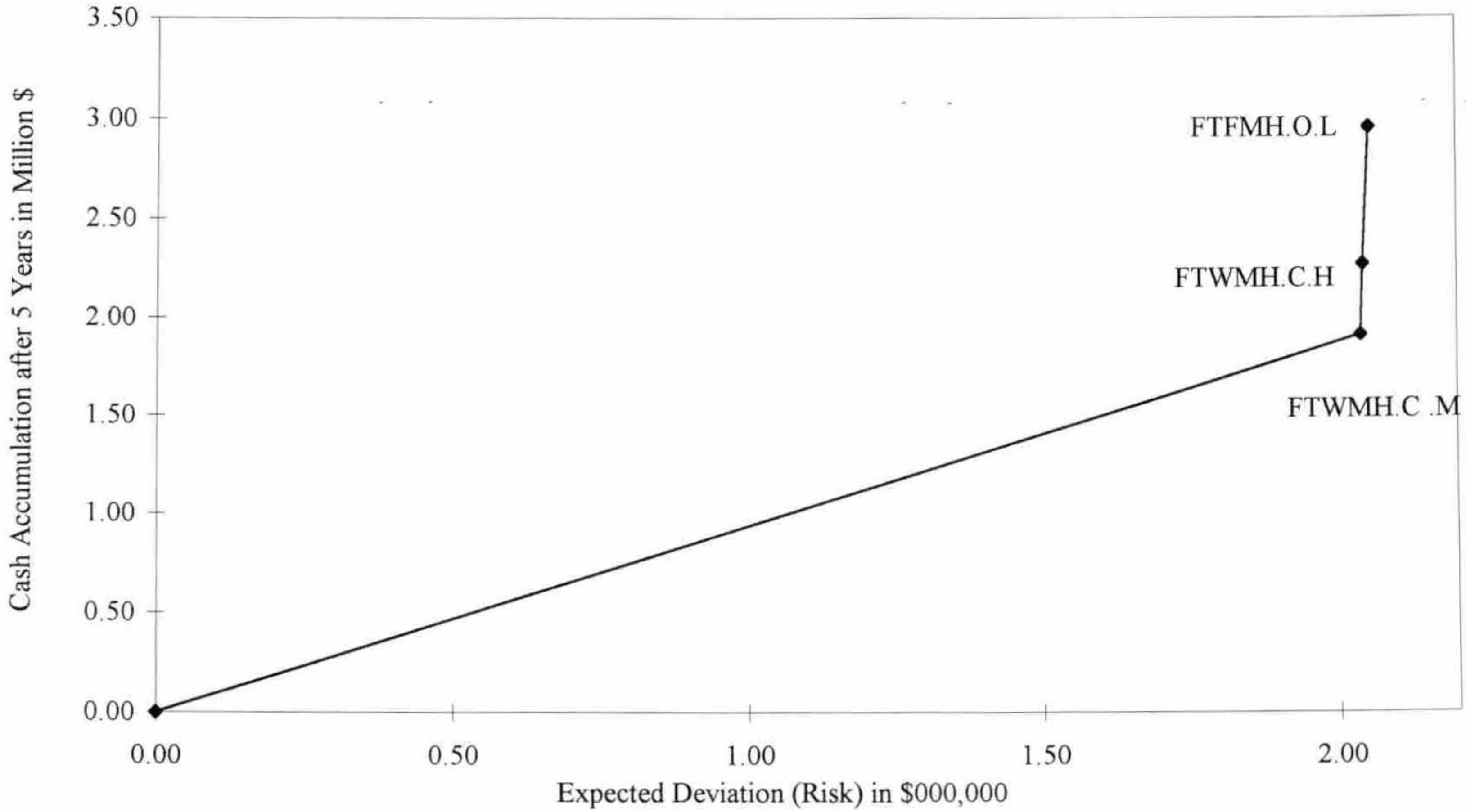

Figure 4.4 Initial MOTAD Model with Financial Constraint of $3.125 Million Available for Equity

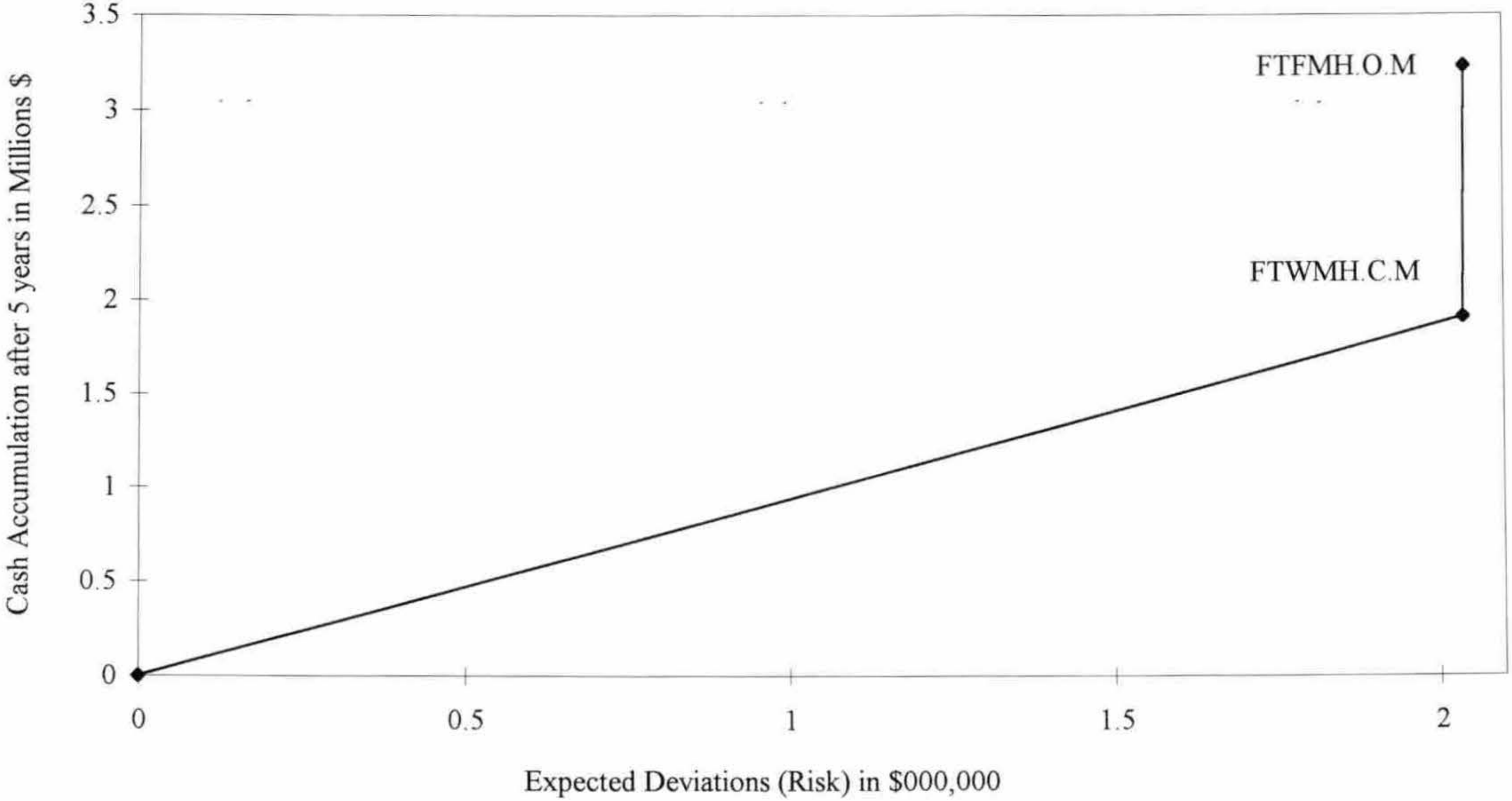

Figure 4.5 Initial MOTAD Model with Financial Constraint of $3.25 Million Available for Equity

FTWMH.C.H had comparable levels of deviations to other operations, but had a lower expected income when compared to the FTWMH.C.H operation. The expected income could be increased by $350,000 with only a small increase in risk, approximately $330, when moving from the FTWMH.C.M operation to the FTWMH.C.H operation. When the investment capital constraint was relaxed to $3.125 million, the FTFMH.O.L provided the opportunity to increase expected income by more than $1 million for increasing risk $1400, when compared to the FTWMH.C.M. When the investment capital constraint was further relaxed to $3.25

Table 4.2 Second Cooperative Model Estimated Frontier with Financial Constraints of $3.0, $3.125, and $3.25 Million Available for Equity

Financial Constraint	Farm Operation	Expected Deviations from Mean Income (Risk)	Expected Cash Accumulation after 5 years of operation
$3.0 million	FTWMH.C.M	$203,776	$1,908,280
$3.0 million	FTWMH.C.H	$204,105	$2,267,277
$3.125 million	FTWMH.C.M	$203,776	$1,908,280
$3.125 million	FTWMH.C.H	$204,105	$2,267,277
$3.125 million	FTFMH.O.L	$205,176	$2,952,275
$3.25 million	FTWMH.C.M	$203,776	$1,908,280
$3.25 million	FTFMH.O.M	$204,011	$3,228,830

million, the FTFMH.O.M yielded an increased expected income of $1.3 million for a $235 increase in risk, when compared to the FTWMH.O.M. There are greater benefits to the hog production operations that have the ability to obtain slightly more equity capital. In Table 4.2 if the hog production operation could increase investment capital available from $3 million to $3.25 million, less then 10%, then expected income increased by $1 million, while risk actually decreased.

In all three cases when financial constraints were imposed, the potential to generate income became constrained by the limited equity capital available. The choice of operations was expanded when the model moved from $3 million to $3.125 million available equity and also when the equity constraint was relaxed to $3.25 million. When more investment capital was available a more efficient hog production operation, FTFMH.O.M, became feasible. Under prior constraints this operation was unfeasible.

The main difference between the initial and second cooperative models was the level of expected income that could be obtained and the amount of risk that could be tolerated. In the initial model, the FTFMH.O.H operation was feasible and provided an expected cash accumulation of $3.5 million for $208,115 expected risk. At higher levels of λ the initial member model, financially unconstrained, offered greater expected income than any of the financially constrained models without significantly increasing the hog production operation's exposure to risk.

Cooperative Model Deviation Thresholds

As a result of the restriction that allowed for the inclusion of only one farm operation in the portfolio of investments, a risk neutral solution was not apparent in the analysis. Given the lack of curvature in the cooperative model's efficient frontiers, the hog production cooperatives were sensitive to risk. More importantly, because the frontiers lacked properties of a concave function, the cooperative's utility function will almost never be tangent to the frontier. This made the selection of a hog production cooperative by the farmer-members more difficult. Alternatively, if the threshold deviation levels for each hog production operation are computed and the cooperative's farmer-members identify acceptable levels of risk for given income levels a solution may be apparent. Utilizing the GAMS MOTAD program, the deviation levels for the farm operations were computed and sorted from low to high according to the deviation thresholds are in Table 4.3. For example, if the cooperative decided it would not take on more than $205,000 in risk, then the cooperative would have four hog production operations from which to choose. Each hog production operation's expected income fell in the range from $1 million to $3.2 million. The ultimate selection by the cooperative of which hog production operation to undertake also depends on the equity required for the operation. In this example, the equity requirement range from $2.7 to $3.2 million as a range of about 18.5% above the minimum level.

Table 4.3 Threshold Deviation Levels for all Farm Operations Cooperative Model Conclusions

Operation	Deviation Threshold Levels	Equity Requirement	Average Cash Accumulation after 5 years
FTWMH.C.M	$203,776	$2,712,323	$1,908,280
FTFMH.O.M	$204,011	$3,217,309	$3,228,830
FTW.C.H	$204,017	$2,984,542	$1,068,640
FTWMH.C.H	$204,105	$2,984,542	$2,267,277
FTFMH.O.L	$205,176	$3,052,639	$2,952,275
FTF.O.H	$205,322	$3,381,979	$1,807,481
FTW.C.M	$206,010	$2,712,323	$703,707
FTFMH.O.H	$208,115	$3,381,979	$3,506,029
FTF.O.M	$208,295	$3,217,309	$1,523,617
FTWMH.C.L	$211,876	$2,425,602	$1,513,312
FTF.O.L	$213,049	$3,052,639	$1,225,969
FTW.C.L	$218,415	$2,425,602	$281,849

Cooperative Model Conclusions

From the above results, two main points are apparent. First, for relatively tight equity constraints, $3 million, expected income can be increased by more than $300,000 if an additional $329 is taken on as risk. Similarly, when equity is constrained to $3.125 million, expected income can be increased by $685,000 if an additional $1,071 is taken on as risk. When equity is limited to $3.25 million, the expected income potential is increased by an additional $1.32 million for only $235 more in risk. It appears that disproportionately high rewards are offered for modest levels of risk in all models.

Second, the use of a multiplier herd to sell gilts appears to provide substantial benefits to the hog production operation. The hog production operations that used a multiplier herd to sell gilts exhibited a reduction in expected risk levels by an average of about $3,000, while simultaneously offering an average increase in expected income of $1.46 million. This implies that the use of a multiplier herd to sell gilts provides superior returns. The results indicate that selling gilts generated cash flows with substantially less negative variation from mean expected income or a range of about 18.5 % above the minimum level.

Initial Member Model

The choice of how many shares each farmer-member would purchase was also analyzed. The cooperative MOTAD model's inputs were replaced with inputs that were on a farmer-member scale. The model was altered to determine the level of farmer-member participation in the selected models. This initial model was constrained to limit the number of shares an individual farmer-member could purchase at 18. This was based on Iowa Cooperative laws that limits an individual member's ownership at 15% of a closed production cooperative. Each hog production operation had an average of 120, 5,000 bushel shares determined by the estimated annual corn required. The same hog finishing constraint from the first model was also included in the member MOTAD model.

The member model was used to determine an optimal level of participation by the farmer-members in the hog production operations. Figure 4.6 shows the estimated frontier from the initial member model, and the values for expected risk and expected cash accumulation after five years are in Table 4.4.

Table 4.4 Initial Member Model Estimated Frontier Second Member Model

Expected Deviations from Mean Income (Risk)	Farm Operation	Expected Cash Accumulation after 5 years of operation	Optimal Number of Shares Purchased
$1,643	FTFMH.O.H	$28,781	1
$4,930	FTFMH.O.H	$86,343	3
$6,573	FTFMH.O.H	$115,124	4
$9,860	FTFMH.O.H	$172,686	6
$14,787	FTFMH.O.H	$259,025	9
$19,716	FTFMH.O.H	$345,373	12
$24,645	FTFMH.O.H	$431,716	15
$29,574	FTFMH.O.H	$518,059	18

The model's results are intuitive given the prior knowledge of the initial cooperative model's results. In the initial member model, the level of risk was the only binding constraint. The initial member model continued until the constraint on the maximum number of shares became binding.

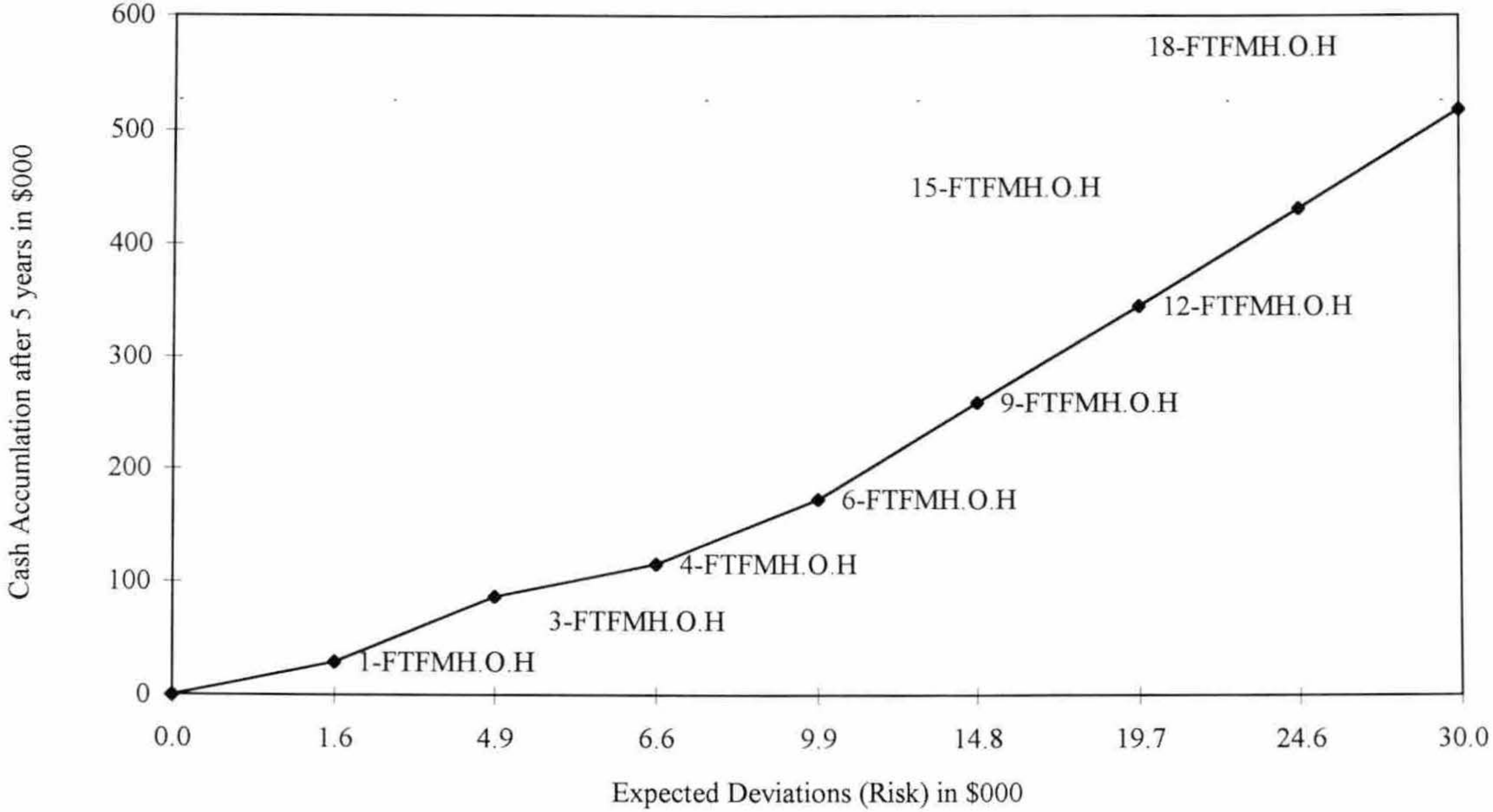

Figure 4.6 Initial Member MOTAD model

Second Member Model

The member MOTAD model was also run a second time with a financing constraint to see how the farm operation selection would change when limits were placed on the investment capital farmer-members units could purchase. The constraint limited the amount of money each farmer-member can use to purchase shares in the cooperative. The three levels of investment capital available used were: $50,000, $100,000, and $250,000. While both member models allowed for multiple shares in a cooperative to be owned by one farmer-member, once again neither allowed a farmer-member to own shares in different cooperatives.

It would not be likely that any single farmer-member would have the financial ability to purchase all 120 shares of any single cooperative, nor would any cooperative allow a member to own a majority of the existing shares. The second member model was similar to the second cooperative model, with a constraint on the financing available to farmer-members. In the second member model the three levels of farmer-member financing used were: $50,000, $100,000, and $250,000. Figures 4.7 through 4.9 show the plots of the estimated efficient frontiers, and Table 4.5 shows the values from the plots.

In the financially constrained member models, the limitation on investment capital became a binding constraint. The FTFMH.O.H operation, one of the operations with the highest equity requirement, was able to provide its farmer-members with more expected income at all levels of risk and for all financial restrictions. The second member models were all captured by the initial member model. As each financial restriction is loosened, the frontier looked increasingly similar to the initial model's frontier.

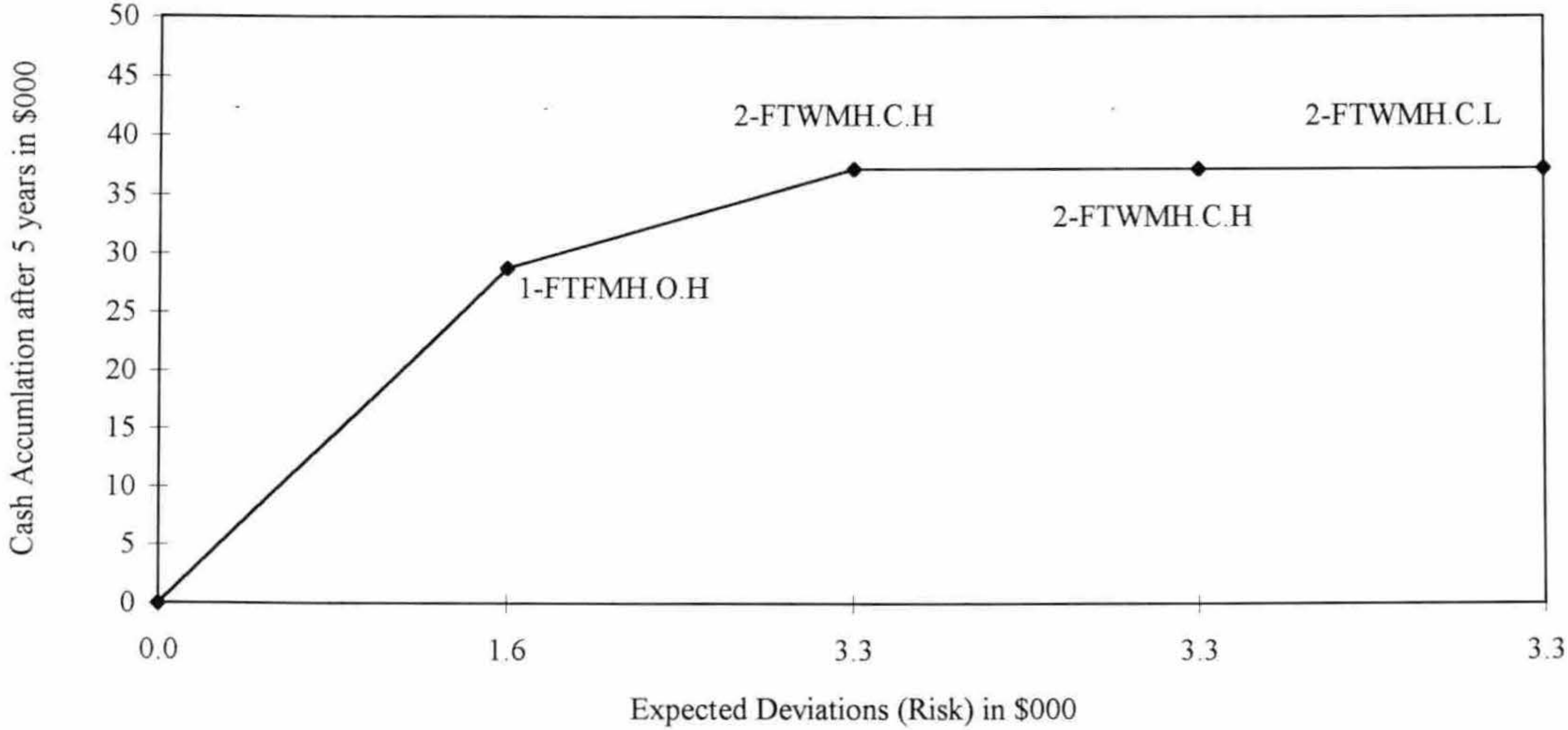

Figure 4.7 Second Member MOTAD Model with Financial Constraint of $50,000 Available for Equity

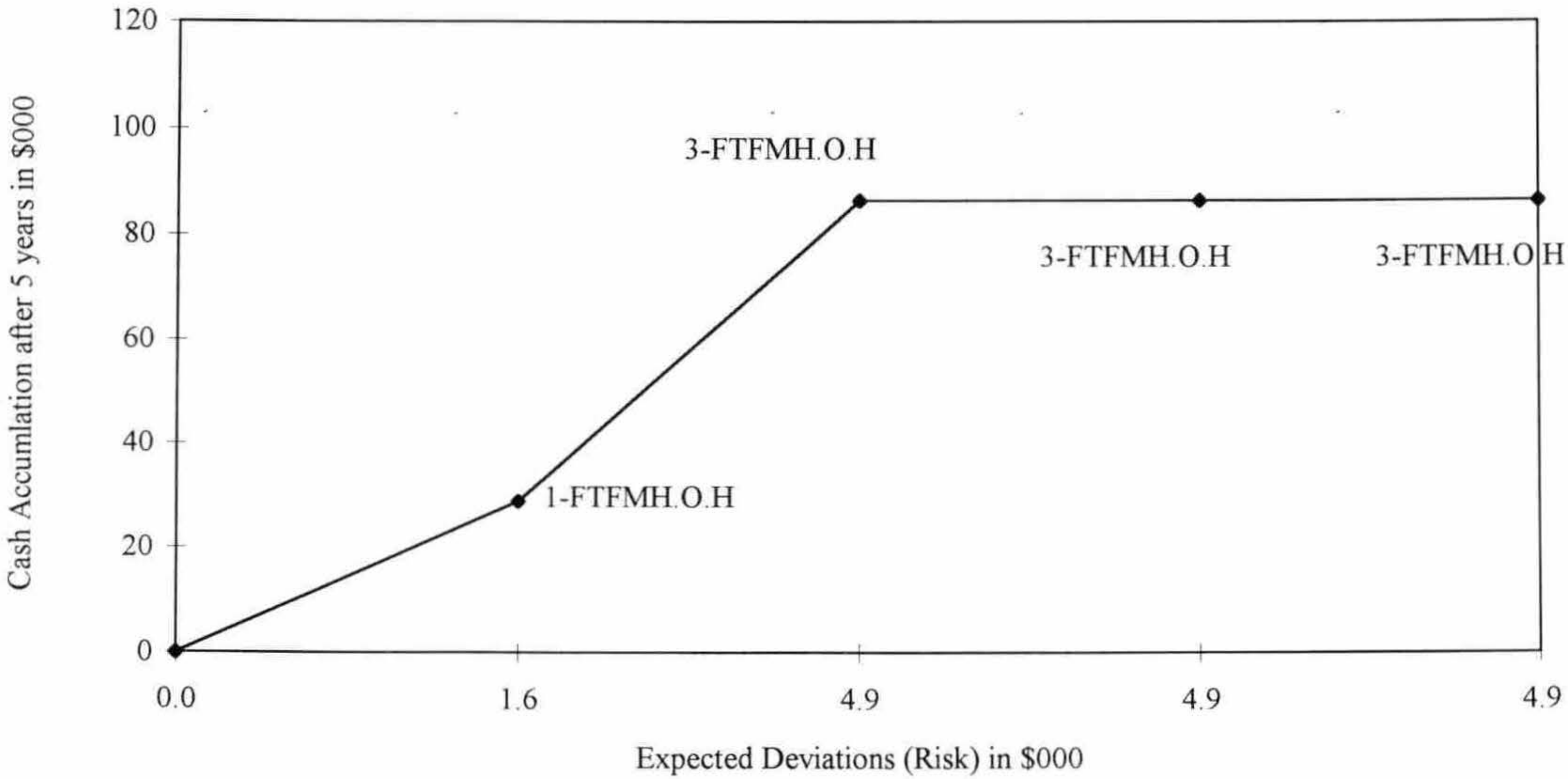

Figure 4.8 Second Member MOTAD Model with Financial Constraint of $100,000 Available for Equity

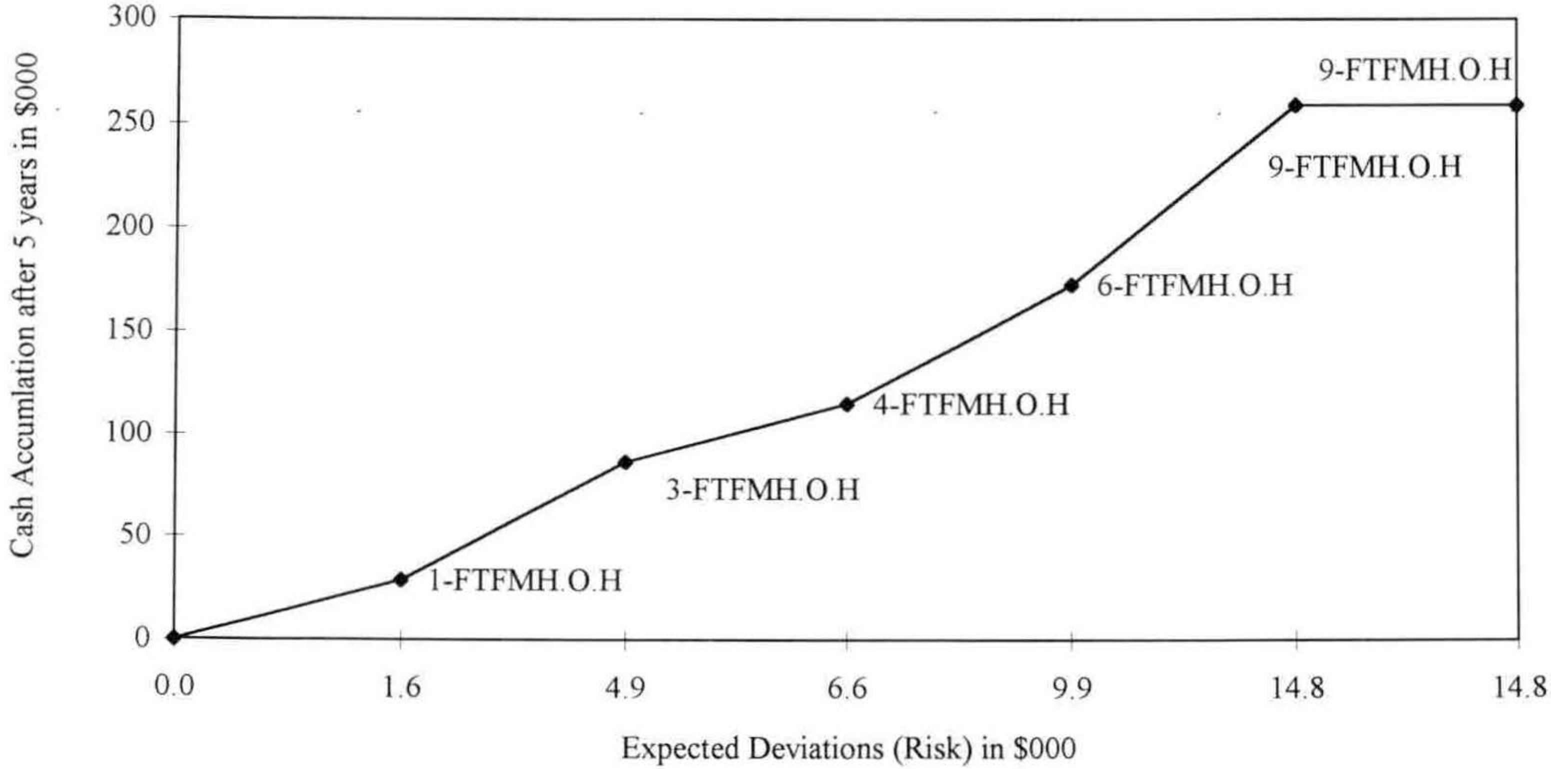

Figure 4.9 Second Member MOTAD Model with Financial Constraint of $250,000 Available for Equity

Table 4.5 Estimated Frontiers for Member Model with Financial Constraints

Financial Constraint	Number of shares and Farm Operation	Expected Cash Accumulation after 5 years of operation	Expected Deviations from Mean Income (Risk)
$50,000	1-FTFMH.O.H	$28,781	$1,643
$50,000	2-FTWMH.C.H	$37,206	$3,267
$50,000	2-FTWMH.C.H	$37,206	$3,267
$50,000	2-FTWMH.C.H	$37,206	$3,267
$100,000	1-FTFMH.O.H	$28,781	$1,643
$100,000	3-FTFMH.O.H	$86,343	$4,930
$100,000	3-FTFMH.O.H	$86,343	$4,930
$100,000	3-FTFMH.O.H	$86,343	$4,930
$250,000	1-FTFMH.O.H	$28,781	$1,643
$250,000	3-FTFMH.O.H	$86,343	$4,930
$250,000	4-FTFMH.O.H	$115,124	$6,572
$250,000	6-FTFMH.O.H	$172,686	$9,858
$250,000	9-FTFMH.O.H	$259,029	$14,787
$250,000	9-FTFMH.O.H	$259,029	$14,787

Adding Value

The main objective of the closed cooperative was to provide an additional corn marketing opportunity for grain farmers. The farmer-members are paid Posted County Price (PCP)[1], $1.74 per bushel, when they deliver corn to the cooperative. At the end of each quarter, the hog production operation makes a second advance payment, the Quarterly Corn Payment, based on the average corn price at the principal nearby market for corn. This payment is the local cash corn price less the PCP already received at delivery. In the very unlikely event that this amount is negative no payment is made. A final value-added payment is made at the end of the year. This value-added payment is based on accumulated cash at the

[1] PCP for Iowa northwest crop reporting district.

end of the year after all expenses, including long term and intermediate term loans, and line of credit payments have been made. This final payment incorporates the extra value gained from feeding the corn through livestock. Here is where the payment would be suspended if the local cash price less the PCP was negative.

In Table 4.6 the average annual member payments over a five year period are listed. This would be the average payment made on a per bushel basis for a 5,000 bushels a year contract running for five years or a total of 25,000 bushels.

Table 4.6 Average Annual Member Payments by Source for 5 Year Period ($/bu), Standard Deviations in Paraenthesis

Operation	Posted County Price Paid	Quarterly Corn Payment	Value-Added Payment	Total Payment per Member
FTF.O.L	$1.74	$0.47	$0.40 (0.1767)	$2.62 (0.1571)
FTF.O.M	$1.74	$0.47	$0.50 (0.1721)	$2.71 (0.1526)
FTF.O.H	$1.74	$0.47	$0.59 (0.1690)	$2.81 (0.1495)
FTFMH.O.L	$1.74	$0.47	$0.97 (0.1667)	$3.18 (0.1470)
FTFMH.O.M	$1.74	$0.47	$1.06 (0.1653)	$3.27 (0.1456)
FTFMH.O.H	$1.74	$0.47	$1.15 (0.1647)	$3.37 (0.1450)
FTW.C.L	$1.74	$0.47	$0.09 (0.1835)	$2.31 (0.1638)
FTW.C.M	$1.74	$0.47	$0.23 (0.1727)	$2.44 (0.1532)
FTW.C.H	$1.74	$0.47	$0.35 (0.1695)	$2.56 (0.1500)
FTWMH.C.L	$1.74	$0.47	$0.50 (0.1758)	$2.71 (0.1570)
FTWMH.C.M	$1.74	$0.47	$0.63 (0.1676)	$2.84 (0.1479)
FTWMH.C.H	$1.74	$0.47	$0.74 (0.1671)	$2.96 (0.1473)

The Total Payment per Member column is the average annual payment made to the member in each of the five years given in dollars per bushel delivered. Comparing these payments to the Iowa average corn price for 1990 to 1995 of $2.21 per bushel, all of the operations provided the grain farmer with a successful means to add value to a portion of their corn marketed through the livestock production operation. Table 4.7 shows the payments made on a per share basis over the five years.

The quarterly corn payments are identical for all operations because they were faced with identical market conditions in the simulations. The difference between the posted county price and the market price was always the same regardless of the closed cooperative setup and production methods. The operations vary in the value added payments made to the members due to the different levels of equity capital invested.

Table 4.7 Member Payments in Dollars Per Share for 5 Years of Delivery (25,000 bu.)

Operation	Posted County Price Paid	Quarterly Corn Payment	Value-Added Payment	Total Payment per Member
FTF.O.L	$43,500	$11,750	$21,750	$77,000
FTF.O.M	$43,500	$11,750	$24,000	$79,250
FTF.O.H	$43,500	$11,750	$26,500	$81,750
FTFMH.O.L	$43,500	$11,750	$35,750	$91,000
FTFMH.O.M	$43,500	$11,750	$38,000	$93,250
FTFMH.O.H	$43,500	$11,750	$40,250	$95,550
FTW.C.L	$43,500	$11,750	$14,000	$69,250
FTW.C.M	$43,500	$11,750	$17,500	$72,750
FTW.C.H	$43,500	$11,750	$20,500	$75,750
FTWMH.C.L	$43,500	$11,750	$24,000	$79,250
FTWMH.C.M	$43,500	$11,750	$27,250	$82,500
FTWMH.C.H	$43,500	$11,750	$30,250	$85,500

Distribution of Payments

It is important to note that all of the proposed hog production cooperatives were established so that any payments made to farmer-members were not made from cash flows generated solely from the depreciation of fixed assets. All of the hog production cooperatives were not able to make farmer-member payments unless the hog production operation was profitable. Maintaining the value of fixed assets and not using them as a source of cash for payments made it possible for members to sell their shares should they decide to. By not making payments from depreciation, the hog production cooperative will maintain the value of the long term assets. In analyzing each operation, the member payments were sorted and distributions for each type of payment, quarterly corn payments and total payments, were calculated for each operation.

Quarterly Corn Payments

The member-patrons received the Agricultural Stabilization and Conservation Service Posted County Price for their corn upon delivery as specified in the cooperative uniform marketing contract. At the end of each quarter, the cooperative made a payment to each member based upon the local market price as defined in the cooperative contract. The quarterly corn payment made was the difference between the PCP and the average Tuesday through Thursday close at the local elevator for that quarter. The maximum set for the quarterly corn payment was $1.50 per bushel. Thus the farmer-members would have to deliver corn at an opportunity cost when prices exceeded the PCP by more than $1.50. In this analysis all operations faced identical feed input circumstances, prices and biological performance inputs, resulting in identical quarterly corn payments for all operations.

In Figure 4.10 the distribution of the quarterly corn payments is graphed. The distribution of payments looks roughly normal, and the average payment each member received was $0.47 per bushel. The quarterly corn payment can also be viewed as a risk management tool. The farmer-members won't lose out on high cash market corn prices,

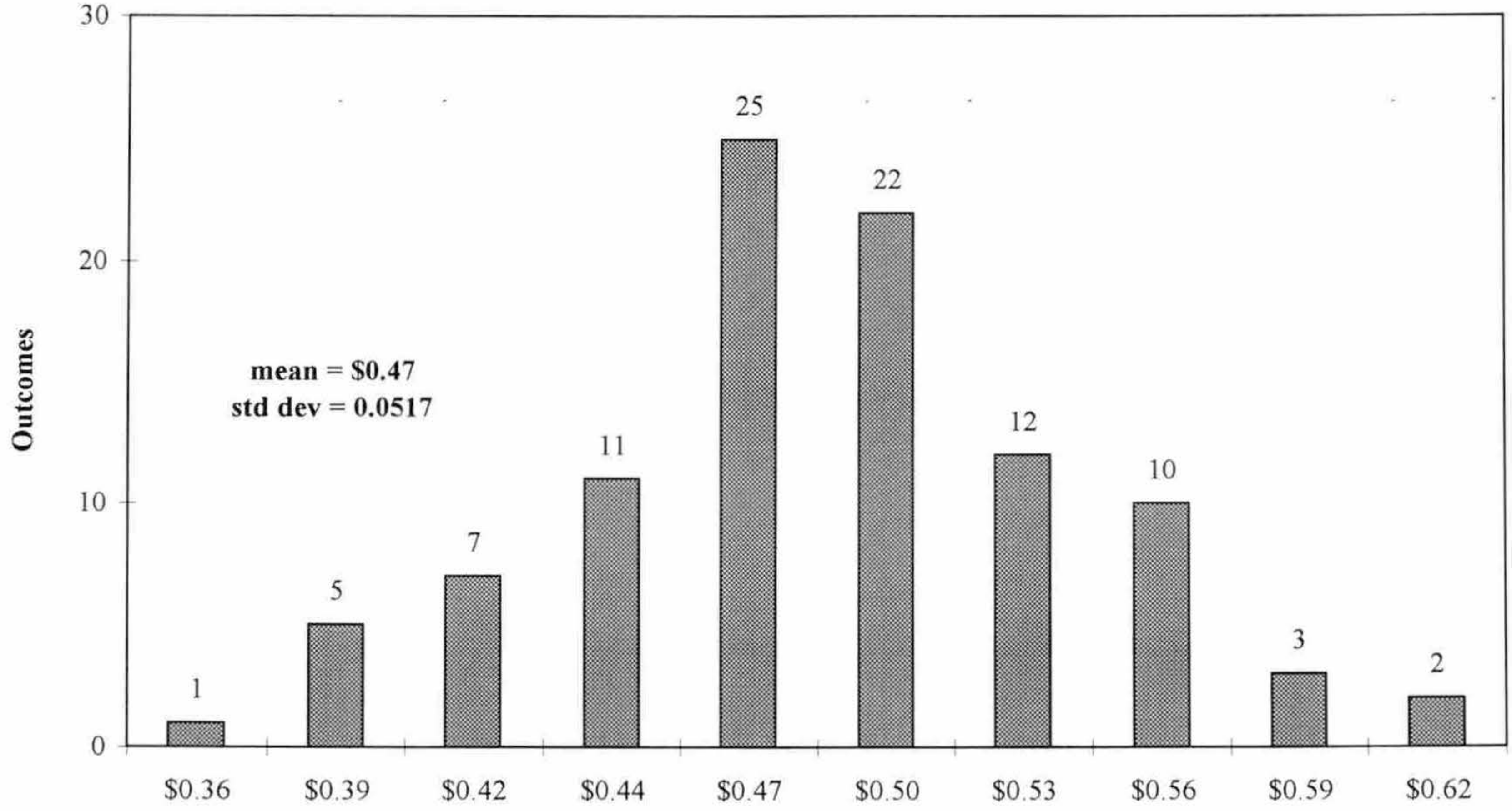

Figure 4.10 Average Yearly Quartlerly Payment ($/bu)

because a larger quarterly corn payment will be made when corn prices rise. Furthermore, it communicates more accurately the value added benefits provide by the hog production cooperative. It is useful to demonstrate to members what portion of the payments result from corn and what portion resulted from hog production (value added payment).

The cap placed on the quarterly corn payment was used to provide the cooperative with some protection if cash market corn prices rise extremely high, as was the case in 1996 for example. In this case, the farmer members could have sold their corn for more at the cash market, but must remember that they are committed to a value-added activity, which may not add value at all times. This is a similar situation to the one the farmer-member would face if he or she had a commitment to a livestock enterprise on their farm. If the farmer-members owned livestock and facilities they would be feeding at a loss.

However, since the hog production cooperative is an independent entity with independent financing, it must price corn at a level which allows it to meet its own cash requirements. If the members were to take a quarterly corn payment larger than \$1.50, there is a potential for the hog production operation to become unprofitable because the cooperative would lack the necessary operating cash. This limitation ensures that while farmers were getting a payment, the cooperative was not paying out capital it needed for operations. If the cooperative were to make quarterly corn payments in excess of \$1.50, this would come at the expense of any value-added payments and in the extreme case the equity capital endowment of the cooperative. Lenders to the cooperative would typically find this unacceptable.

Value Added Payments

Each farmer-member was eligible for a value added payment based on the cooperative's performance for the fiscal year. This payment was calculated based upon the accumulation of cash at the end of five years. This total amount available was used for calculating the value added payments. If the analysis were done with the cash accumulation after each year, the value added payments would have had the benefit of the time value of money and accumulated some interest. Figures 4.11 through 4.22 show the graphed distributions for all the models evaluated.

The distribution of value-added payments varies among the different hog production operations. Looking at the average payments made over all operation of farm type, listed in Table 4.8, there is more than a 100% increase in the FTFMH's average value added payments

Table 4.8 Average Payments for All Leverage Levels Made to Each Farm Type

Farm Type	Average Value Added Payment	Average Total Payment
FTF	$0.50	$2.71
FTFMH	$1.06	$3.27
FTW	$0.22	$2.44
FTWMH	$0.62	$2.84

when compared to FTF operations. In the operations that utilize contracting an increase of almost 200% can be realized with the addition of a multiplier herd. The dispersion or spread of the value added payments decreases with increased levels of equity. In Table 4.6 the operations that used higher equity (M or H), were able to reduce the standard deviation

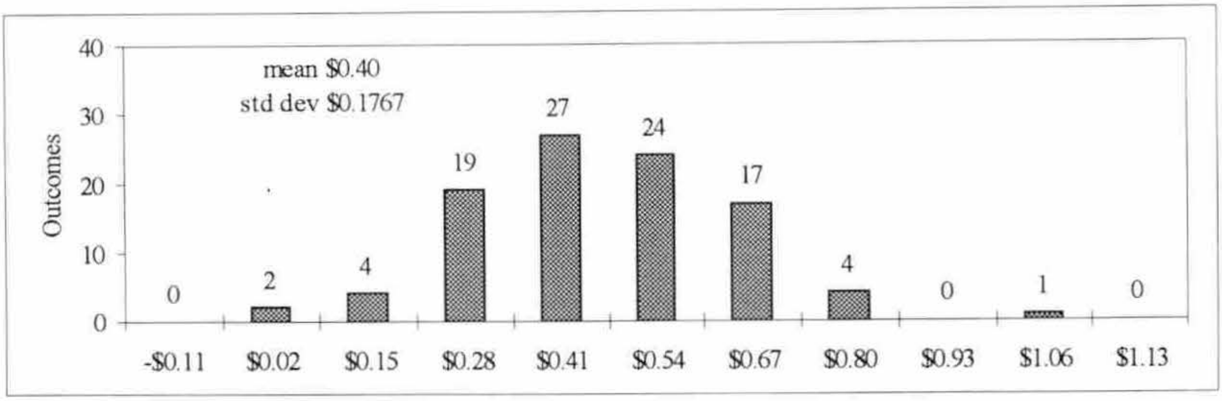

Figure 4.11 Average FTF.O.L Yearly Value Added Payment ($/bu)

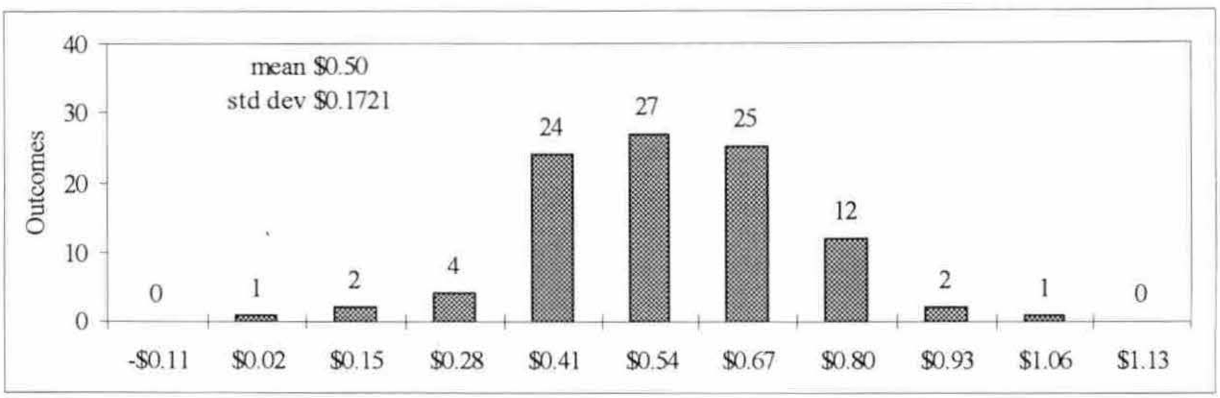

Figure 4.12 Average FTF.O.M Yearly Value Added Payment ($/bu)

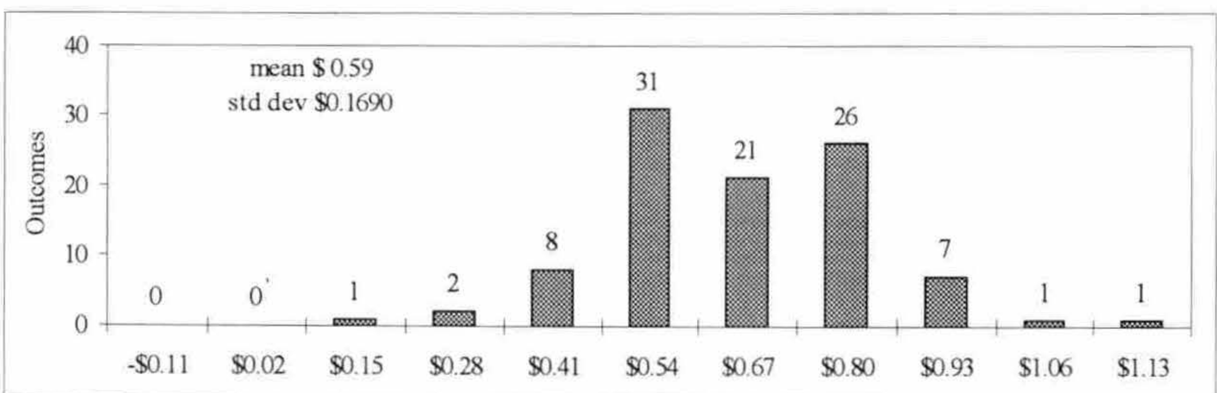

Figure 4.13 Average FTF.O.H Yearly Value Added Payment ($/bu)

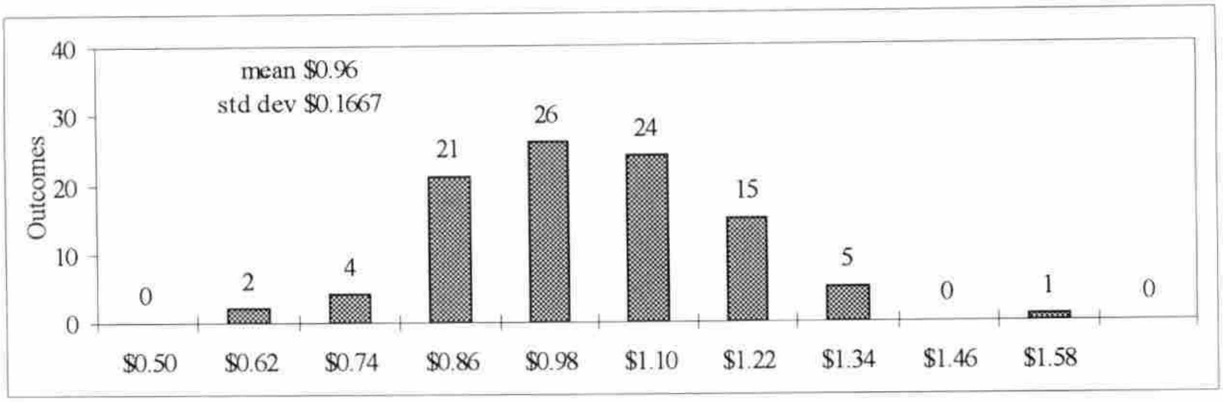

Figure 4.14 Average FTFMH.O.L Yearly Value Added Payment ($/bu)

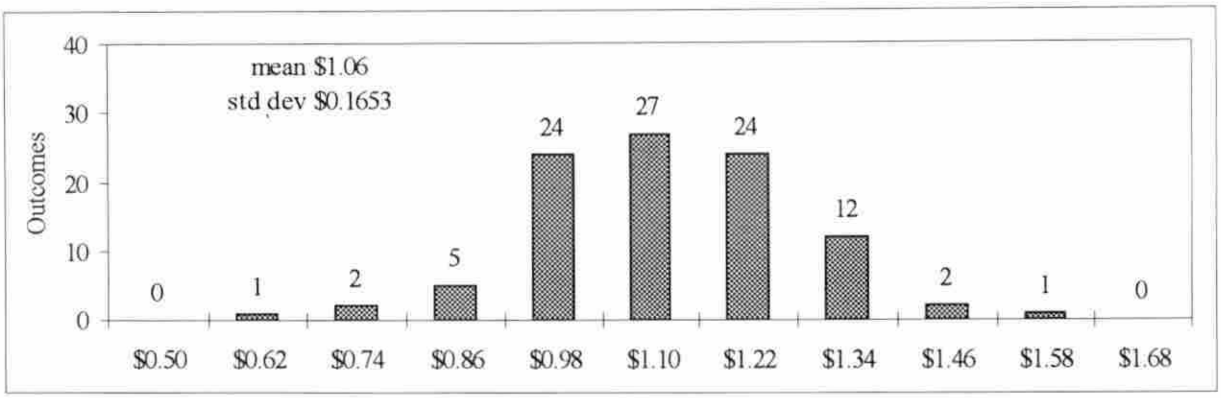

Figure 4.15 Average FTFMH.O.M Yearly Value Added Payment ($/bu)

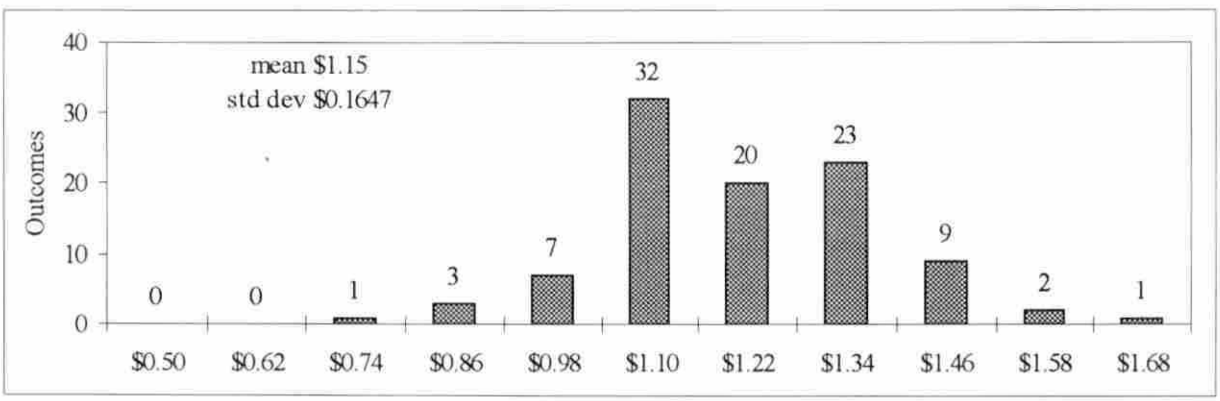

Figure 4.16 Average FTFMH.O.H Yearly Value Added Payment ($/bu)

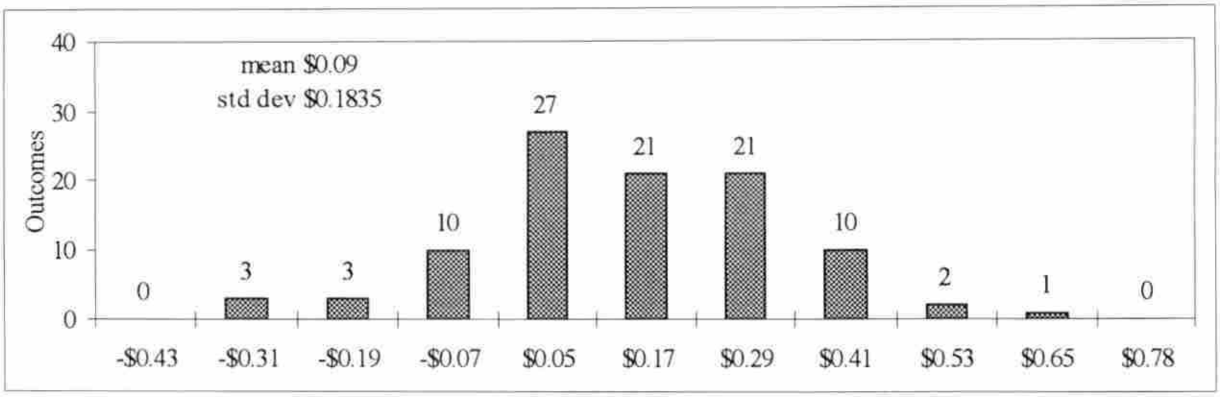

Figure 4.17 Average FTW.C.L Yearly Value Added Payment ($/bu)

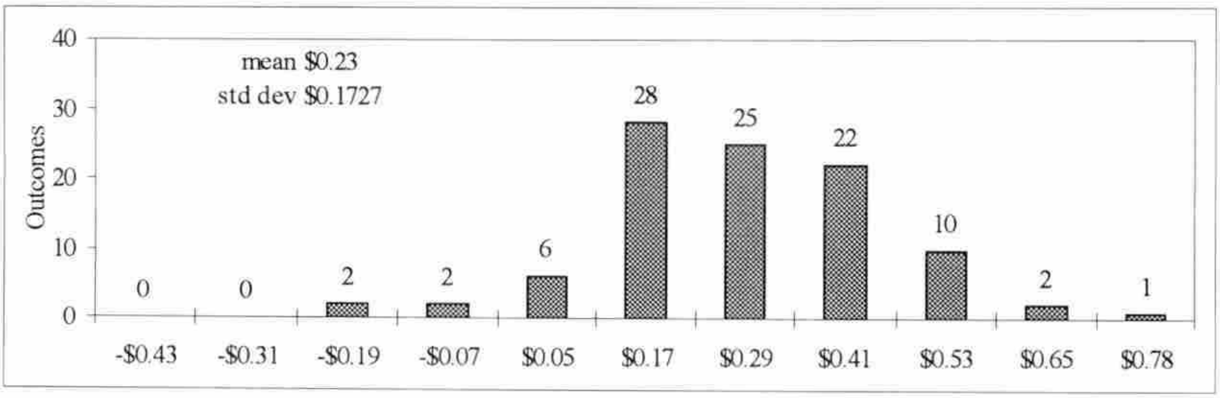

Figure 4.18 Average FTW.C.M Yearly Value Added Payment ($/bu)

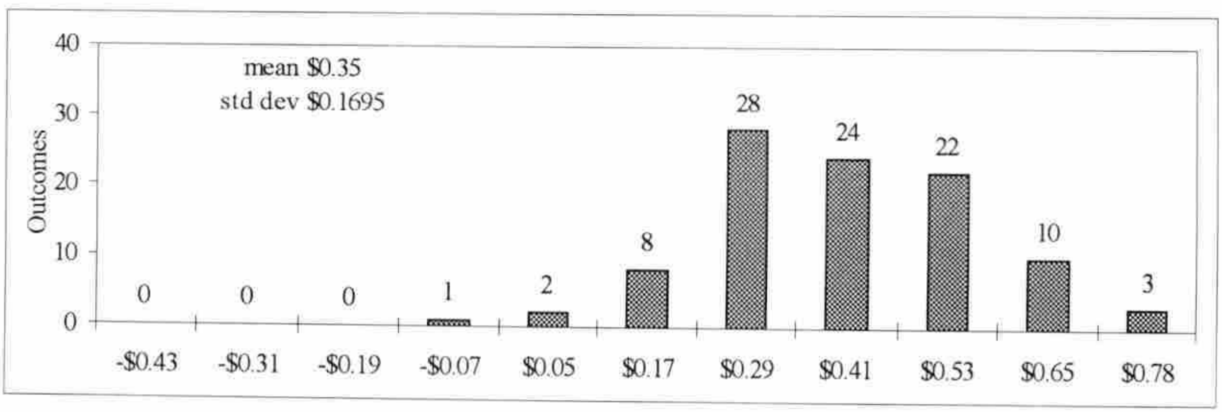

Figure 4.19 Average FTW.C.H Yearly Value Added Payment ($/bu)

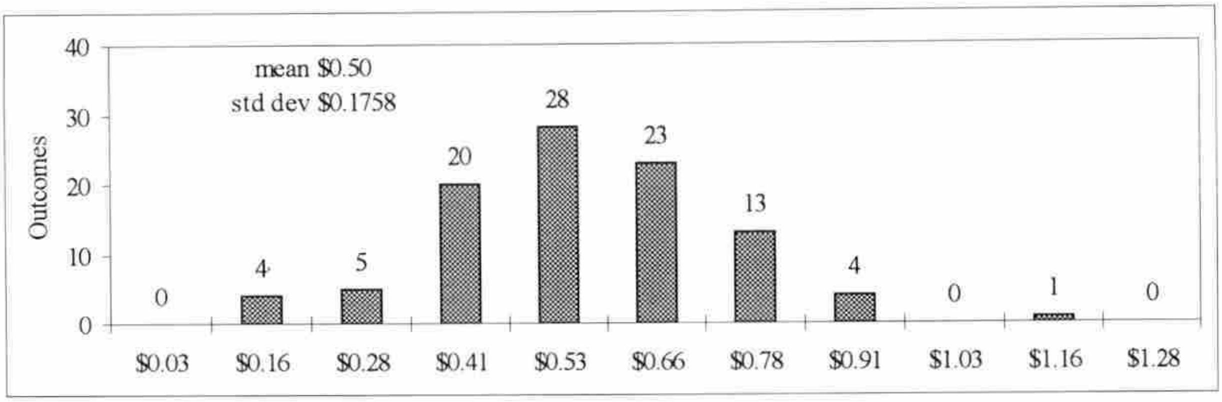

Figure 4.20 Average FTWMH.C.L Yearly Value Added Payment ($/bu)

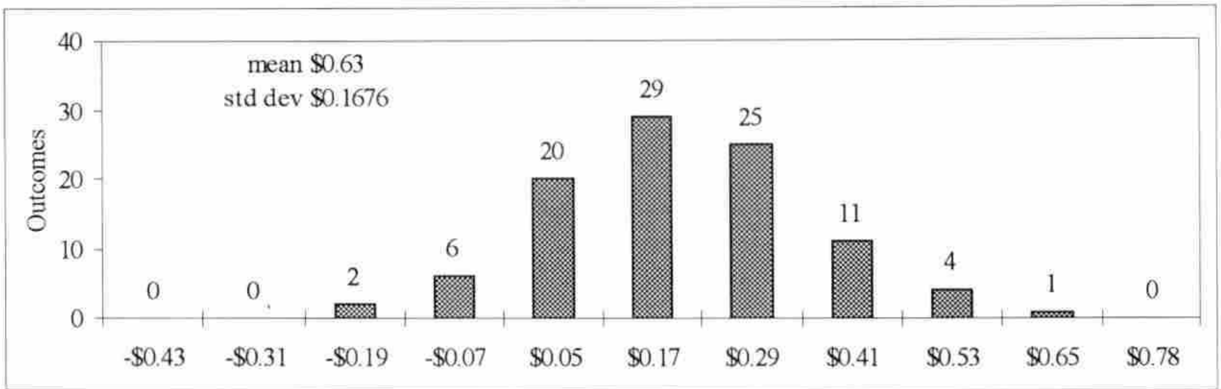

Figure 4.21 Average FTWMH.C.M Yearly Value Added Payment ($/bu)

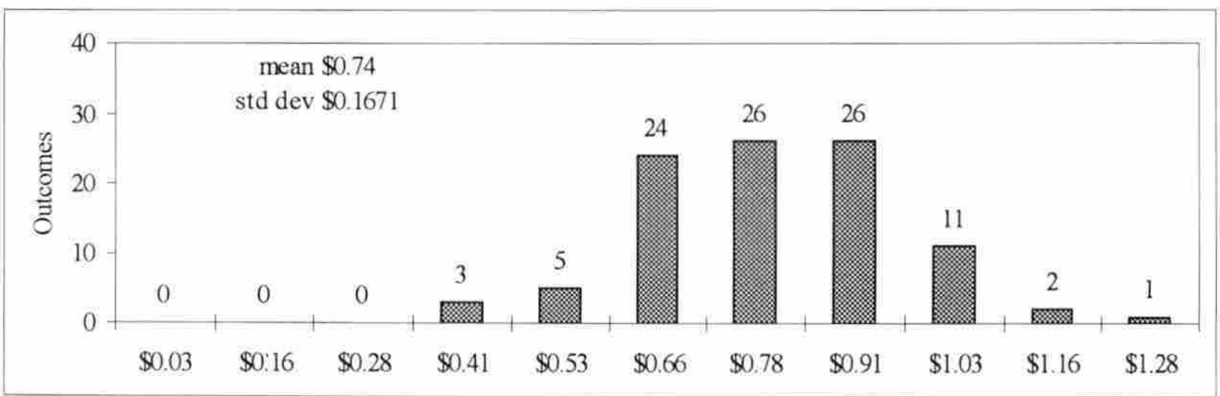

Figure 4.22 Average FTWMH.C.H Yearly Value Added Payment ($/bu)

associated with their value added payments when compared with those operations that used lower equity levels.

Total Payments

The average annual total payment to the farmer-members over five years was based on total bushels of corn delivered. All of the cooperative hog production operations had a five year ironclad delivery contract associated with membership. Figures 4.23 through 4.34 illustrate the distributions of the Total Payments made to the farmer-members in the cooperative analyzed. Failure to deliver was assumed to trigger penalties and in extreme cases suits for liquidated damages.

The Total Payment distributions appear to be roughly normal in their shape, but there are visible differences in the average total payment amounts, see Table 4.8. When comparing the operations on a total dollars paid per bushel, the operations that had multiplier herds and owned their finishing facilities (FTFMH) were able to pay larger total payments to their members. Comparing operations with a multiplier herd to those without, FTF to FTFMH and FTW to FTWMH, there was an increase in the total payment of the non-contract finishing farms from $2.71 to $3.27 (FTF to FTFMH), or an increase of over 20% on average across all operations when a multiplier herd was added.

In the contracting models, there was an increase of from $2.44 to $2.84 (FTW to FTWMH) or over 16% when a multiplier herd was added to the operation. Comparing contract finishing to non-contract finishing (FTF to FTW, FTFMH to FTWMH, and FTF to FTW), the non-contract finishing farms or farms that owned their own finishing facilities

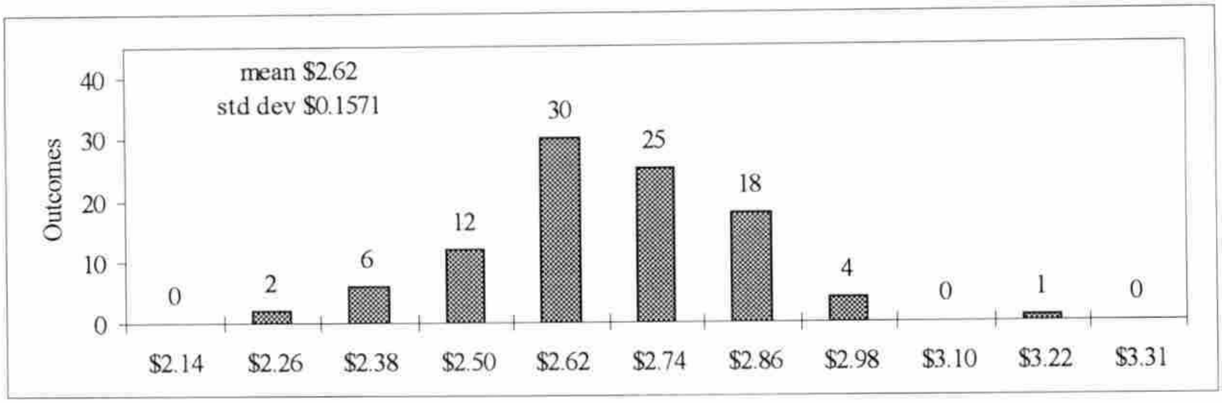

Figure 4.23 Average FTF.O.L Yearly Total Payment ($/bu)

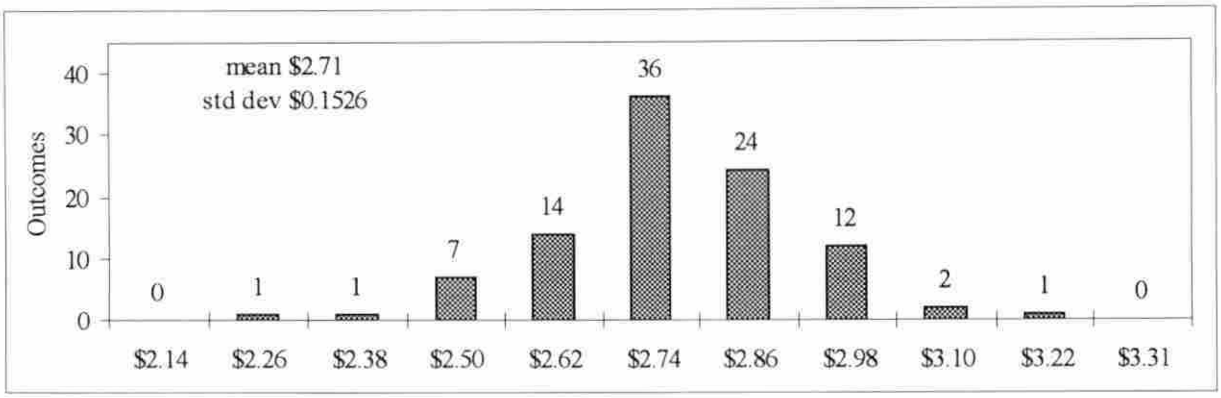

Figure 4.24 Average FTF.O.M Total Payments ($/bu)

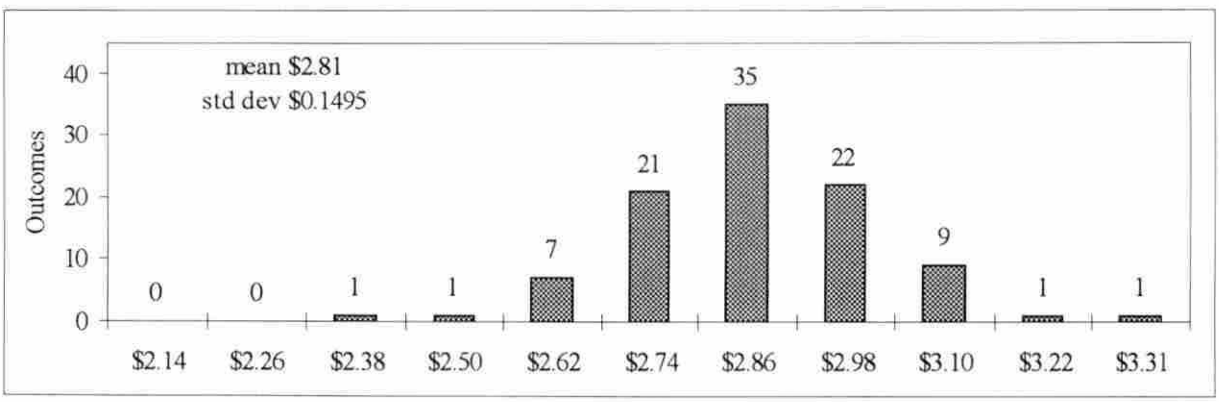

Figure 4.25 Average FTF.O.H Total Payments ($/bu)

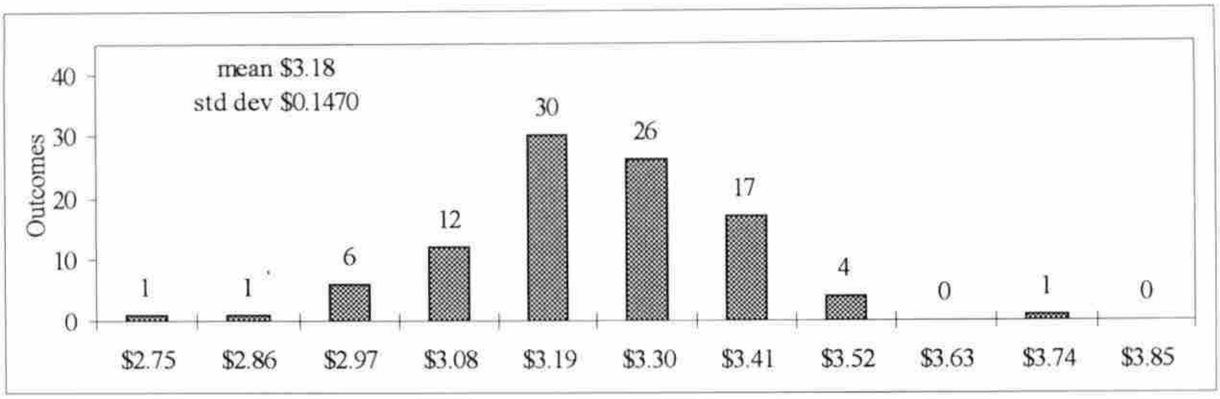

Figure 4.26 Average FTFMH.O.L Total Payments ($/bu)

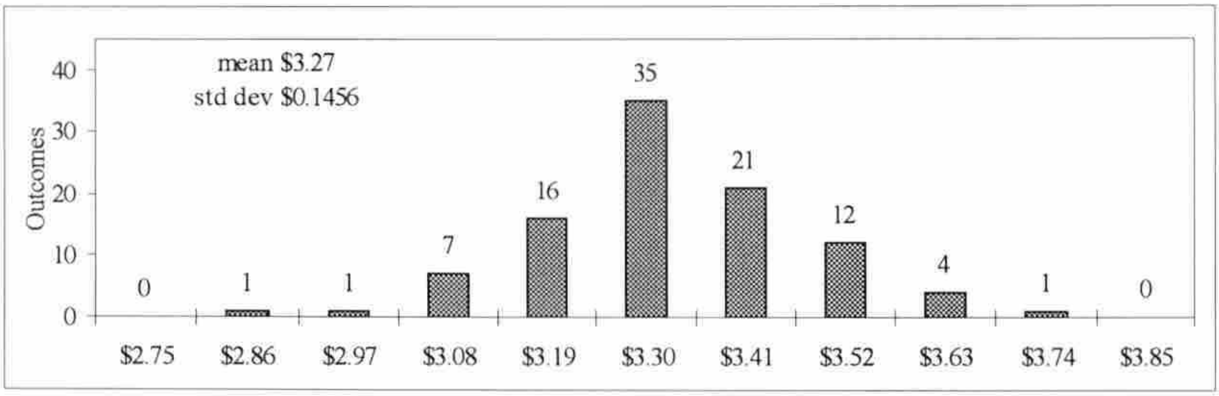

Figure 4.27 Average FTFMH.O.M Total Payments ($/bu)

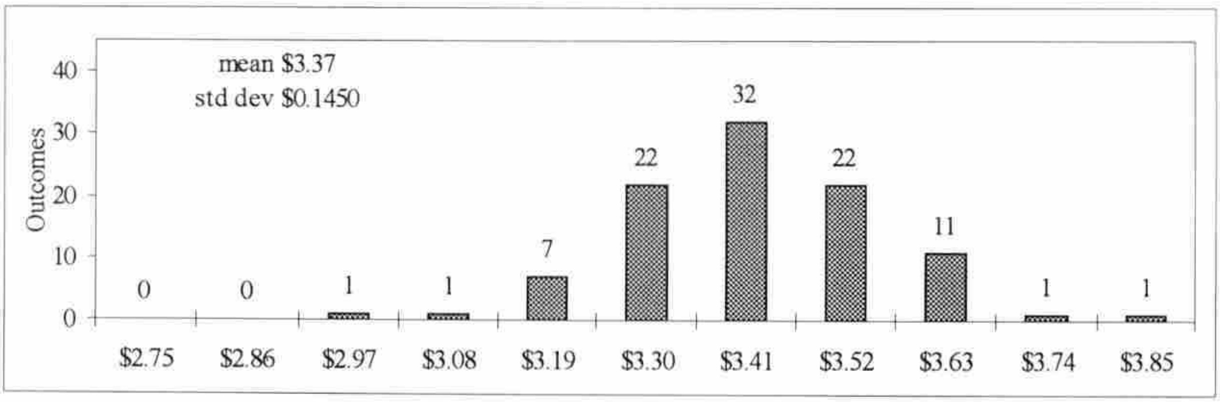

Figure 4.28 Average FTFMH.O.H Total Payments ($/bu)

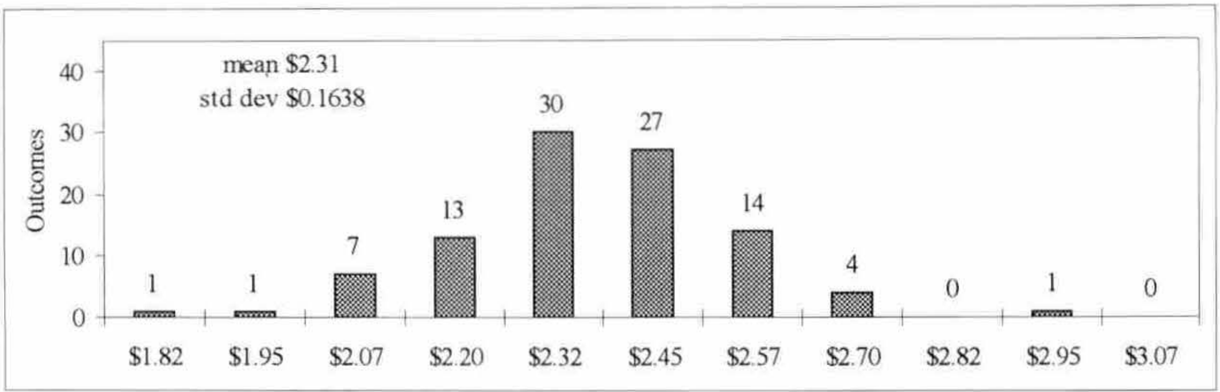

Figure 4.29 Average FTW.C.L Total Payments ($/bu)

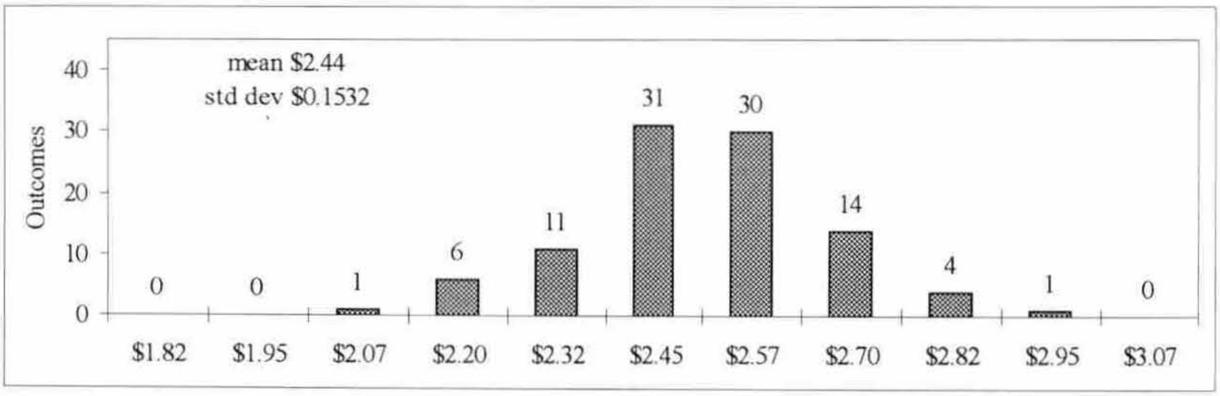

Figure 4.30 Average FTW.C.M Total Payments ($/bu)

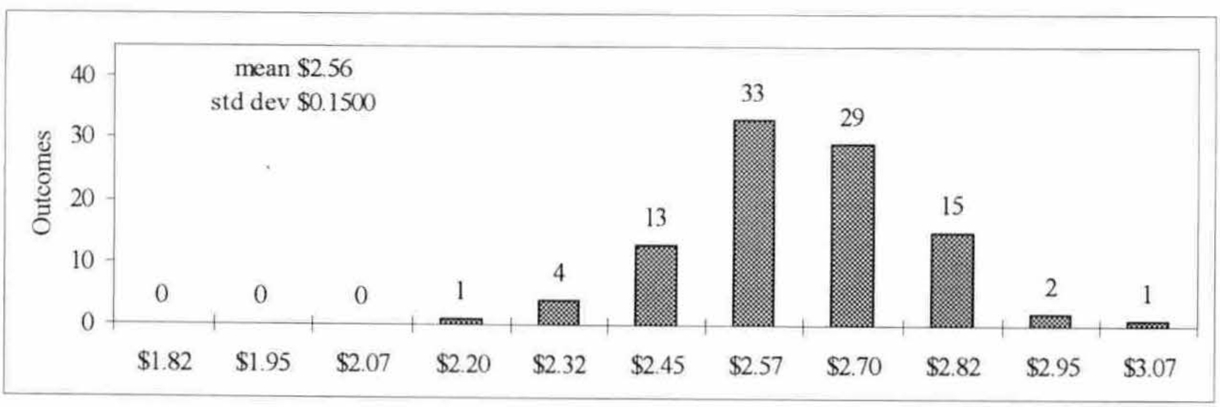

Figure 4.31 Average FTW.C.H Total Payments ($/bu)

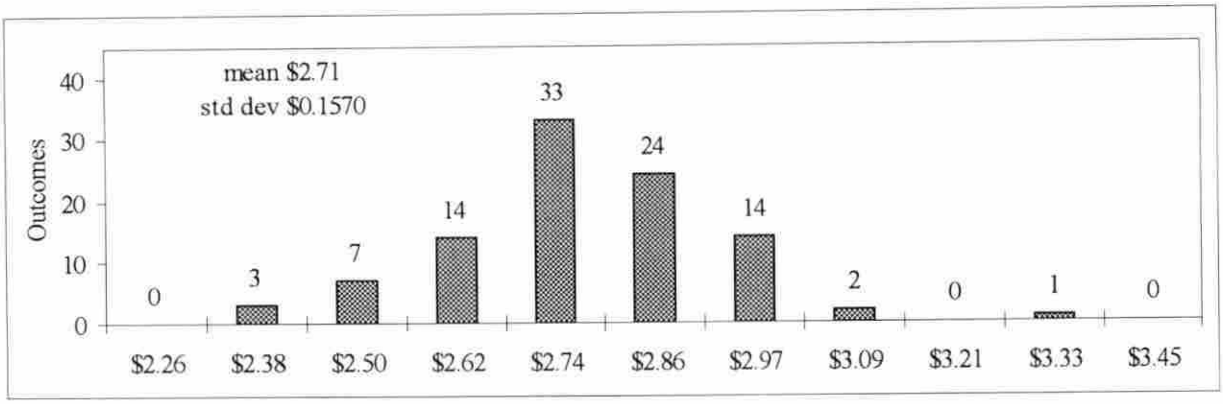

Figure 4.32 Average FTWMH.C.L Total Payments ($/bu)

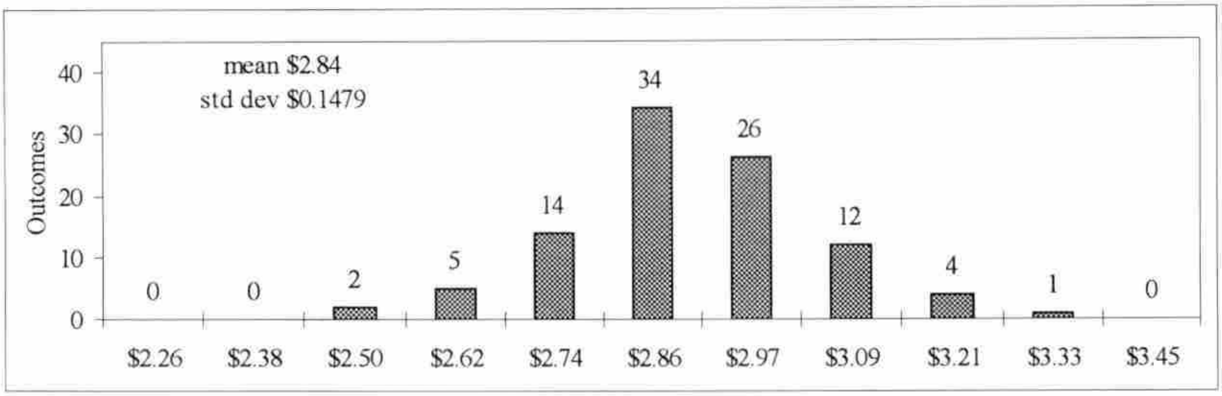

Figure 4.33 Average FTWMH.C.M Total Payments ($/bu)

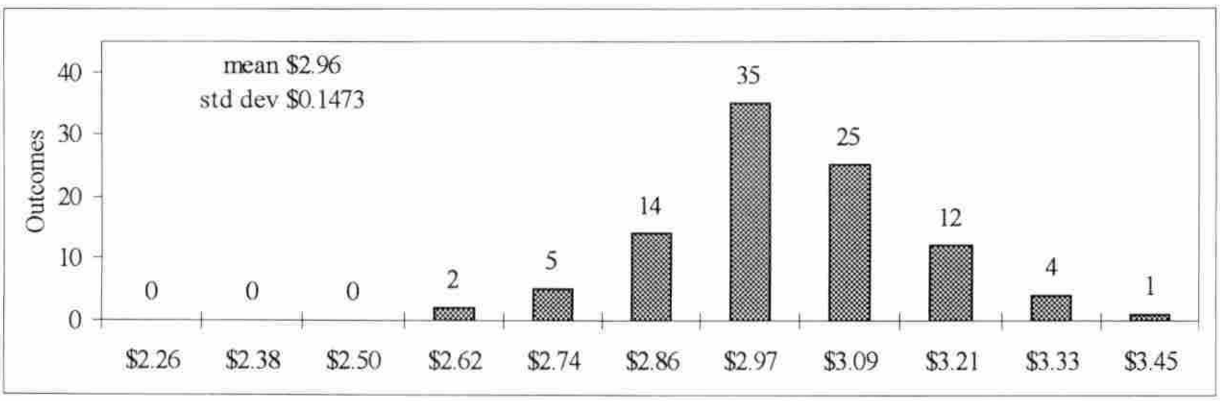

Figure 4.34 Average FTWMH.C.H Total Payments ($/bu)

performed better. The FTF operation's total payments were 11% higher than the FTW, and the FTFMH operation's total payments were 15% higher than the FTWMH. When the FTF was compared to the FTWMH, the FTWMH operations were able to pay 4.7% more in total payments. Accordingly, when the FTFMH operations were compared to FTW operations, an increase of over 34% was realized.

Summary and Conclusions

Closed value added swine cooperatives appear to be a viable alternative for Iowa grain producers as a means for adding value to grain production. Analysis of four swine production systems indicated that cumulative performance over a five year period (including startup periods) resulted in positive cash flow and net income. This was true under three different financial leverage positions.

The cooperative MOTAD analysis indicated that the performance of operations with high or medium equity levels were generally superior to those with lower equity levels for all four production systems - generating better returns for the risk levels analyzed. Similar results to those from MOTAD were obtained when mean variance analysis was used.

The cooperative MOTAD analysis also indicated that constraints on the amount of equity capital available affected the efficient frontier. The most stringent equity constraint of $3.0 million available for equity selected a farrow-to-wean operation (FTWMH.C.H) with lower expected income. Relaxation of the constraint by 5% permitted expected income to increase markedly by allowing a low equity farrow-to-finish operation with owned-finishers and a multiplier herd (FTFMH.O.L) to enter. Relaxation of the equity constraint by an additional 5% permitted a better capitalized farrow-to-finish operation with owned-finishers and multiplier herd (FTFMH.O.M) to enter with an additional income of $300,000.

The member MOTAD analysis indicated that constraints on the amount of equity capital available also affected the efficient frontier. The most stringent equity constraint of $50,000 available for equity per member indicated that a single member would maximize their expected cash accumulation after five years at $37,206 by owning two shares of the high equity farrow-to-wean with contract finishing operation (FTWMH.C.H). Relaxation of the constraint to $100,000 per member for equity, increased the expected cash accumulation per member markedly to $86,343, by allowing for three shares of a high equity farrow-to-finish operation with owned-finishers and a multiplier herd (FTFMH.O.H) to be purchased. Relaxation of the equity constraint to $250,000 per member for equity showed that purchasing additional shares of the higher equity farrow-to-finish operation with owned-finishers and multiplier herd (FTFMH.O.H) was the only way to increase expected cash accumulation while keeping risk at a minimal level.

All efficient frontier selections resulted in significant added value for producers joining the cooperative. The farrow-to-wean with contract finishing operations (FTW) generated an average of $0.22 per bushel, in value added payments, that was added to the value of all corn provided to the cooperative by its members each year. The farrow-to-finish operations with owned finishers (FTF) provided an average of $0.50 per bushel, in value added payments, and the farrow-to-finish with multiplier herd and owned finishers (FTFMH) provided an average of $1.06 per bushel, in value added payments, each year. These value added payments represent a better alternatives for the farmer than selling their grain in the open market.

Several conclusions can be drawn from these results which may be useful to groups who are considering forming cooperatives

1. Using the farm operation as multiplier herd to sell gilts provided higher income. Production systems without multiplier herds were universally inferior to those without them.
2. Using owned finishing facilities provided higher returns than contract finishing.
3. Severe constraints on equity capital can significantly reduce income and value added payments. Allowing as little as 10% more equity permitted value added payments to increase nearly three fold.
4. Risk exposure did not increase significantly when the medium equity farrow-to-finish as a multiplier herd operation (FTFMH.O.M) was selected over the farrow to wean with contract finishing (FTW.C.M). An insignificantly small increase in risk allowed value added returns to increase markedly.
5. In the member models, increasing equity contributions from \$50,000 to \$250,000 (an increase of \$200,000) provided an increase in expected cash accumulation after 5 years from \$37,206 to \$259,029, an increase of over \$220,000.
6. By using additional equity, the farrow-to-finish as a multiplier herd and owned finishers operations (FTWMH) were able to add an additional \$0.84 per bushel each year in value added payments, or \$21,000 over five years, when compared to the farrow-to-wean with contract finishing operations (FTW).

Suggestions for Further Research

One biological variable that was originally proposed to be modeled but later excluded was feed efficiency of the hogs. It became apparent that this variable was very dynamic variable and with the data in the PIGChamp dataset unable to accurately be modeled. Using the SFA model, more detailed information about amount of feed and dietary contents were required. Being able to accurately model the feed efficiency could provide some additional insight into the variation of output. This data might easily be obtained by working with a single producer. Additionally, working with a single producer would also enable this model to be checked for accuracy. Using the producer's actual biological and price outcomes the model could re-estimated and checked with the original results for accuracy.

Another way to check the assess the model's accuracy would be to use a bootstrap procedure to obtain confidence intervals for the estimates of farmer-member payments. The bootstrapping would be done independent of the distribution estimation obtained from BESTFIT®, thus enabling the distribution assumptions and estimates to be checked.

Additionally this research can greatly benefit from the expansion of the database used to obtain distribution estimates. The estimates for the biological variables could be improved by including more farms and having longer records for each. The estimates of the price variables could also be improved by using a longer time series.

APPENDIX A

FARM SETUP PARAMERTERS -

DATA INPUT SHEETS FROM THE SFA MODEL

Data Input Sheet for Modern Swine Production

Data Input by:	Carl Watson	TEAMPork - Iowa Pork Industry Center
Name of Swine Farm:	**2400 Sow -- 1000 pigs / week Swine Unit**	
Type of Swine Operation:	***Farrow-to-Finish Operation - Low Equity***	

START-UP COSTS

Facility and Equipment Costs

Building Site Preparation	$ 24,000	
Manure Management System	144,000	
Water Supply System	36,000	
Electric Lines/Generator	72,000	
L.P. Tanks	7,200	
Acres of Real Estate Purchased	240	
Purchase Price (Avg. Price per Acre)	$ 2,071	
Community Acceptance and Legal Start-up Fees	50,000	
Total Facility and Equipment Costs:		***$830,240***

Construction Costs

Total Costs	***$***	***6,406,764.00***
Total Cost/Sow -		***2,669.49***
Cost/Hog Marketed		***135.87***

Breeding Stock Purchases

Total Costs	***$***	***803,400.00***
TOTAL CAPITAL COSTS:	***$***	***7,210,164.00***

Buildings and Equipment

	$/Space	Total Costs	Animal Spaces	Sq. Ft/Space
Breeding and Gestation Facilities	$ 450.00	$ 1,026,000	2,280	11.0
Farrowing Facilities	2,000.00	768,000	384	35.0
Nursery Facilities:	130.00	1,039,584	7,997	3.0
Grow-Finish Facilities	170.00	3,058,980	17,994	8.0
Isolation Building	160.00	96,000	600	
Managers Home and Alarm		85,000		
Other: (overwrite this)		-		
Other: (overwrite this)		-		
Total Building and Equipment Costs:		***$ 6,073,564***		

Existing Swine Facility Valuation

Breeding & Gestation	$ -
Farrowing	-
Nursery Phases	-
Grow-Finish Phases	-
Land for Swine Use	
Existing Facility Value	***$ -***
Depreciation per Year	***$ -***

Construction Schedule (% /month)	45%	20%	20%	10%	5%	0%
	$ 3,106,712	***$ 1,380,761***	***$ 1,380,761***	***$ 690,380***	***$ 345,190***	***$ -***

Equity Contribution (30% of Facility Costs)	$ 1,922,029	$ 321,360	$ 809,250	$ 1,245,000 Money Needed for3 Mths Production
Economic Development Grant Money	$ -	***$ 321,360***		
	30.0%	40.0%	65.0%	

	Equity Contribution	Equity Percentage	Total Captial Reqired	PCP and Mkt basis	Dollars per bushel
TOTAL EQUITY CONTRIBUTION	$ 3,052,639	37.64%	$ 8,110,038.82	$ 1.50	$ 4.92

New Breeding Stock (Start-up) Costs:

Average Sow Inventory of Facility Design:	2400		***100.00% of Herd***		
Current Sow Inventory (0 if Repopulating)	0		***0.00% of Herd***		
Initial Gilt Purchases:		***2560***	***100.00% of Herd***		
Cost per Gilt FOB the Farm:	$ 250				
Delivery Schedule (% delivered/month):	0%	40%	30%	30%	0%
Number of Head Loaded per Month:	-	***1,032***	***774***	***774***	-

Average Boar Inventory of Facility Design:	120		***Sow to Boar Ratio:***	***20.0***
Current Boar Inventory	0			
Initial Boar Purchases:		***132***		
Cost per Boar FOB the Farm:	$ 1,200			
Delivery Schedule (% delivered/month):	0%	100%	0%	0%
	-	***132***	-	-

Internal Grandparent System? (Y or N)	NO
If Yes, Cost of Grandparent Gilts:	$ -

DIET INPUTS

	CP. Level	% Lysine	Price of Feed Input	
Corn	8.00%	0.25%	$ 2.26	***per bushel***
Protein Source--Soybean Meal	44.00%	2.90%	$ 183.18	***per Ton***
Limestone	0.00%	0.00%	$ 16.50	per cwt.
Dicalcium Phosphate	0.00%	0.00%	$ 27.50	per cwt.
DSM/SDPP	55.60%	4.67%	$ 225.00	per cwt.
Whey, dried	12.00%	0.90%	$ 21.25	per cwt.
Vitamin Premix	0.00%	0.00%	$ 32.75	per cwt.
Salt	0.00%	0.00%	$ 11.80	per unit
Other Diet Ingredient	0.00%	0.00%	$ -	per unit

Breeding Herd Rations

	Gestation	Lactation -- 9	Boar	Gilt Pool
Crude Protein Content of Ration	***15.13%***	***19.01%***	***15.13%***	***15.13%***
Ration Ingredients (pounds)				
Corn	1528	1286	1528	1528
Protein Source--Soybean Meal	410	630	410	410
Limestone	15	16	15	15
Dicalcium Phosphate	31	48	31	31
Vitamin Premix	6	8	6	6
Salt	10	12	10	10
Other Diet Ingredient	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5
Average Cost/Ton for Ration:	***$119***	***$135***	***$119***	***$119***
Pounds of Feed fed per Day	5.00	12.00	6.00	6.00

Nursery Rations

	Pre-Starter Diet	Nursery 1--Starter	Nursery 2 Diet	Nursery 3 Diet	Nursery 4 Diet
Crude Protein Content of Ration	***27.00%***	***24.90%***	***20.88%***	***17.86%***	***0.00%***
Percent Lysine of the Ration	***1.80%***	***1.56%***	***1.21%***	***0.99%***	***0.00%***
Ration Ingredients (pounds):					
Corn	650	716	1,205	1,384	0
Protein Source--Soybean Meal	800	920	730	560	0
Limestone	18	14	16	18	0
Dicalcium Phosphate	42	40	36	26	0
DSM/SDPP	180	0	0	0	0
Whey, dried	300	300	0	0	0
Vitamin Premix	10	10	8	7	0
Salt	0	0	5	5	0
Other Diet Ingredient	0	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***	***0***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5	$0
Average Cost/Ton for Ration:	***$591***	***$199***	***$136***	***$125***	***$0***
Days on Ration:	3	5	18	30	0
Average Daily Gain on Ration:	0.40	0.67	0.90	1.05	0.00
Feed Efficiency on Ration:	1.20	1.50	1.80	1.95	0.00
Average Weight Exiting Ration:	***12***	***15***	***32***	***63***	

Nursery Weighted Averages

21.08% Crude Protein

1.22% Lysine

$160 Wtd Avg. Cost/Ton

53 Days in Nursery

0.933 ADG

1.82 FE

71 Average Days of Age Exiting the Nursery

63 Average Weight Exiting the Nursery

DIETS INPUTS CONTINUED

Grower - Finisher Rations

BARROW RATIONS

BARROW RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin 5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.66%*	*0.54%*	*0.48%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	35	28	24	24	0	0
Average Daily Gain on Ration:	1.15	1.80	2.10	2.20	0.00	0.00
Feed Efficiency on Ration:	2.45	2.80	3.20	3.60	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Barrow Gro-Fin Weighted Averages

13.19% Crude Protein
0.64% Lysine

$108 Wtd Avg. Cost/Ton
111 Days in Gro-Fin Stage
1.74 ADG
2.95 FE

GILT RATIONS

GILT RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.45%*	*0.32%*	*0.26%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	37	30	25	25	0	0
Average Daily Gain on Ration:	1.09	1.71	2.00	2.09	0.00	0.00
Feed Efficiency on Ration:	2.62	3.00	3.42	3.85	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Gilt Gro-Fin Weighted Averages

13.19% Crude Protein
0.49% Lysine

$108 Wtd Avg. Cost/Ton
117 Days in Gro-Fin Stage
1.66 ADG
3.15 FE

256 Average Market Weight

PRODUCTION DATA INPUTS

Breeding Herd Data

Biological Maximum for Litters per Female per Year:		2.64
Average Farrowing Index (Litters per Sow per Year)		2.16
Average Litters per Breeding Female per Year		2.23
Average Days from Weaning to 1st Service	5.20	
Sows Bred on First or Second Heat Cycle	1	
No. of Services/Boar/Day during mating period:	2	
Number of Services per Estrus	3	
Average Farrowing / Rate over 12 Months	84.50%	
Range in Farrowing Rate over 12 Months	6.00%	
Cull Rate for Sows	30.00%	
Average Weight Cull Sows Sold	400	
Cull Rate for Boars	50.00%	
Average Weight Cull Boars Sold	450	
Breeding Herd Mortality Rate	4.00%	

Days between Activities from MCS 3:	***7.0***
Number of Sow Groups Bred per Month	***4.3***
Average Number of Females / Breeding Group	***122***
Average Inventory of Breeding Females:	***2400***
Average Inventory of Boars	***120***
Number of Litters per Year:	***5364***
Non Productive Sow Days:	***67.7***
Average Monthly Gilt Pool Purchases:	***160***
Average Gilt Pool Inventory:	***239***
Average Females Culled:	***71***

Gilt Pool Data

Fixed Number of Gilts Entering Gilt Pool per Month? (Y or N)		Y
Number of Gilts Added to the Gilt Pool each Month		***160***
Average Age of Purchased Gilt in Days	175	
Number of Days for Gilt Isolation	15	
Number of Days for Gilt Acclimation	15	

Average Gilt Pool Inventory:	***239***
Minimum Gilt Pool Inventory:	***239***
Maximum Gilt Pool Inventory:	***239***

Farrowing Data

Farrowing Rooms	4	
Number of Farrowings per Period (Room)	103	
Down Time between Farrowings (Days)	6	
Percent of Litter that are Boars/Barrows		***49%***
Percent of Litter that are Gilts		***51%***
Average Pigs Born Alive/Litter	10.30	
Farrowing/Preweaning Mortality	11.28%	***31%***
Average Weaning Age (Days)	18	
Average Weaning Weight (Pounds)	12	
Percent of Hogs Sold as Weaner Pigs	0.00%	

Total Number of Crates:	***411***
Farrowings per Crate Usage (Percent of Facility Usage):	***107%***
Pigs Weaned per Litter:	***9.14***
Pigs Weaned per Sow/Year:	***20.42***
Pigs Weaned per Year:	***49,016***
Pigs Weaned per Week:	***943***
Pigs Weaned per Month:	***4,085***
Pounds Weaned per Litter:	***109.7***
Pounds Weaned per Year:	***588,196***

Nursery Data

Nursery Mortality	2.10%
Percent of Hogs Sold as Feeder Pigs	0.00%

Gro-Finish Data

Grower Mortality	0.00%
Finisher Mortality	1.70%
Percent of Hogs Sold as "Lights":	5.00%
Average Weight of "Lights":	220
Percent of Hogs Sold as Market Animals	***95.00%***

Market Hogs per Litter:	***8.53***
Market Hogs per Year:	***45,774***
Market Hogs per Week:	***880***

Carcass ("Kill Sheet") Data

Carcass Yields	75.50%
Market Hog Percent Lean	51.83%

FINANCIAL INFORMATION

Average Annual Inflation Rate: 2.50%

Loan Data

	Interest Rate	Loan Term in Years	Repayment Schedule	Beginning Balance
Long-Term Swine Facility Interest Rate	8.50%	15.00	**Monthly**	
IT Breeding Stock Interest Rate	8.75%	5	**Monthly**	
Line of Credit Interest Rate	9.00%	1	**Monthly**	$ -

Prices

	Long-Term	Year 1	Year 2	Year 3
Average Market Barrow Sale Price/cwt.	$ 45.00	$ 58.00	$ 51.00	$ 48.00
Average Market Gilt Sale Price/cwt.	46.00	59.00	52.00	49.00
Average Sale Price/cwt. for "Lights"	36.00	46.40	40.80	38.40
Average Feeder Pig Sale Price/cwt.	39.19	50.76	44.64	42.01
Average Weaner Pig Sale Price/Head	32.00	32.00	32.00	32.00
Average Cull Sow Sale Price/cwt.	37.19	47.85	42.08	39.60
Average Cull Boar Sale Price/cwt.	32.36	41.63	36.61	34.45
Premiums for "Select" Breeding Stock Sales				
Average Premium Received for "Selects"	$ -	$ -	$ -	$ -
Average Number of "Selects" per litter	2.2	1.5	2.2	2.2
Number of "Selects" sold per year	***11,800***	***5,451***	***11,808***	***11,816***
Average Corn Price/bushel	$ 2.26	$ 2.25	$ 2.51	$ 2.23
Average Soybean Meal Price/Ton	183.18	179.19	189.52	197.63

AVERAGE ANNUAL or MONTHLY NON-FEED VARIABLE COSTS

Indicate M for Monthly, or A for Annual: A

	ANNUAL COSTS	***cwt.***	***head***
Repair and Maintenance of Facilities	$ 60,736	*$0.49*	
Repair and Maintenance of Equipment	30,368	*0.25*	
Utility Costs	115,200	*0.94*	*2.40*
Supplies	38,400	*0.31*	
Veterinary Consultation	24,000		*0.50*
Veterinary Products (all feed & nonfeed medicines)	48,000		*1.00*
Breeding Costs	-		
Marketing/Transportation	96,000	*0.78*	
Labor (including benefits)	404,000	*3.29*	*8.43*
Truck and Auto Expenses	16,800	*0.14*	
Property Taxes and Insurance	79,851	*0.65*	
Contract Fee (Dollars per Head)	-	-	
Rent per Pig Space	-		
Professional Fees (non veterinary)	19,200	*0.16*	
Record-Keeping System	6,000	*0.05*	
Manure Management	108,000	*0.88*	
Miscellaneous	18,000	*0.15*	
Family Living Expenses	40,000		
Other	-		
Patronage Payments to Owner/Members	-		

Full Time Employees:	13
Labor Hours / Year / Employee	2,250
Full Time Equivalents (F.T.E.'s)	***14.63***
Labor Cost / Hour (w/ benefits)	***$13.81***
Cubic ft. of Manure per Day:	2.2
Gallons of Manure Nutrients:	***14,415,456***
Manure Mng't Fee per Gallon:	***$0.0075***

3.00	Months Working Capital	
80.00%	of Accumulated Cash paid to Owners	***$ 443,082***
	Average 3 Month Operating Expenses:	***$ 1,245,000***

ESTIMATED BREAK EVEN COSTS: ***$38.60***

Income Tax Rate: 0%

$44.91 Revenue / cwt.

Patronage Payment Months: March, June, September, December

Start-up Month (Jan = 1, Feb = 2, etc.): 1

Start-up Year (four digits: 1995, etc.: 1997

Data Input Sheet for Modern Swine Production

Data Input by: Carl Watson — TEAMPork - Iowa Pork Industry Center

Name of Swine Farm: **2400 Sow -- 1000 pigs / week Swine Unit**

Type of Swine Operation: ***Farrow-to-Finish with as a Multiplier Herd Operation - Low Equity***

START-UP COSTS

Facility and Equipment Costs

Building Site Preparation	$ 24,000
Manure Management System	144,000
Water Supply System	36,000
Electric Lines/Generator	72,000
L.P. Tanks	7,200
Acres of Real Estate Purchased	240
Purchase Price (Avg. Price per Acre)	$ 2,071
Community Acceptance and Legal Start-up Fees	50,000
Total Facility and Equipment Costs:	***$830,240***

Construction Costs

Total Costs	***$***	***6,406,764.00***
Total Cost/Sow		***2,669.49***
Cost/Hog Marketed		***135.87***

Breeding Stock Purchases

Total Costs	***$***	***803,400.00***
TOTAL CAPITAL COSTS:	***$***	***7,210,164.00***

Buildings and Equipment

	$/Space	Total Costs	Animal Spaces	Sq. Ft/Space
Breeding and Gestation Facilities	$ 450.00	$ 1,026,000	2,280	11.0
Farrowing Facilities	2,000.00	768,000	384	35.0
Nursery Facilities:	130.00	1,039,584	7,997	3.0
Grow-Finish Facilities	170.00	3,058,980	17,994	8.0
Isolation Building	160.00	96,000	600	
Managers Home and Alarm		85,000		
Other: (overwrite this)		-		
Other: (overwrite this)		-		
Total Building and Equipment Costs:		***$ 6,073,564***		

Existing Swine Facility Valuation

Breeding & Gestation	$ -
Farrowing	-
Nursery Phases	-
Grow-Finish Phases	-
Land for Swine Use	
Existing Facility Value	***$ -***
Depreciation per Year	***$ -***

Construction Schedule (% /month)	45%	20%	20%	10%	5%	0%
	$ 3,106,712	***$ 1,380,761***	***$ 1,380,761***	***$ 690,380***	***$ 345,190***	***$ -***

Equity Contribution (30% of Facility Costs)	$ 1,922,029	$ 321,360	$ 809,250	$ 1,245,000 Money Needed for3 Mths Production
Economic Development Grant Money	$ -	***$ 321,360***		
	30.0%	40.0%	65.0%	

	Equity Contribution	Equity Percentage	Total Capital Required	PCP and Mkt basis	Dollars per bushel
TOTAL EQUITY CONTRIBUTION	$ 3,052,639	37.64%	$ 8,110,038.82	$ 1.50	$ 4.92

New Breeding Stock (Start-up) Costs:

Average Sow Inventory of Facility Design:	2400		***100.00% of Herd***		
Current Sow Inventory (0 if Repopulating)	0		***0.00% of Herd***		
Initial Gilt Purchases:		***2580***	***100.00% of Herd***		
Cost per Gilt FOB the Farm:	$ 250				
Delivery Schedule (% delivered/month):	0%	40%	30%	30%	0%
Number of Head Loaded per Month:	-	***1,032***	***774***	***774***	-

Average Boar Inventory of Facility Design:	120		***Sow to Boar Ratio:***	***20.0***
Current Boar Inventory	0			
Initial Boar Purchases:		***132***		
Cost per Boar FOB the Farm:	$ 1,200			
Delivery Schedule (% delivered/month):	0%	100%	0%	0%
	-	***132***	-	-

Internal Grandparent System? (Y or N)	NO
If Yes, Cost of Grandparent Gilts:	$ -

DIET INPUTS

	CP. Level	% Lysine	Price of Feed Input	
Corn	8.00%	0.25%	$ ***2.26***	***per bushel***
Protein Source--Soybean Meal	44.00%	2.90%	$ ***183.18***	***per Ton***
Limestone	0.00%	0.00%	$ 16.50	per cwt.
Dicalcium Phosphate	0.00%	0.00%	$ 27.50	per cwt.
DSM/SDPP	55.60%	4.67%	$ 225.00	per cwt.
Whey, dried	12.00%	0.90%	$ 21.25	per cwt.
Vitamin Premix	0.00%	0.00%	$ 32.75	per cwt.
Salt	0.00%	0.00%	$ 11.80	per unit
Other Diet Ingredient	0.00%	0.00%	$ -	per unit

Breeding Herd Rations

	Gestation	Lactation -- 9	Boar	Gilt Pool
Crude Protein Content of Ration	***15.13%***	***19.01%***	***15.13%***	***15.13%***
Ration Ingredients (pounds)				
Corn	1528	1286	1528	1528
Protein Source--Soybean Meal	410	630	410	410
Limestone	15	16	15	15
Dicalcium Phosphate	31	48	31	31
Vitamin Premix	6	8	6	6
Salt	10	12	10	10
Other Diet Ingredient	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5
Average Cost/Ton for Ration:	***$119***	***$135***	***$119***	***$119***
Pounds of Feed fed per Day	5.00	12.00	6.00	6.00

Nursery Rations

	Pre-Starter Diet	Nursery 1--Starter	Nursery 2 Diet	Nursery 3 Diet	Nursery 4 Diet
Crude Protein Content of Ration	***27.00%***	***24.90%***	***20.88%***	***17.86%***	***0.00%***
Percent Lysine of the Ration	***1.80%***	***1.56%***	***1.21%***	***0.99%***	***0.00%***
Ration Ingredients (pounds):					
Corn	650	716	1,205	1,384	0
Protein Source--Soybean Meal	800	920	730	560	0
Limestone	18	14	16	18	0
Dicalcium Phosphate	42	40	36	26	0
DSM/SDPP	180	0	0	0	0
Whey, dried	300	300	0	0	0
Vitamin Premix	10	10	8	7	0
Salt	0	0	5	5	0
Other Diet Ingredient	0	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***	***0***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5	$0
Average Cost/Ton for Ration:	***$591***	***$199***	***$136***	***$125***	***$0***
Days on Ration:	3	5	18	30	0
Average Daily Gain on Ration:	0.40	0.67	0.90	1.05	0.00
Feed Efficiency on Ration:	1.20	1.50	1.80	1.95	0.00
Average Weight Exiting Ration:	***12***	***15***	***32***	***63***	

Nursery Weighted Averages

21.08% Crude Protein

1.22% Lysine

$160 Wtd Avg. Cost/Ton

53 Days in Nursery

0.933 ADG

1.82 FE

71 Average Days of Age Exiting the Nursery

63 Average Weight Exiting the Nursery

DIETS INPUTS CONTINUED

Grower - Finisher Rations

BARROW RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin 5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.66%*	*0.54%*	*0.48%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	35	28	24	24	0	0
Average Daily Gain on Ration:	1.15	1.80	2.10	2.20	0.00	0.00
Feed Efficiency on Ration:	2.45	2.80	3.20	3.60	0.00	0.00
Average Weight Exiting Ration:	*102*	*154*	*202*	*256*		

Barrow Gro-Fin Weighted Averages

13.19% Crude Protein
0.64% Lysine

$108 Wtd Avg. Cost/Ton
111 Days in Gro-Fin Stage
1.74 ADG
2.95 FE

GILT RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.45%*	*0.32%*	*0.26%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	37	30	25	25	0	0
Average Daily Gain on Ration:	1.09	1.71	2.00	2.09	0.00	0.00
Feed Efficiency on Ration:	2.62	3.00	3.42	3.85	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*258*		

Gilt Gro-Fin Weighted Averages

13.19% Crude Protein
0.49% Lysine

$108 Wtd Avg. Cost/Ton
117 Days in Gro-Fin Stage
1.66 ADG
3.15 FE

256 Average Market Weight

PRODUCTION DATA INPUTS

Breeding Herd Data

Biological Maximum for Litters per Female per Year:		*2.64*
Average Farrowing Index (Litters per Sow per Year)		*2.16*
Average Litters per Breeding Female per Year		*2.23*
Average Days from Weaning to 1st Service	5.20	
Sows Bred on First or Second Heat Cycle	1	
No. of Services/Boar/Day during mating period	2	
Number of Services per Estrus	3	
Average Farrowing / Rate over 12 Months	84.50%	
Range in Farrowing Rate over 12 Months	6.00%	
Cull Rate for Sows	30.00%	
Average Weight Cull Sows Sold	400	
Cull Rate for Boars	50.00%	
Average Weight Cull Boars Sold	450	
Breeding Herd Mortality Rate	4.00%	

Days between Activities from MCS 3:	*7.0*
Number of Sow Groups Bred per Month	*4.3*
Average Number of Females / Breeding Group	*122*
Average Inventory of Breeding Females:	*2400*
Average Inventory of Boars	*120*
Number of Litters per Year:	*5364*
Non Productive Sow Days:	*67.7*
Average Monthly Gilt Pool Purchases:	*160*
Average Gilt Pool Inventory:	*239*
Average Females Culled:	*71*

Gilt Pool Data

Fixed Number of Gilts Entering Gilt Pool per Month? (Y or N)		Y
Number of Gilts Added to the Gilt Pool each Month		*160*
Average Age of Purchased Gilt in Days	175	
Number of Days for Gilt Isolation	15	
Number of Days for Gilt Acclimation	15	

Average Gilt Pool Inventory:	*239*
Minimum Gilt Pool Inventory:	*239*
Maximum Gilt Pool Inventory:	*239*

Farrowing Data

Farrowing Rooms	4	
Number of Farrowings per Period (Room)	103	
Down Time between Farrowings (Days)	6	
Percent of Litter that are Boars/Barrows		*49%*
Percent of Litter that are Gilts		*51%*
Average Pigs Born Alive/Litter	10.30	
Farrowing/Preweaning Mortality	11.28%	*31%*
Average Weaning Age (Days)	18	
Average Weaning Weight (Pounds)	12	
Percent of Hogs Sold as Weaner Pigs	0.00%	

Total Number of Crates:	*411*
Farrowings per Crate Usage (Percent of Facility Usage):	*107%*
Pigs Weaned per Litter:	*9.14*
Pigs Weaned per Sow/Year:	*20.42*
Pigs Weaned per Year:	*49,016*
Pigs Weaned per Week:	*943*
Pigs Weaned per Month:	*4,085*
Pounds Weaned per Litter:	*109.7*
Pounds Weaned per Year:	*588,196*

Nursery Data

Nursery Mortality	2.10%
Percent of Hogs Sold as Feeder Pigs	0.00%

Gro-Finish Data

Grower Mortality	0.00%
Finisher Mortality	1.70%
Percent of Hogs Sold as "Lights":	5.00%
Average Weight of "Lights":	220
Percent of Hogs Sold as Market Animals	*95.00%*

Market Hogs per Litter:	*8.53*
Market Hogs per Year:	*45,774*
Market Hogs per Week:	*880*

Carcass ("Kill Sheet") Data

Carcass Yields	75.50%
Market Hog Percent Lean	51.83%

FINANCIAL INFORMATION

Average Annual Inflation Rate	2.50%			

Loan Data	Interest Rate	Loan Term in Years	Repayment Schedule	Beginning Balance
Long-Term Swine Facility Interest Rate	8.50%	15.00	**Monthly**	
IT Breeding Stock Interest Rate	8.75%	5	**Monthly**	
Line of Credit Interest Rate	9.00%	1	**Monthly**	$ -

Prices	Long-Term	Year 1	Year 2	Year 3
Average Market Barrow Sale Price/cwt.	$ 45.00	$ 58.00	$ 51.00	$ 48.00
Average Market Gilt Sale Price/cwt.	46.00	59.00	52.00	49.00
Average Sale Price/cwt. for "Lights"	36.00	46.40	40.80	38.40
Average Feeder Pig Sale Price/cwt.	39.19	50.76	44.64	42.01
Average Weaner Pig Sale Price/Head	32.00	32.00	32.00	32.00
Average Cull Sow Sale Price/cwt.	37.19	47.85	42.08	39.60
Average Cull Boar Sale Price/cwt.	32.36	41.63	36.61	34.45
Premiums for "Select" Breeding Stock Sales				
Average Premium Received for "Selects"	$ 25.00	$ 25.00	$ 25.00	$ 25.00
Average Number of "Selects" per litter	2.2	1.5	2.2	2.2
Number of "Selects" sold per year	***11,800***	***5,451***	***11,808***	***11,816***
Average Corn Price/bushel	$ 2.26	$ 2.25	$ 2.51	$ 2.23
Average Soybean Meal Price/Ton	183.18	179.19	189.52	197.63

AVERAGE ANNUAL or MONTHLY NON-FEED VARIABLE COSTS

Indicate M for Monthly, or A for Annual | A

	ANNUAL COSTS	*cwt.*	*head*
Repair and Maintenance of Facilities	$ 60,736	*$0.49*	
Repair and Maintenance of Equipment	30,368	*0.25*	
Utility Costs	115,200	*0.94*	*2.40*
Supplies	38,400	*0.31*	
Veterinary Consultation	24,000		*0.50*
Veterinary Products (all feed & nonfeed medicines)	48,000		*1.00*
Breeding Costs	-		
Marketing/Transportation	96,000	*0.78*	
Labor (including benefits)	404,000	*3.29*	*8.43*
Truck and Auto Expenses	16,800	*0.14*	
Property Taxes and Insurance	79,851	*0.65*	
Contract Fee (Dollars per Head)	-	*-*	
Rent per Pig Space	-		
Professional Fees (non veterinary)	19,200	*0.16*	
Record-Keeping System	6,000	*0.05*	
Manure Management	108,000	*0.88*	
Miscellaneous	18,000	*0.15*	
Family Living Expenses	40,000		
Other	-		
Patronage Payments to Owner/Members	-		

Full Time Employees:	13
Labor Hours / Year / Employee	2,250
Full Time Equivalents (F.T.E.'s)	*14.63*
Labor Cost / Hour (w/ benefits)	*$13.81*
Cubic ft. of Manure per Day:	2.2
Gallons of Manure Nutrients:	*14,415,456*
Manure Mgm't Fee per Gallon:	*$0.0075*

3.00	MonthsWorking Capital	
80.00%	of Accumulated Cash paid to Owners	*$ 443,082*
	Average 3 Month Operating Expenses:	*$ 1,245,000*

ESTIMATED BREAK-EVEN COSTS ***$38.80***

Income Tax Rate | 0%

$44.91 ***Revenue / cwt.***

Patronage Payment Months: March, June, September, December

Start-up Month (Jan = 1, Feb = 2, etc.)	1
Start-up Year (four digits: 1995, etc.	1997

Data Input Sheet for Modern Swine Production

Data Input by: Carl Watson — TEAMPork - Iowa Pork Industry Center

Name of Swine Farm: **2400 Sow -- 1000 pigs / week Swine Unit**

Type of Swine Operation: ***Farrow-to-Wean with Contract Finishing Operation - Low Equity***

START-UP COSTS

Facility and Equipment Costs

Building Site Preparation	$ 12,000	
Manure Management System	48,000	
Water Supply System	19,200	
Electric Lines/Generator	72,000	
L.P. Tanks	3,600	
Acres of Real Estate Purchased	80	
Purchase Price (Avg. Price per Acre)	$ 2,071	
Community Acceptance and Legal Start-up Fees	50,000	
Total Facility and Equipment Costs:		*$370,460*

Construction Costs

Total Costs	*$*	*2,179,800.00*
Total Cost/Sow		*908.25*
Cost/Hog Marketed		*46.23*

Breeding Stock Purchases

Total Costs	*$*	*803,400.00*
TOTAL CAPITAL COSTS:	***$***	***2,983,200.00***

Buildings and Equipment

	$/Space	Total Costs	Animal Spaces	Sq. Ft/Space
Breeding and Gestation Facilities	$ 450.00	$ 1,026,000	2,280	11.0
Farrowing Facilities	2,000.00	768,000	384	35.0
Nursery Facilities:	-	-	8,000	3.0
Grow-Finish Facilities	-	-	18,000	8.0
Isolation Building	160.00	96,000	600	
Managers Home and Alarm		85,000		
Other: (overwrite this)		-		
Other: (overwrite this)		-		
Total Building and Equipment Costs:		*$ 1,975,000*		

Existing Swine Facility Valuation

Breeding & Gestati	$ -
Farrowing	-
Nursery Phases	-
Grow-Finish Phase	-
Land for Swine Use	
Existing Facility Value	*$ -*
Depreciation per Year	*$ -*

Construction Schedule (% /month)	45%	20%	20%	10%	5%	0%
	$ 1,055,466	*$ 469,096*	*$ 469,096*	*$ 234,548*	*$ 117,274*	*$ -*

Equity Contribution (30% of Facility Costs)	$ 653,940	$ 321,360	$ 1,450,302	$ 1,450,302 Money Needed for3 Mths Production
Economic Development Grant Money	$ -	*$ 321,360*		
	30.0%	40.0%	100.0%	

	Equity Contribution	Equity Percentage	Total Capital Required	PCP and Mkt basis	Dollars per bushel
TOTAL EQUITY CONTRIBUTION	$ 2,425,602	81.31%	$ 2,983,200.00	$ 1.50	$ 3.91

New Breeding Stock (Start-up) Costs:

Average Sow Inventory of Facility Design:	2400		*100.00% of Herd*
Current Sow Inventory (0 if Repopulating)	0		*0.00% of Herd*
Initial Gilt Purchases:		*2580*	*100.00% of Herd*
Cost per Gilt FOB the Farm:	$ 250		

Delivery Schedule (% delivered/month):	0%	40%	30%	30%	0%
Number of Head Loaded per Month:	-	*1,032*	*774*	*774*	-

Average Boar Inventory of Facility Design:	120	*Sow to Boar Ratio:*	*20.0*
Current Boar Inventory	0		
Initial Boar Purchases:		*132*	

Cost per Boar FOB the Farm:	$ 1,200			
Delivery Schedule (% delivered/month):	0%	100%	0%	0%
	-	*132*	-	-

Internal Grandparent System? (Y or N)	NO
If Yes, Cost of Grandparent Gilts	$ -

DIET INPUTS

	CP. Level	% Lysine	Price of Feed Input	
Corn	8.00%	0.25%	***$ 2.26***	***per bushel***
Protein Source--Soybean Meal	44.00%	2.90%	***$ 183.18***	***per Ton***
Limestone	0.00%	0.00%	$ 16.50	per cwt.
Dicalcium Phosphate	0.00%	0.00%	$ 27.50	per cwt.
DSM/SDPP	55.60%	4.67%	$ 225.00	per cwt.
Whey, dried	12.00%	0.90%	$ 21.25	per cwt.
Vitamin Premix	0.00%	0.00%	$ 32.75	per cwt.
Salt	0.00%	0.00%	$ 11.80	per unit
Other Diet Ingredient	0.00%	0.00%	$ -	per unit

Breeding Herd Rations

	Gestation	Lactation -- 9	Boar	Gilt Pool
Crude Protein Content of Ration	***15.13%***	***19.01%***	***15.13%***	***15.13%***
Ration Ingredients (pounds)				
Corn	1528	1286	1528	1528
Protein Source--Soybean Meal	410	630	410	410
Limestone	15	16	15	15
Dicalcium Phosphate	31	48	31	31
Vitamin Premix	6	8	6	6
Salt	10	12	10	10
Other Diet Ingredient	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5
Average Cost/Ton for Ration:	***$119***	***$135***	***$119***	***$119***
Pounds of Feed fed per Day	5.00	12.00	6.00	6.00

Nursery Rations

	Pre-Starter Diet	Nursery 1--Starter	Nursery 2 Diet	Nursery 3 Diet	Nursery 4 Diet
Crude Protein Content of Ration	***27.00%***	***24.90%***	***20.88%***	***17.86%***	***0.00%***
Percent Lysine of the Ration	***1.80%***	***1.56%***	***1.21%***	***0.99%***	***0.00%***
Ration Ingredients (pounds):					
Corn	650	716	1,205	1,384	0
Protein Source--Soybean Meal	800	920	730	560	0
Limestone	18	14	16	18	0
Dicalcium Phosphate	42	40	36	26	0
DSM/SDPP	180	0	0	0	0
Whey, dried	300	300	0	0	0
Vitamin Premix	10	10	8	7	0
Salt	0	0	5	5	0
Other Diet Ingredient	0	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***	***0***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5	$0
Average Cost/Ton for Ration:	***$591***	***$199***	***$136***	***$125***	***$0***
Days on Ration:	3	5	18	30	0
Average Daily Gain on Ration:	0.40	0.67	0.90	1.05	0.00
Feed Efficiency on Ration:	1.20	1.50	1.80	1.95	0.00
Average Weight Exiting Ration:	***12***	***15***	***32***	***63***	

Nursery Weighted Averages

21.08% Crude Protein

1.22% Lysine

$160 Wtd Avg. Cost/Ton

53 Days in Nursery

0.933 ADG

1.82 FE

71 Average Days of Age Exiting the Nursery

63 Average Weight Exiting the Nursery

DIETS INPUTS CONTINUED

DIETS INPUTS CONTINUED

Grower - Finisher Rations

Exiting the Nursery

BARROW RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin 5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.66%*	*0.54%*	*0.48%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	35	28	24	24	0	0
Average Daily Gain on Ration:	1.15	1.80	2.10	2.20	0.00	0.00
Feed Efficiency on Ration:	2.45	2.80	3.20	3.80	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Barrow Gro-Fin Weighted Averages
13.19% Crude Protein
0.64% Lysine

$108 Wtd Avg. Cost/Ton
111 Days in Gro-Fin Stage
1.74 ADG
2.95 FE

GILT RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.45%*	*0.32%*	*0.26%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	37	30	25	25	0	0
Average Daily Gain on Ration:	1.09	1.71	2.00	2.09	0.00	0.00
Feed Efficiency on Ration:	2.62	3.00	3.42	3.85	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Gilt Gro-Fin Weighted Averages
13.19% Crude Protein
0.49% Lysine

$108 Wtd Avg. Cost/Ton
117 Days in Gro-Fin Stage
1.66 ADG
3.15 FE

256 Average Market Weight

PRODUCTION DATA INPUTS

Breeding Herd Data

Biological Maximum for Litters per Female per Year:		2.64		
Average Farrowing Index (Litters per Sow per Year)		2.16	***Days between Activities from MCS 3:***	7.0
Average Litters per Breeding Female per Year		2.23	***Number of Sow Groups Bred per Month***	4.3
Average Days from Weaning to 1st Service	5.20		***Average Number of Females / Breeding Group***	122
Sows Bred on First or Second Heat Cycle	1		***Average Inventory of Breeding Females:***	2400
No. of Services/Boar/Day during mating period:	2		***Average Inventory of Boars***	120
Number of Services per Estrus	3			
Average Farrowing / Rate over 12 Months	84.50%		***Number of Litters per Year:***	5364
Range in Farrowing Rate over 12 Months	6.00%		***Non Productive Sow Days:***	67.7
Cull Rate for Sows	30.00%			
Average Weight Cull Sows Sold	400			
Cull Rate for Boars	50.00%		***Average Monthly Gilt Pool Purchases:***	160
Average Weight Cull Boars Sold	450		***Average Gilt Pool Inventory:***	239
Breeding Herd Mortality Rate	4.00%		***Average Females Culled:***	71

Gilt Pool Data

Fixed Number of Gilts Entering Gilt Pool per Month? (Y or N)		Y		
Number of Gilts Added to the Gilt Pool each Month		160	***Average Gilt Pool Inventory:***	239
Average Age of Purchased Gilt in Days	175		***Minimum Gilt Pool Inventory:***	239
Number of Days for Gilt Isolation	15		***Maximum Gilt Pool Inventory:***	239
Number of Days for Gilt Acclimation	15			

Farrowing Data

Farrowing Rooms	4		***Total Number of Crates:***	411
Number of Farrowings per Period (Room)	103		***Farrowings per Crate Usage (Percent of Facility Usage):***	107%
Down Time between Farrowings (Days)	6			
Percent of Litter that are Boars/Barrows		49%		
Percent of Litter that are Gilts		51%		
Average Pigs Born Alive/Litter	10.30		***Pigs Weaned per Litter:***	9.14
Farrowing/Preweaning Mortality	11.28%	31%	***Pigs Weaned per Sow/Year:***	20.42
Average Weaning Age (Days)	18		***Pigs Weaned per Year:***	49,016
Average Weaning Weight (Pounds)	12		***Pigs Weaned per Week:***	943
Percent of Hogs Sold as Weaner Pigs	0.00%		***Pigs Weaned per Month:***	4,085
			Pounds Weaned per Litter:	109.7
			Pounds Weaned per Year:	588,196

Nursery Data

Nursery Mortality	2.10%
Percent of Hogs Sold as Feeder Pigs	0.00%

Gro-Finish Data

Grower Mortality	0.00%	***Market Hogs per Litter:***	8.53
Finisher Mortality	1.70%	***Market Hogs per Year:***	45,774
Percent of Hogs Sold as "Lights":	5.00%	***Market Hogs per Week:***	880
Average Weight of "Lights":	220		
Percent of Hogs Sold as Market Animals:	95.00%		

Carcass ("Kill Sheet") Data

Carcass Yields	75.50%
Market Hog Percent Lean	51.83%

FINANCIAL INFORMATION

Average Annual Inflation Rate	2.50%			

Loan Data

	Interest Rate	Loan Term in Years	Repayment Schedule	Beginning Balance
Long-Term Swine Facility Interest Rate	8.50%	15.00	**Monthly**	
IT Breeding Stock Interest Rate	8.75%	5	**Monthly**	
Line of Credit Interest Rate	9.00%	1	**Monthly**	$ -

Prices

	Long-Term	Year 1	Year 2	Year 3
Average Market Barrow Sale Price/cwt.	$ 45.00	$ 58.00	$ 51.00	$ 48.00
Average Market Gilt Sale Price/cwt.	46.00	59.00	52.00	49.00
Average Sale Price/cwt. for "Lights"	36.00	46.40	40.80	38.40
Average Feeder Pig Sale Price/cwt.	39.19	50.76	44.64	42.01
Average Weaner Pig Sale Price/Head	32.00	32.00	32.00	32.00
Average Cull Sow Sale Price/cwt.	37.19	47.85	42.08	39.60
Average Cull Boar Sale Price/cwt.	32.36	41.63	36.61	34.45

Premiums for "Select" Breeding Stock Sales

	Long-Term	Year 1	Year 2	Year 3
Average Premium Received for "Selects"				
Average Number of "Selects" per litter	2.2	1.5	2.2	2.2
Number of "Selects" sold per year	***11,800***	***5,451***	***11,808***	***11,816***
Average Corn Price/bushel	$ 2.26	$ 2.25	$ 2.51	$ 2.23
Average Soybean Meal Price/Ton	183.18	179.19	189.52	197.63

AVERAGE ANNUAL or MONTHLY NON-FEED VARIABLE COSTS

Indicate M for Monthly, or A for Annual A

	ANNUAL COSTS	*cwt.*	*head*
Repair and Maintenance of Facilities	$ 19,750	*$0.16*	
Repair and Maintenance of Equipment	9,875	*0.08*	
Utility Costs	115,200	*0.94*	*2.40*
Supplies	38,400	*0.31*	
Veterinary Consultation	24,000		*0.50*
Veterinary Products (all feed & nonfeed medicines)	48,000		*1.00*
Breeding Costs	-		
Marketing/Transportation	96,000	*0.78*	
Labor (including benefits)	404,000	*3.29*	*8.43*
Truck and Auto Expenses	16,800	*0.14*	
Property Taxes and Insurance	27,168	*0.22*	
Contract Fee per Nursery Pig Space	$ 32.00		
Contract Fee per Grow-Finish Pig Space	$ 34.00		
Contract Fee	868,006	*7.06*	
Rent per Pig Space	-		
Professional Fees (non veterinary)	19,200	*0.16*	
Record-Keeping System	6,000	*0.05*	
Manure Management	108,000	*0.88*	
Miscellaneous	18,000	*0.15*	
Family Living Expenses	40,000		
Other	-		
Patronage Payments to Owner/Members	-		

Full Time Employees:	13
Labor Hours / Year / Employee	2,250
Full Time Equivalents (F.T.E.'s)	***14.63***
Labor Cost / Hour (w/ benefits)	***$13.81***
Cubic ft. of Manure per Day:	2.2
Gallons of Manure Nutrients:	***14,415,456***
Manure Mng't Fee per Gallon:	***$0.0075***

ESTIMATED BREAK-EVEN COSTS: ***$40.71***

Income Tax Rate: 0%

Revenue / cwt. ***$44.91***

Start-up Month (Jan = 1, Feb = 2, etc.)	1
Start-up Year (four digits: 1995, etc.	1997

Patronage Payment Months: March, June, September, December

3.00	MonthsWorking Capital
80.00%	of Accumulated Cash paid to Owners

Average Total Monthly Expenditures at the Steady State: $ 478,497
Average 3 Month Operating Expenses: $ 1,450,302

Data Input Sheet for Modern Swine Production

Data Input by: Carl Watson — TEAMPork - Iowa Pork Industry Center

Name of Swine Farm: **2400 Sow -- 1000 pigs / week Swine Unit**

Type of Swine Operation: ***Farrow-to-Wean with Contract Finishing as a Multiplier Herd - Low Equity***

START-UP COSTS

Facility and Equipment Costs

Building Site Preparation	$ 12,000	
Manure Management System	48,000	
Water Supply System	19,200	
Electric Lines/Generator	72,000	
L.P. Tanks	3,600	
Acres of Real Estate Purchased	80	
Purchase Price (Avg. Price per Acre)	$ 2,071	
Community Acceptance and Legal Start-up Fees	50,000	
Total Facility and Equipment Costs:		*$370,480*

Construction Costs

Total Costs	*$*	*2,179,800.00*
Total Cost/Sow		*908.25*
Cost/Hog Marketed		*46.23*

Breeding Stock Purchases

Total Costs	*$*	*803,400.00*
TOTAL CAPITAL COSTS:	*$*	*2,983,200.00*

Buildings and Equipment

	$/Space	Total Costs	Animal Spaces	Sq. Ft/Space
Breeding and Gestation Facilities	$ 450.00	$ 1,026,000	2,280	11.0
Farrowing Facilities	2,000.00	768,000	384	35.0
Nursery Facilities:	-	-	8,000	3.0
Grow-Finish Facilities	-	-	18,000	8.0
Isolation Building	160.00	96,000	600	
Managers Home and Alarm		85,000		
Other: (overwrite this)		-		
Other: (overwrite this)		-		
Total Building and Equipment Costs:		*$ 1,975,000*		

Existing Swine Facility Valuation

Breeding & Gestati	$ -
Farrowing	-
Nursery Phases	-
Grow-Finish Phase	-
Land for Swine Use	
Existing Facility Value	*$ -*
Depreciation per Year	*$ -*

Construction Schedule (% /month)	45%	20%	20%	10%	5%	0%
	$ 1,055,466	*$ 469,096*	*$ 469,096*	*$ 234,548*	*$ 117,274*	*$ -*

Equity Contribution (30% of Facility Costs)	$ 653,940	$ 321,360	$ 1,450,302		$ 1,450,302 Money Needed for3 Mths Production
Economic Development Grant Money	$ -				
	30.0%	40.0%	100.0%		

	Equity Contribution	Equity Percentage	Total Capital Required	PCP and Mkt basis	Dollars per bushel
TOTAL EQUITY CONTRIBUTION	$ 2,425,602	81.31%	$ 2,983,200.00	$ 1.50	$ 3.91

New Breeding Stock (Start-up) Costs:

Average Sow Inventory of Facility Design:	2400		*100.00% of Herd*
Current Sow Inventory (0 if Repopulating)	0		*0.00% of Herd*
Initial Gilt Purchases:		*2580*	*100.00% of Herd*
Cost per Gilt FOB the Farm:	$ 250		

Delivery Schedule (% delivered/month):	0%	40%	30%	30%	0%
Number of Head Loaded per Month:	-	*1,032*	*774*	*774*	-

Average Boar Inventory of Facility Design:	120	*Sow to Boar Ratio:*	*20.0*
Current Boar Inventory	0		
Initial Boar Purchases:		*132*	

Cost per Boar FOB the Farm:	$ 1,200			
Delivery Schedule (% delivered/month):	0%	100%	0%	0%
	-	*132*	-	-

Internal Grandparent System? (Y or N)	NO
If Yes, Cost of Grandparent Gilts:	$ -

DIET INPUTS

	CP. Level	% Lysine	Price of Feed Input	
Corn	8.00%	0.25%	***$ 2.26***	***per bushel***
Protein Source--Soybean Meal	44.00%	2.90%	***$ 183.18***	***per Ton***
Limestone	0.00%	0.00%	$ 16.50	per cwt.
Dicalcium Phosphate	0.00%	0.00%	$ 27.50	per cwt.
DSM/SDPP	55.60%	4.67%	$ 225.00	per cwt.
Whey, dried	12.00%	0.90%	$ 21.25	per cwt.
Vitamin Premix	0.00%	0.00%	$ 32.75	per cwt.
Salt	0.00%	0.00%	$ 11.80	per unit
Other Diet Ingredient	0.00%	0.00%	$ -	per unit

Breeding Herd Rations

	Gestation	Lactation -- 9	Boar	Gilt Pool
Crude Protein Content of Ration	***15.13%***	***19.01%***	***15.13%***	***15.13%***
Ration Ingredients (pounds)				
Corn	1528	1286	1528	1528
Protein Source--Soybean Meal	410	630	410	410
Limestone	15	16	15	15
Dicalcium Phosphate	31	48	31	31
Vitamin Premix	6	8	6	6
Salt	10	12	10	10
Other Diet Ingredient	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5
Average Cost/Ton for Ration:	***$119***	***$135***	***$119***	***$119***
Pounds of Feed fed per Day	5.00	12.00	6.00	6.00

Nursery Rations

	Pre-Starter Diet	Nursery 1--Starter	Nursery 2 Diet	Nursery 3 Diet	Nursery 4 Diet
Crude Protein Content of Ration	***27.00%***	***24.90%***	***20.88%***	***17.86%***	***0.00%***
Percent Lysine of the Ration	***1.80%***	***1.56%***	***1.21%***	***0.99%***	***0.00%***
Ration Ingredients (pounds):					
Corn	650	716	1,205	1,384	0
Protein Source--Soybean Meal	800	920	730	560	0
Limestone	18	14	16	18	0
Dicalcium Phosphate	42	40	36	26	0
DSM/SDPP	180	0	0	0	0
Whey, dried	300	300	0	0	0
Vitamin Premix	10	10	8	7	0
Salt	0	0	5	5	0
Other Diet Ingredient	0	0	0	0	0
TOTAL POUNDS:	***2,000***	***2,000***	***2,000***	***2,000***	***0***
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5	$0
Average Cost/Ton for Ration:	***$591***	***$199***	***$136***	***$125***	***$0***
Days on Ration:	3	5	18	30	0
Average Daily Gain on Ration:	0.40	0.67	0.90	1.05	0.00
Feed Efficiency on Ration:	1.20	1.50	1.80	1.95	0.00
Average Weight Exiting Ration:	***12***	***15***	***32***	***63***	

Nursery Weighted Averages

21.08% Crude Protein

1.22% Lysine

$160 Wtd Avg. Cost/Ton

53 Days in Nursery

0.933 ADG

1.82 FE

71 Average Days of Age Exiting the Nursery

63 Avg Weight Exiting the Nursery

DIETS INPUTS CONTINUED

Grower - Finisher Rations

BARROW RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin 5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.66%*	*0.54%*	*0.48%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	35	28	24	24	0	0
Average Daily Gain on Ration:	1.15	1.80	2.10	2.20	0.00	0.00
Feed Efficiency on Ration:	2.45	2.80	3.20	3.60	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Barrow Gro-Fin Weighted Averages

13.19% Crude Protein

0.64% Lysine

$108 Wtd Avg. Cost/Ton

111 Days in Gro-Fin Stage

1.74 ADG

2.95 FE

GILT RATIONS	Gro-Fin 1	Gro-Fin 2	Gro-Fin 3	Gro-Fin 4	Gro-Fin5	Gro-Fin 6
Crude Protein Content of Ration	*15.38%*	*13.41%*	*11.81%*	*11.10%*	*0.00%*	*0.00%*
Percent Lysine of the Ration	*0.80%*	*0.45%*	*0.32%*	*0.26%*	*0.00%*	*0.00%*
Ration Ingredients (pounds):						
Corn	1,534	1,648	1,743	1,785	0	0
Protein Source--Soybean Meal	420	310	220	180	0	0
Limestone	17	18	18	19	0	0
Dicalcium Phosphate	20	15	10	8	0	0
Vitamin Premix	4	4	4	3	0	0
Salt	5	5	5	5	0	0
Other Diet Ingredient	0	0	0	0	0	0
TOTAL POUNDS:	*2,000*	*2,000*	*2,000*	*2,000*	*0*	*0*
Grind, Mix, and Deliver Charge:	$5	$5	$5	$5		
Average Cost/Ton for Ration:	*$116*	*$109*	*$103*	*$101*	*$0*	*$0*
Days on Ration:	37	30	25	25	0	0
Average Daily Gain on Ration:	1.09	1.71	2.00	2.09	0.00	0.00
Feed Efficiency on Ration:	2.62	3.00	3.42	3.85	0.00	0.00
Average Weight Exiting Ration:	*103*	*154*	*203*	*256*		

Gilt Gro-Fin Weighted Averages

13.19% Crude Protein

0.49% Lysine

$108 Wtd Avg. Cost/Ton

117 Days in Gro-Fin Stage

1.66 ADG

3.15 FE

256 Average Market Weight

PRODUCTION DATA INPUTS

Breeding Herd Data

Biological Maximum for Litters per Female per Year:	***2.64***
Average Farrowing Index (Litters per Sow per Year)	***2.16***
Average Litters per Breeding Female per Year	***2.23***
Average Days from Weaning to 1st Service	5.20
Sows Bred on First or Second Heat Cycle	1
No. of Services/Boar/Day during mating period:	2
Number of Services per Estrus	3
Average Farrowing / Rate over 12 Months	84.50%
Range in Farrowing Rate over 12 Months	6.00%
Cull Rate for Sows	30.00%
Average Weight Cull Sows Sold	400
Cull Rate for Boars	50.00%
Average Weight Cull Boars Sold	450
Breeding Herd Mortality Rate	4.00%

Days between Activities from MCS 3:	***7.0***
Number of Sow Groups Bred per Month	***4.3***
Average Number of Females / Breeding Group	***122***
Average Inventory of Breeding Females:	***2400***
Average Inventory of Boars	***120***
Number of Litters per Year:	***5364***
Non Productive Sow Days:	***67.7***
Average Monthly Gilt Pool Purchases:	***160***
Average Gilt Pool Inventory:	***239***
Average Females Culled:	***71***

Gilt Pool Data

Fixed Number of Gilts Entering Gilt Pool per Month? (Y or N)	Y
Number of Gilts Added to the Gilt Pool each Month	***160***
Average Age of Purchased Gilt in Days	175
Number of Days for Gilt Isolation	15
Number of Days for Gilt Acclimation	15

Average Gilt Pool Inventory:	***239***
Minimum Gilt Pool Inventory:	***239***
Maximum Gilt Pool Inventory:	***239***

Farrowing Data

Farrowing Rooms	4	
Number of Farrowings per Period (Room)	103	
Down Time between Farrowings (Days)	6	
Percent of Litter that are Boars/Barrows		***49%***
Percent of Litter that are Gilts		***51%***
Average Pigs Born Alive/Litter	10.30	
Farrowing/Preweaning Mortality	11.28%	***31%***
Average Weaning Age (Days)	18	
Average Weaning Weight (Pounds)	12	
Percent of Hogs Sold as Weaner Pigs	0.00%	

Total Number of Crates:	***411***
Farrowings per Crate Usage (Percent of Facility Usage):	***107%***
Pigs Weaned per Litter:	***9.14***
Pigs Weaned per Sow/Year:	***20.42***
Pigs Weaned per Year:	***49,016***
Pigs Weaned per Week:	***943***
Pigs Weaned per Month:	***4,085***
Pounds Weaned per Litter:	***109.7***
Pounds Weaned per Year:	***588,196***

Nursery Data

Nursery Mortality	2.10%
Percent of Hogs Sold as Feeder Pigs	0.00%

Gro-Finish Data

Grower Mortality	0.00%
Finisher Mortality	1.70%
Percent of Hogs Sold as "Lights":	5.00%
Average Weight of "Lights":	220
Percent of Hogs Sold as Market Animals:	***95.00%***

Market Hogs per Litter:	***8.53***
Market Hogs per Year:	***45,774***
Market Hogs per Week:	***880***

Carcass ("Kill Sheet") Data

Carcass Yields	75.50%
Market Hog Percent Lean	51.83%

FINANCIAL INFORMATION

	Interest Rate	Loan Term in Years	Repayment Schedule	Beginning Balance
Average Annual Inflation Rate	2.50%			
Loan Data				
Long-Term Swine Facility Interest Rate	8.50%	15.00	**Monthly**	
IT Breeding Stock Interest Rate	8.75%	5	**Monthly**	
Line of Credit Interest Rate	9.00%	1	**Monthly**	$ -

Prices	Long-Term	Year 1	Year 2	Year 3
Average Market Barrow Sale Price/cwt.	$ 45.00	$ 58.00	$ 51.00	$ 48.00
Average Market Gilt Sale Price/cwt.	46.00	59.00	52.00	49.00
Average Sale Price/cwt. for "Lights"	36.00	46.40	40.80	38.40
Average Feeder Pig Sale Price/cwt.	39.19	50.76	44.64	42.01
Average Weaner Pig Sale Price/Head	32.00	32.00	32.00	32.00
Average Cull Sow Sale Price/cwt.	37.19	47.85	42.08	39.60
Average Cull Boar Sale Price/cwt.	32.36	41.63	36.61	34.45

Premiums for "Select" Breeding Stock Sales	Long-Term	Year 1	Year 2	Year 3
Average Premium Received for "Selects"	$ 25.00	$ 25.00	$ 25.00	$ 25.00
Average Number of "Selects" per litter	2.2	1.5	2.2	2.2
Number of "Selects" sold per year	***11,800***	***5,309***	***11,808***	***11,816***
Average Corn Price/bushel	$ 2.26	$ 2.25	$ 2.51	$ 2.23
Average Soybean Meal Price/Ton	183.18	179.19	189.52	197.63

AVERAGE ANNUAL or MONTHLY NON-FEED VARIABLE COSTS

Indicate M for Monthly, or A for Annual: A

	ANNUAL COSTS	*cwt.*	*head*
Repair and Maintenance of Facilities	$ 19,750	*$0.16*	
Repair and Maintenance of Equipment	9,875	*0.08*	
Utility Costs	115,200	*0.94*	*2.40*
Supplies	38,400	*0.31*	
Veterinary Consultation	24,000		*0.50*
Veterinary Products (all feed & nonfeed medicines)	48,000		*1.00*
Breeding Costs	-		
Marketing/Transportation	96,000	*0.78*	
Labor (including benefits)	404,000	*3.29*	*8.43*
Truck and Auto Expenses	16,800	*0.14*	
Property Taxes and Insurance	27,168	*0.22*	
Contract Fee per Nursery Pig Space	$ 32.00		
Contract Fee per Grow-Finish Pig Space	$ 34.00		
Contract Fee	868,006	*7.06*	
Rent per Pig Space	-		
Professional Fees (non veterinary)	19,200	*0.16*	
Record-Keeping System	6,000	*0.05*	
Manure Management	108,000	*0.88*	
Miscellaneous	18,000	*0.15*	
Family Living Expenses	40,000		
Other	-		
Patronage Payments to Owner/Members	-		

Full Time Employees:	13
Labor Hours / Year / Employee	2,250
Full Time Equivalents (F.T.E.'s)	***14.63***
Labor Cost / Hour (w/ benefits)	***$13.81***
Cubic ft. of Manure per Day:	2.2
Gallons of Manure Nutrients:	***14,415,456***
Manure Mng't Fee per Gallon:	***$0.0075***

ESTIMATED BREAK-EVEN COSTS		***$40.71***
Income Tax Rate	0%	
Revenue / cwt		***$44.91***
Start-up Month (Jan = 1, Feb = 2, etc.)	1	
Start-up Year (four digits: 1995, etc.	1997	

Patronage Payment Months: March, June, September, December

APPENDIX B

ACTUAL RESULTS FROM THE SWINE FEASIBILITY ANALYSIS MODEL FOR ALL FARM OPERATION

Table A.1 Actual Results from the SFA model for a Farrow-to-Finish Farm Operation, Low Equity Contribution (30-45-65)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$804,163	35	$883,963	69	$1,763,183
2	$2,303,756	36	$1,981,339	70	$1,326,113
3	$1,639,769	37	$1,253,242	71	$542,355
4	$1,938,111	38	$1,081,557	72	$1,115,936
5	$1,268,808	39	($319,517)	73	$312,641
6	$1;083,735	40	$1,030,123	74	($88,735)
7	$1,677,399	41	$1,220,770	75	$543,112
8	$886,432	42	$1,549,452	76	$2,283,835
9	$695,869	43	$1,740,137	77	$1,714,191
10	$456,629	44	$594,897	78	$1,426,982
11	$671,522	45	$1,906,112	79	$1,341,489
12	$1,946,742	46	$754,367	80	$1,514,132
13	$844,773	47	$1,798,061	81	$1,423,393
14	$(7,137,276)**	48	$2,020,801	82	$860,887
15	$1,817,744	49	$1,244,764	83	$311,581
16	$62,987	50	$1,190,523	84	$943,165
17	$1,336,784	51	$1,213,726	85	$403,982
18	$1,156,089	52	$1,275,391	86	$1,078,348
19	$1,159,769	53	$1,814,965	87	$944,290
20	$1,570,702	54	$1,382,210	88	$1,737,471
21	$2,194,292	55	$1,658,722	89	$720,766
22	$1,072,450	56	$835,737	90	$1,649,780
23	$(6,169,615)**	57	$1,581,680	91	$867,255
24	$1;537,496	58	$2,966,098	92	$1,539,307
25	$1,607,827	59	$1,676,062	93	$1,584,364
26	$1,761,248	60	$730,351	94	$1,106,487
27	$936,427	61	$656,739	95	$958,713
28	$668,801	62	$778,276	96	$992,693
29	$834,473	63	$988,400	97	$1,026,824
30	$796,846	64	$1,639,015	98	$1,070,924
31	$1,654,221	65	$2,199,882	99	$1,412,529
32	$1,427,760	66	$839,715	100	$936,695
33	$1,386,387	67	$800,682		
34	$1,451,649	68	$1,160,336		

AVERAGE	$1,225,969
STD DEV	$546,879

Negative values are in parenthesis.

** observation was treated as an outlier and omitted

Table A.2 Actual Results from the SFA model for a Farrow-to-Finish Farm Operation, Medium Equity Contribution (30-50-75)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$1,119,084	35	$1,258,389	69	$2,059,162
2	$2,587,525	36	$2,274,049	70	$1,619,662
3	$1,928,718	37	$1,547,455	71	$839,476
4	$2,222,100	38	$1,405,687	72	$1,407,497
5	$1,568,161	39	$35,607	73	$635,208
6	$1,368,463	40	$1,322,103	74	$249,656
7	$1,965,212	41	$1,501,884	75	$848,409
8	$1,166,639	42	$1,848,165	76	$2,559,910
9	$1,000,836	43	$2,022,710	77	$2,008,117
10	$763,845	44	$902,408	78	$1,746,838
11	$993,048	45	$2,197,804	79	$1,617,128
12	$2,232,905	46	$1,059,470	80	$1,832,977
13	$1,127,274	47	$2,095,087	81	$1,710,760
14	$(6,886,841)**	48	$2,295,350	82	$1,173,041
15	$2,098,701	49	$1,540,003	83	$622,057
16	$415,079	50	$1,494,161	84	$1,241,819
17	$1,638,016	51	$1,508,570	85	$727,102
18	$1,456,711	52	$1,566,406	86	$1,357,686
19	$1,447,023	53	$2,099,459	87	$1,259,073
20	$1,851,962	54	$1,674,840	88	$2,036,355
21	$2,469,740	55	$1,942,577	89	$1,046,945
22	$1,354,518	56	$1,154,921	90	$1,928,257
23	$(5,920,009)**	57	$1,865,111	91	$1,170,670
24	$1,820,732	58	$3,249,928	92	$1,823,543
25	$1,889,340	59	$1,958,487	93	$1,864,803
26	$2,035,351	60	$1,038,223	94	$1,391,988
27	$1,232,719	61	$977,662	95	$1,245,520
28	$963,820	62	$1,076,759	96	$1,300,913
29	$1,149,535	63	$1,299,179	97	$1,311,305
30	$1,122,652	64	$1,908,688	98	$1,364,804
31	$1,940,224	65	$2,482,374	99	$1,697,232
32	$1,703,919	66	$1,152,861	100	$1,250,559
33	$1,677,235	67	$1,107,929		
34	$1,736,455	68	$1,454,122		

AVERAGE	$1,523,617
STD DEV	534,502

Negative values are in parenthesis.
** observation was treated as an outlier and omitted

Table A.3 Actual Results from the SFA model for a Farrow-to-Finish Farm Operation, High Equity Contribution (30-50-85)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$1,416,014	35	$1,540,565	69	$2,344,842
2	$2,862,125	36	$2,560,169	70	$1,903,458
3	$2,208,184	37	$1,834,522	71	$1,114,303
4	$2,497,336	38	$1,709,216	72	$1,687,576
5	$1,855,320	39	$358,624	73	$926,100
6	$1,644,925	40	$1,596,939	74	$544,967
7	$2,241,382	41	$1,773,818	75	$1,136,979
8	$1,438,589	42	$2,137,447	76	$2,828,685
9	$1,296,680	43	$2,293,157	77	$2,283,703
10	$1,056,278	44	$1,184,828	78	$2,059,062
11	$1,295,735	45	$2,478,142	79	$1,887,293
12	$2,511,789	46	$1,352,991	80	$2,140,939
13	$1,398,107	47	$2,380,926	81	$1,991,178
14	$(6,634,333)**	48	$2,568,443	82	$1,461,144
15	$2,368,234	49	$1,821,880	83	$918,864
16	$745,940	50	$1,791,058	84	$1,532,999
17	$1,911,657	51	$1,793,137	85	$1,021,937
18	$1,732,311	52	$1,850,946	86	$1,628,366
19	$1,728,351	53	$2,376,714	87	$1,562,113
20	$2,126,589	54	$1,961,157	88	$2,317,762
21	$2,740,034	55	$2,216,336	89	$1,361,954
22	$1,628,054	56	$1,449,117	90	$2,196,191
23	$(5,670,403)**	57	$2,136,747	91	$1,457,976
24	$2,093,552	58	$3,521,039	92	$2,095,126
25	$2,159,239	59	$2,232,462	93	$2,138,374
26	$2,303,048	60	$1,330,916	94	$1,665,185
27	$1;523,721	61	$1,279,596	95	$1,523,645
28	$1,253,173	62	$1,363,699	96	$1,596,478
29	$1,450,319	63	$1,594,875	97	$1,586,028
30	$1,424,594	64	$2,174,412	98	$1,643,288
31	$2,213,238	65	$2,753,321	99	$1,971,253
32	$1,972,688	66	$1,446,342	100	$1,544,897
33	$1,957,088	67	$1,402,695		
34	$2,006,637	68	$1,733,279		

AVERAGE	$1,807,481
STD DEV	526,723

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.4 Actual Results from the SFA model for a Farrow-to-Finish with Multiplier Herd Farm Operation, Low Equity Contribution (30-40-65)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$2,560,496	35	$2,683,745	69	$3,484,792
2	$4,005,499	36	$3,701,880	70	$3,047,662
3	$3;350,349	37	$2,976,154	71	$2,260,791
4	$3,641,097	38	$2,854,000	72	$2,827,073
5	$2,997,066	39	$1,516,411	73	$2,069,443
6	$2,788,749	40	$2,738,027	74	$1,689,167
7	$3,384,510	41	$2,923,162	75	$2,277,407
8	$2,583,629	42	$3,278,625	76	$3,969,380
9	$2,440,800	43	$3,434,618	77	$3,425,808
10	$2,200,544	44	$2,330,232	78	$3,210,985
11	$2,441,733	45	$3,620,635	79	$3,029,870
12	$3,654,501	46	$2,495,802	80	$3,283,035
13	$2,543,357	47	$3,522,478	81	$3,135,067
14	$(4,973,959)**	48	$3,714,885	82	$2,602,507
15	$3,512,984	49	$2,966,240	83	$2,061,617
16	$1,904,341	50	$2,940,070	84	$2,679,484
17	$3,061,701	51	$2,936,249	85	$2,166,428
18	$2,874,175	52	$2,996,915	86	$2,773,020
19	$2,870,614	53	$3,524,594	87	$2,715,778
20	$3,272,861	54	$3,104,452	88	$3,461,183
21	$3,887,129	55	$3,362,768	89	$2,510,397
22	$2,774,698	56	$2,590,589	90	$3,343,367
23	$(4,625,196)**	57	$3,282,814	91	$2,606,529
24	$3,240,488	58	$4,664,898	92	$3,237,493
25	$3,303,282	59	$3,374,178	93	$3,281,126
26	$3,450,894	60	$2,475,044	94	$2,809,556
27	$2,666,931	61	$2,422,276	95	$2,667,028
28	$2,395,751	62	$2,506,228	96	$2,741,185
29	$2,595,739	63	$2,742,635	97	$2,729,853
30	$2,571,070	64	$3,325,135	98	$2,790,321
31	$3,359,597	65	$3,901,311	99	$3,116,231
32	$3,119,600	66	$2,594,851	100	$2,686,042
33	$3,101,649	67	$2,546,291		
34	$3,152,704	68	$2,876,567		

AVERAGE	$2,952,275
STD DEV	$526,037

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.5 Actual Results from the SFA model for a Farrow-to-Finish with Multiplier Herd Farm Operation, Medium Equity Contribution (30-45-75)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$2,843,503	35	$2,958,173	69	$3,763,846
2	$4,279,330	36	$3,981,027	70	$3,325,932
3	$3,625,079	37	$3,255,712	71	$2,529,910
4	$3,915,172	38	$3,137,224	72	$3,103,692
5	$3,275,307	39	$1,806,190	73	$2,347,279
6	$3,061,644	40	$3,011,201	74	$1,964,867
7	$3,658,041	41	$3,194,198	75	$2,550,695
8	$2,885,361	42	$3,559,499	76	$4,239,065
9	$2,728,375	43	$3,705,753	77	$3,700,790
10	$2,483,850	44	$2,602,313	78	$3,501,695
11	$2,722,942	45	$3,894,261	79	$3,300,447
12	$3,929,655	46	$2,779,319	80	$3,564,873
13	$2;814,615	47	$3,801,381	81	$3,410,375
14	$(4,740,593)**	48	$3,988,115	82	$2,880,739
15	$3,783,417	49	$3,242,684	83	$2,345,249
16	$2,190,791	50	$3,217,789	84	$2,957,706
17	$3,322,435	51	$3,212,000	85	$2,451,102
18	$3,147,411	52	$3,276,880	86	$3,043,892
19	$3,147,790	53	$3,800,456	87	$3,003,211
20	$3,545,856	54	$3,383,932	88	$3,743,443
21	$4,158,139	55	$3,635,465	89	$2,794,141
22	$3,047,325	56	$2,874,881	90	$3,612,217
23	$(4,378,906)**	57	$3,553,866	91	$2,887,990
24	$3,511,978	58	$4,935,434	92	$3,509,115
25	$3,575,455	59	$3,647,478	93	$3,553,633
26	$3,719,433	60	$2,749,730	94	$3,082,648
27	$2,946,682	61	$2,703,018	95	$2,942,735
28	$2,679,026	62	$2,786,758	96	$3,017,589
29	$2,876,667	63	$3,025,352	97	$3,004,358
30	$2,848,541	64	$3,592,687	98	$3,065,611
31	$3,630,054	65	$4,171,335	99	$3,388,701
32	$3,389,262	66	$2,877,395	100	$2,965,354
33	$3,373,886	67	$2,820,627		
34	$3,423,504	68	$3,149,748		

AVERAGE	$3,228,830
STD DEV	$523,313

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.6 Actual Results from the SFA model for a Farrow-to-Finish with Multiplier Herd Farm Operation, High Equity Contribution (30-50-85)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$3,119,628	35	$3,159,354	69	$4,034,478
2	$4,547,667	36	$4,252,295	70	$3,596,023
3	$3,894,370	37	$4,301,829	71	$2,794,567
4	$4,183,271	38	$3,411,863	72	$3,376,126
5	$3,548,489	39	$2,082,580	73	$2,616,553
6	$3,328,122	40	$3,281,408	74	$2,233,811
7	$3,925,712	41	$3,457,060	75	$2,815,413
8	$3,124,403	42	$3,863,417	76	$4,504,479
9	$3,007,957	43	$3,977,767	77	$3,968,580
10	$2,761,221	44	$2,868,856	78	$3,784,838
11	$2,993,305	45	$4,161,446	79	$3,566,694
12	$4,199,245	46	$3,057,885	80	$3,841,422
13	$3,080,456	47	$4,075,079	81	$3,680,628
14	$(4,589,578)**	48	$4,254,916	82	$3,151,559
15	$4,050,388	49	$3,510,820	83	$2,619,493
16	$2,460,976	50	$3,484,462	84	$3,229,022
17	$3,599,831	51	$3,478,489	85	$2,725,821
18	$3,417,543	52	$3,550,197	86	$3,306,426
19	$3,421,749	53	$4,070,714	87	$3,279,988
20	$3,814,578	54	$3,657,557	88	$4,001,461
21	$4,425,873	55	$3,904,032	89	$3,066,819
22	$3,316,829	56	$3,153,969	90	$3,877,006
23	$(4,132,616)**	57	$3,822,006	91	$3,163,163
24	$3,778,228	58	$5,200,284	92	$3,777,374
25	$3,841,504	59	$3,915,946	93	$3,821,915
26	$3,983,721	60	$3,019,416	94	$3,351,986
27	$3,217,886	61	$2,972,154	95	$3,213,082
28	$2,954,704	62	$3,058,829	96	$3,285,622
29	$3,147,625	63	$3,302,703	97	$3,274,060
30	$3,118,559	64	$3,855,274	98	$3,336,260
31	$3,895,448	65	$4,435,718	99	$3,656,232
32	$3,655,153	66	$3,151,468	100	$3,236,237
33	$3,642,354	67	$3,090,558		
34	$3,688,601	68	$3,417,964		

AVERAGE	$3,506,029
STD DEV	$528,918

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.7 Actual Results from the SFA model for a Farrow-to-Wean with contract finishing Farm Operation, Low Equity Contribution (30-40-100)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	($142,605)	35	$27,594	69	$835,620
2	$1,367,407	36	$1,082,815	70	$416,108
3	$722,327	37	$340,092	71	($430,058)
4	$1,003,340	38	$128,689	72	$185,689
5	$321,240	39	($1,295,129)	73	($695,150)
6	$147,372	40	$104,469	74	($1,074,820)
7	$744,564	41	$284,630	75	($424,365)
8	($63,674)	42	$627,962	76	$1,347,154
9	($263,535)	43	$783,119	77	$797,695
10	($523,976)	44	($373,840)	78	$492,609
11	($300,992)	45	$995,789	79	$392,052
12	$1,029,372	46	($181,696)	80	$573,052
13	($111,033)	47	$883,236	81	$486,495
14	$(8,139,571)**	48	$1,080,572	82	($56,559)
15	$888,794	49	$318,438	83	($666,401)
16	($965,809)	50	$245,543	84	$28,788
17	$351,825	51	$289,087	85	($578,763)
18	$199,715	52	$355,088	86	$131,227
19	$224,640	53	$894,149	87	$20,227
20	$664,680	54	$456,618	88	$823,115
21	$1,253,694	55	$728,086	89	($273,534)
22	$140,213	56	($152,349)	90	$697,700
23	$(7,151,364)**	57	$650,414	91	($49,714)
24	$616,346	58	$2,030,733	92	$604,101
25	$663,150	59	$744,722	93	$645,850
26	$802,348	60	($238,856)	94	$167,677
27	($16,650)	61	($329,907)	95	$14,133
28	($297,921)	62	($167,663)	96	$68,882
29	($141,910)	63	$42,952	97	$105,964
30	($199,566)	64	$675,118	98	$146,704
31	$711,599	65	$1,261,280	99	$489,464
32	$465,651	66	($148,771)	100	($33,885)
33	$446,776	67	($165,318)		
34	$515,958	68	$203,090		

AVERAGE	$281,849
STD DEV	$561,751

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.8 Actual Results from the SFA model for a Farrow-to-Wean with contract finishing Farm Operation, Medium Equity Contribution (30-45-117)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$352,770	35	$443,025	69	$1,243,193
2	$1,753,736	36	$1,490,770	70	$823,216
3	$1,111,769	37	$748,766	71	($14,383)
4	$1,388,974	38	$620,747	72	$582,852
5	$752,544	39	($794,324)	73	($220,258)
6	$526,672	40	$490,226	74	($593,516)
7	$1,129,837	41	$664,110	75	$9,757
8	$334,471	42	$1,052,292	76	$1,724,330
9	$212,302	43	$1,164,744	77	$1,189,644
10	($25,065)	44	$87,618	78	$969,461
11	$197,741	45	$1,382,873	79	$769,441
12	$1,426,056	46	$269,772	80	$1,049,424
13	$274,986	47	$1,299,085	81	$883,719
14	$(7,766.256)**	48	$1,469,326	82	$378,756
15	$1,272,737	49	$729,370	83	($165,780)
16	($458,877)	50	$685,249	84	$453,819
17	$781,028	51	$683,429	85	($78,042)
18	$634,233	52	$763,789	86	$507,577
19	$635,869	53	$1,290,507	87	$486,274
20	$1,049,547	54	$872,810	88	$1,221,690
21	$1,637,038	55	$1,113,536	89	$243,436
22	$529,980	56	$350,958	90	$1,074,715
23	$(6,908,236)**	57	$1,033,876	91	$392,691
24	$1,000,202	58	$2,409,332	92	$991,766
25	$1,041,183	59	$1,129,863	93	$1,028,602
26	$1,178,720	60	$221,513	94	$557,432
27	$418,036	61	$165,196	95	$403,425
28	$159,625	62	$278,442	96	$503,915
29	$335,002	63	$522,959	97	$499,270
30	$302,109	64	$1,050,977	98	$543,698
31	$1,089,529	65	$1,638,109	99	$870,741
32	$847,848	66	$342,219	100	$431,439
33	$842,800	67	$297,687		
34	$891,726	68	$606,975		

AVERAGE	$703,707
STD DEV	$531,341

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.9 Actual Results from the SFA model for a Farrow-to-Wean with contract finishing Farm Operation, High Equity Contribution (30-50-133)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$717,560	35	$801,837	69	$1,602,005
2	$2;112,548	36	$1,849,582	70	$1,182,028
3	$1,470,581	37	$1,107,579	71	$344,430
4	$1,747,786	38	$994,874	72	$941,664
5	$1,112,767	39	($358,646)	73	$179,442
6	$885,484	40	$849,038	74	($201,868)
7	$1,488,649	41	$1,022,922	75	$369,589
8	$693,284	42	$1,414,743	76	$2,083,142
9	$582,488	43	$1,523,556	77	$1,548,456
10	$351,531	44	$447,276	78	$1,385,216
11	$572,051	45	$1,741,685	79	$1,128,253
12	$1,786,165	46	$636,299	80	$1,429,729
13	$633,798	47	$1,658,065	81	$1,242,531
14	$(7,407,444)**	48	$1,828,138	82	$739,228
15	$1,631,549	49	$1,088,182	83	$206,910
16	($12,897)	50	$1,051,341	84	$812,631
17	$1,139,961	51	$1,042,241	85	$304,833
18	$999,605	52	$1,122,688	86	$866,390
19	$996,621	53	$1,649,320	87	$866,238
20	$1;408,359	54	$1,234,884	88	$1,580,502
21	$1,995,850	55	$1,472,349	89	$638,725
22	$888,792	56	$728,311	90	$1,433,527
23	$(6,682,641)**	57	$1,392,688	91	$755,846
24	$1,359,014	58	$2,768,145	92	$1,350,578
25	$1,399,995	59	$1,488,675	93	$1,387,414
26	$1,537,532	60	$580,748	94	$916,244
27	$776,848	61	$537,489	95	$762,237
28	$521,839	62	$637,254	96	$863,506
29	$701,327	63	$891,868	97	$858,207
30	$683,178	64	$1,409,789	98	$902,510
31	$1,448,341	65	$1,996,921	99	$1,229,553
32	$1,206,660	66	$703,799	100	$790,482
33	$1,201,612	67	$657,735		
34	$1,250,538	68	$965,787		

AVERAGE	$1,068,640
STD DEV	$523,894

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.10 Actual Results from the SFA model for a Farrow-to-Wean with Contract Finishing and Multiplier Herd Farm Operation, Low Equity Contribution (30-40-100)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$1,158,602	35	$1,262,571	69	$2,057,083
2	$2,571,712	36	$2,304,667	70	$1,637,359
3	$1,929,384	37	$1,565,528	71	$808,268
4	$2,208,962	38	$1,447,317	72	$1,399,105
5	$1,562,688	39	$92,872	73	$638,320
6	$1,348,892	40	$1,307,681	74	$260,450
7	$1,947,990	41	$1,485,423	75	$833,612
8	$1,152,270	42	$1,860,158	76	$2,546,307
9	$1,022,922	43	$1,985,981	77	$2,010,229
10	$788,196	44	$906,322	78	$1,797,841
11	$1,026,971	45	$2,202,185	79	$1,591,138
12	$2,236,958	46	$1,077,396	80	$1,867,533
13	$1;095,016	47	$2,109,800	81	$1,697,128
14	$(6,941,569)**	48	$2,285,429	82	$1,201,005
15	$2,090,568	49	$1,543,425	83	$649,607
16	$454,998	50	$1,508,908	84	$1,267,282
17	$1,602,694	51	$1,503,421	85	$747,932
18	$1,455,968	52	$1,577,534	86	$1,329,738
19	$146,115	53	$2,103,038	87	$1,304,269
20	$1,868,737	54	$1,681,411	88	$2,041,257
21	$2,456,158	55	$1,931,717	89	$1,089,142
22	$1,344,616	56	$1,166,237	90	$1,896,036
23	$(5,953,362)**	57	$1,853,166	91	$1,200,804
24	$1,819,371	58	$3,230,003	92	$1,807,483
25	$1,863,491	59	$1,948,933	93	$1,849,395
26	$1,999,875	60	$1,039,506	94	$1,372,669
27	$1,236,179	61	$996,094	95	$1,223,365
28	$973,011	62	$1,093,951	96	$1,322,339
29	$1,162,280	63	$1,330,447	97	$1,312,965
30	$1,140,169	64	$1,873,244	98	$1,360,145
31	$2;104,390	65	$2,460,479	99	$1,691,867
32	$1,666,524	66	$1,156,504	100	$1,244,730
33	$1,662,204	67	$1,117,112		
34	$1,714,143	68	$1,427,614		

AVERAGE	$1,513,312
STD DEV	$545,278

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.11 Actual Results from the SFA model for a Farrow-to-Wean with Contract Finishing and Multiplier Herd Farm Operation, Medium Equity Contribution (30-45-117)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$1,556,749	35	$1,641,026	69	$2,441,195
2	$2,951,738	36	$2,688,771	70	$2,021,218
3	$2,309,770	37	$1,946,768	71	$1,183,619
4	$2,586,976	38	$1,834,064	72	$1,780,854
5	$1,951,975	39	$498,127	73	$1,020,249
6	$1,724,674	40	$1,688,227	74	$641,298
7	$2,327,839	41	$1,862,111	75	$1,208,778
8	$1,532,473	42	$2,253,932	76	$2,922,332
9	$1,421,678	43	$2,362,745	77	$2,387,646
10	$1,189,696	44	$1,286,466	78	$2,221,528
11	$1,411,240	45	$2,580,874	79	$1,967,443
12	$2,625,355	46	$1,474,880	80	$2,268,143
13	$1,472,987	47	$2,497,254	81	$2,081,720
14	$(6,568,254)**	48	$2,667,328	82	$1,578,418
15	$2,470,738	49	$1,927,372	83	$1,044,401
16	$850,197	50	$1,890,530	84	$1,651,820
17	$1,979,150	51	$1,881,431	85	$1,144,022
18	$1,838,795	52	$1,961,878	86	$1,705,579
19	$1,835,811	53	$2,488,509	87	$1,705,427
20	$2,247,548	54	$2,074,074	88	$2,419,691
21	$2,835,040	55	$2,311,538	89	$1,477,914
22	$1,727,982	56	$1,567,500	90	$2,272,716
23	$(5,580,047)**	57	$2,231,877	91	$1,594,296
24	$2,198,204	58	$3,607,334	92	$2,189,768
25	$2,239,184	59	$2,327,865	93	$2,226,603
26	$2,375,756	60	$1,419,938	94	$1,755,434
27	$1,619,920	61	$1,376,678	95	$1,601,427
28	$1,361,613	62	$1,476,444	96	$1,702,695
29	$1,540,155	63	$1,731,058	97	$1,697,397
30	$1,522,376	64	$2,248,979	98	$1,741,700
31	$2,289,166	65	$2,836,111	99	$2,068,742
32	$2,045,850	66	$1,542,988	100	$1,629,671
33	$2,040,801	67	$1,496,924		
34	$2,089,728	68	$1,804,976		

AVERAGE	$1,908,280
STD DEV	$522,779

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

Table A.12 Actual Results from the SFA model for a Farrow-to-Wean with Contract Finishing and Multiplier Herd Farm Operation, High Equity Contribution (30-50-133)

Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years	Iteration	Cash Accumulation after 5 years
1	$1,915,562	35	$1,999,839	69	$2,800,007
2	$3,310,550	36	$3,047,584	70	$2,380,030
3	$2,668,583	37	$2,305,580	71	$1,542,431
4	$2,945,788	38	$2,192,876	72	$2,139,666
5	$2,310,769	39	$856,939	73	$1,379,061
6	$2,083,486	40	$2,047,040	74	$1,000,110
7	$2,686,651	41	$2,220,923	75	$1,567,590
8	$1,891,285	42	$2,612,745	76	$3,281,144
9	$1,780,490	43	$2,721,558	77	$2,746,458
10	$1,549,532	44	$1,645,278	78	$2,585,187
11	$1,770,052	45	$2,939,686	79	$2,326,255
12	$2,984,167	46	$1,834,301	80	$2,627,731
13	$1,831,799	47	$2,856,066	81	$2,440,533
14	$(6,209,442)**	48	$3,062,140	82	$1,937,230
15	$2,829,550	49	$2,286,184	83	$1,404,912
16	$1,209,010	50	$2,249,343	84	$2,010,632
17	$2,337,963	51	$2,240,243	85	$1,502,835
18	$2,197,607	52	$2,320,690	86	$2,064,391
19	$2,194,623	53	$2,847,321	87	$2,064,240
20	$2,606,360	54	$2,432,886	88	$2,778,504
21	$3,193,852	55	$2,670,350	89	$1,836,727
22	$2,086,794	56	$1,926,312	90	$2,631,528
23	$(5,221,235)**	57	$2,590,690	91	$1,953,848
24	$2,557,016	58	$3,966,146	92	$2,548,580
25	$2,597,996	59	$2,686,677	93	$2,585,416
26	$2,734,568	60	$1,778,750	94	$2,114,246
27	$1,978,732	61	$1,735,490	95	$1,960,239
28	$1,720,425	62	$1,835,256	96	$2,061,508
29	$1,898,367	63	$2,089,870	97	$2,056,209
30	$1,881,189	64	$2,607,791	98	$2,100,512
31	$2,647,978	65	$3,194,923	99	$2,427,555
32	$2,404,662	66	$1,901,800	100	$1,988,483
33	$2,399,614	67	$1,855,736		
34	$2,448,540	68	$2,136,788		

AVERAGE	$2,267,277
STD DEV	$523,379

Negative values are in parenthesis.
** observation was treated as an outlier and omitted.

APPENDIX C

INPUT VARIABLE PARAMETERS AND CORRELATIONAL MATRICIES

INPUT VARIABLE PARAMETERS

Variable	Distribution Used	Units	Average	Std Dev
Corn	Log Normal	$/bu.	$ 2.21	0.4653
Soybean Meal	Log Normal	$/mt.	$ 181.49	32.12
Sows	Log Normal	$/cwt.	$ 39.73	7.14
Barrows & Gilts	Log Normal	$/cwt.	$ 46.48	6.91
Feeder Pigs	Log Normal	$/cwt.	$ 39.71	9.68
Farrowing Rate	Beta	% farrowed	80.36 %	8.36
PWPL[1]	Beta	pwpl	8.94	1.10
Nursery Mortality	Beta	% loss	3.07 %	0.89
Finisher Mortality	Beta	% loss	3.30 %	0.87

CORRELATION MATRICIES FOR INPUT VARIABLES

Corn Prices

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN	1.0000											
FEB	0.9819	1.0000										
MAR	0.9703	0.9901	1.0000									
APR	0.9009	0.9354	0.9627	1.0000								
MAY	0.8978	0.9298	0.9534	0.9930	1.0000							
JUN	0.8195	0.8690	0.8895	0.9407	0.9535	1.0000						
JUL	0.5663	0.6379	0.6652	0.7569	0.7758	0.8940	1.0000					
AUG	0.3775	0.4927	0.5299	0.6449	0.6452	0.7662	0.9225	1.0000				
SEP	0.2679	0.3919	0.4256	0.5275	0.5229	0.6586	0.8611	0.9708	1.0000			
OCT	0.1026	0.2287	0.2601	0.3721	0.3691	0.5131	0.7699	0.9152	0.9708	1.0000		
NOV	0.0101	0.1367	0.1633	0.2825	0.2783	0.3938	0.6767	0.8406	0.9187	0.9734	1.0000	
DEC	-0.0433	0.0688	0.0940	0.1947	0.1907	0.3008	0.5985	0.7631	0.8632	0.9384	0.9846	1.0000

[1] Pigs Weaner Per Litter

Soybean Meal Prices

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.9577	1.0000										
Mar	0.9385	0.9712	1.0000									
Apr	0.9125	0.9495	0.9416	1.0000								
May	0.8070	0.8585	0.8147	0.9297	1.0000							
Jun	0.5559	0.6405	0.5972	0.7218	0.8855	1.0000						
Jul	0.5533	0.6137	0.5630	0.6650	0.8099	0.9021	1.0000					
Aug	0.4641	0.5195	0.4704	0.5979	0.7001	0.7358	0.8645	1.0000				
Sep	0.3702	0.4386	0.3507	0.4610	0.6264	0.7427	0.8826	0.9026	1.0000			
Oct	0.2024	0.2599	0.1480	0.2710	0.4451	0.5491	0.7316	0.8616	0.9430	1.0000		
Nov	0.0573	0.1282	-0.0106	0.1209	0.3334	0.4472	0.6573	0.7252	0.8588	0.9393	1.0000	
Dec	0.0802	0.1377	0.0023	0.2023	0.4082	0.5425	0.6960	0.7210	0.8257	0.8847	0.9271	1.0000

Sow Prices

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.9471	1.0000										
Mar	0.8700	0.9151	1.0000									
Apr	0.7233	0.7879	0.9227	1.0000								
May	0.5665	0.5969	0.7914	0.9195	1.0000							
Jun	0.3752	0.4033	0.6017	0.7963	0.9257	1.0000						
Jul	0.2166	0.1938	0.3449	0.5321	0.6888	0.8879	1.0000					
Aug	0.0742	0.0633	0.2153	0.3667	0.5105	0.7269	0.9350	1.0000				
Sep	0.1425	0.1424	0.2388	0.3873	0.5184	0.7216	0.8978	0.9331	1.0000			
Oct	0.0135	-0.0173	0.0937	0.2226	0.3663	0.5778	0.7759	0.8421	0.9207	1.0000		
Nov	0.0459	0.0236	0.1016	0.1726	0.2884	0.4847	0.6920	0.7626	0.8140	0.9175	1.0000	
Dec	0.1992	0.1867	0.1676	0.1588	0.2543	0.3759	0.5323	0.5797	0.6754	0.7802	0.8970	1.0000

Barrows and Gilt Prices

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.9377	1.0000										
Mar	0.7873	0.8831	1.0000									
Apr	0.6549	0.7516	0.9431	1.0000								
May	0.4864	0.5837	0.8291	0.9426	1.0000							
Jun	0.3633	0.4035	0.6607	0.8334	0.9383	1.0000						
Jul	0.1803	0.1510	0.4368	0.6226	0.7620	0.8995	1.0000					
Aug	-0.0286	-0.0593	0.1942	0.3445	0.4658	0.6476	0.8608	1.0000				
Sep	0.0115	-0.0145	0.2126	0.3661	0.5304	0.6923	0.8479	0.8939	1.0000			
Oct	-0.1041	-0.1546	0.0783	0.2018	0.3958	0.5389	0.7233	0.7748	0.9140	1.0000		
Nov	-0.0734	-0.1808	0.0020	0.0948	0.2626	0.3987	0.6001	0.6900	0.7987	0.9136	1.0000	
Dec	0.1463	0.0226	0.1077	0.1624	0.2961	0.3799	0.5135	0.5605	0.6793	0.7698	0.8935	1.0000

Feeder Pigs Prices

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.8792	1.0000										
Mar	0.7413	0.8807	1.0000									
Apr	0.5805	0.7019	0.9054	1.0000								
May	0.4612	0.5263	0.8371	0.9314	1.0000							
Jun	0.2922	0.3466	0.6329	0.7486	0.8751	1.0000						
Jul	0.0236	0.0909	0.4081	0.5393	0.7315	0.8801	1.0000					
Aug	-0.0742	-0.0507	0.1814	0.3376	0.5229	0.7560	0.8346	1.0000				
Sep	-0.1783	-0.1660	0.0893	0.2955	0.4852	0.7324	0.8852	0.9446	1.0000			
Oct	-0.1648	-0.2108	0.0005	0.2053	0.3956	0.6682	0.7964	0.8595	0.9396	1.0000		
Nov	-0.2221	-0.3336	-0.1442	0.0551	0.2592	0.5076	0.6860	0.8026	0.8731	0.9425	1.0000	
Dec	-0.1920	-0.2745	-0.0283	0.1798	0.3644	0.4792	0.6376	0.7914	0.8114	0.8418	0.9274	1.0000

Farrowing Rate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.7618	1.0000										
Mar	0.5047	0.7339	1.0000									
Apr	0.5563	0.6571	0.7712	1.0000								
May	0.6167	0.6678	0.6424	0.6930	1.0000							
Jun	0.4739	0.6659	0.7051	0.6993	0.6830	1.0000						
Jul	0.4792	0.6026	0.6481	0.5636	0.7549	0.7537	1.0000					
Aug	0.4188	0.5649	0.6024	0.5255	0.6877	0.6697	0.7311	1.0000				
Sep	0.4477	0.6387	0.6158	0.5538	0.7449	0.6969	0.8016	0.7824	1.0000			
Oct	0.4660	0.4634	0.4259	0.4254	0.4874	0.4975	0.6293	0.4687	0.6145	1.0000		
Nov	0.4723	0.4462	0.4493	0.4473	0.4652	0.6074	0.6395	0.5059	0.6126	0.7192	1.0000	
Dec	0.4300	0.3675	0.2451	0.3539	0.4080	0.4773	0.5030	0.2908	0.4997	0.5614	0.7295	1.0000

Pigs Weaned Per Litter

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.6621	1.0000										
Mar	0.6095	0.8094	1.0000									
Apr	0.6258	0.6294	0.7844	1.0000								
May	0.5766	0.5719	0.6303	0.7127	1.0000							
Jun	0.6186	0.7201	0.6637	0.7158	0.7962	1.0000						
Jul	0.6208	0.7070	0.6557	0.7218	0.7659	0.8844	1.0000					
Aug	0.5578	0.6234	0.6387	0.5255	0.5973	0.7639	0.7693	1.0000				
Sep	0.6274	0.6638	0.6665	0.6176	0.6676	0.8121	0.8306	0.9341	1.0000			
Oct	0.5623	0.6064	0.5628	0.5210	0.5948	0.7279	0.7756	0.7619	0.8120	1.0000		
Nov	0.5072	0.4962	0.4862	0.5854	0.6360	0.6517	0.7480	0.7276	0.7766	0.8012	1.0000	
Dec	0.3706	0.4271	0.3777	0.3906	0.4633	0.6378	0.6987	0.8149	0.7922	0.7001	0.7517	1.0000

Nursery Mortality

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.5710	1.0000										
Mar	0.1393	0.4622	1.0000									
Apr	0.3641	0.2469	0.5495	1.0000								
May	0.4443	0.3225	0.4665	0.8042	1.0000							
Jun	0.5309	0.7027	0.4658	0.6764	0.6601	1.0000						
Jul	0.5980	0.4382	0.1851	0.4059	0.3957	0.5561	1.0000					
Aug	0.4155	0.3198	0.3266	0.3696	0.3933	0.4455	0.7830	1.0000				
Sep	0.6886	0.2826	0.1572	0.4955	0.4367	0.4449	0.7831	0.6747	1.0000			
Oct	0.6226	0.3509	0.1947	0.5284	0.4272	0.6208	0.6667	0.6659	0.8054	1.0000		
Nov	0.5862	0.2687	0.2001	0.4476	0.4443	0.4780	0.8019	0.8286	0.7050	0.6880	1.0000	
Dec	0.4272	0.2665	0.4458	0.4107	0.3728	0.4211	0.7104	0.6036	0.6259	0.4682	0.7199	1.0000

Finisher Mortality

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.0000											
Feb	0.7751	1.0000										
Mar	0.4788	0.5627	1.0000									
Apr	0.4349	0.3421	0.5643	1.0000								
May	0.5181	0.3918	0.5560	0.7999	1.0000							
Jun	0.7118	0.5854	0.6097	0.6976	0.7401	1.0000						
Jul	0.5380	0.6173	0.4344	0.5765	0.5136	0.6722	1.0000					
Aug	0.4066	0.4828	0.5281	0.4527	0.5620	0.7008	0.7766	1.0000				
Sep	0.4451	0.4609	0.3152	0.4754	0.4524	0.5589	0.6853	0.7673	1.0000			
Oct	0.5315	0.4348	0.2965	0.4330	0.4383	0.7164	0.6073	0.6577	0.8343	1.0000		
Nov	0.5171	0.4986	0.4900	0.4797	0.4916	0.6744	0.7872	0.7326	0.7753	0.8108	1.0000	
Dec	0.6028	0.6093	0.5118	0.5397	0.6204	0.6957	0.8221	0.6501	0.6112	0.4498	0.7221	1.0000

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