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Factors Affecting the Long-Term Market and Profit Potential of the Utah Apple Industry

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FACTORS AFFECTING THE LONG-TERM MARKET AND PROFIT POTENTIAL OF THE UTAH APPLE INDUSTRY

by

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Jodie R. Harris

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ABSTRACT

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by

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The Utah apple industry is a small competitor in a major market. Efforts were made to analyze the long-term market and profitability potential of the industry. This study consisted of two parts, whole farm simulations and a consumer preference survey.

A whole-farm simulation model (FLIPSIM) was used to evaluate and test variations in price, debt load and sizes of Utah apple production units. These variations examined the effects of various possible market and financial conditions that producers could face given the current situation of the apple industry. FLIPSIM was used to demonstrate the stochastic nature of prices and yields of producers in Utah County, Utah. Five scenarios representing long-term nominal price trends were examined using FLIPSIM to test the financial health of the industry under the various financial situations. Each scenario investigated

the impact of different price trend assumptions on a 40-acre and an 80-acre apple production unit under different initial debt loads.

Consumer tastes and preferences for apples were determined through a survey conducted along the Wasatch Front. This survey established general consumer preferences and attempted to measure consumer behavior given various options. The results show producers the purchasing habits of apple consumers.

Results indicate that as long as prices continue to increase in response to counter the escalating prices of inputs, the typical producer will experience success. If prices do not continue to increase, producers will experience financial difficulties. This suggests that apple producers in Utah are currently producing near a level where average total costs equal expected output price. Consequently, major increases in supply without corresponding increases in demand would reduce prices below break-even levels. These difficulties especially affect those producers with high debt loads and smaller operations (40 acres). If prices remain level, producers with 40 acres and 80% debt will experience severe financial problems. If prices decline, these financial problems will become general for all debt levels. Eighty-acre operations are expected to withstand lower prices better than the 40-acre operations, with problems beginning to arise if prices decrease by 1%

with and 80% debt. If prices decline by 3% per year, both sizes of operations are expected to experience major financial problems. If prices drop 3% per annum, neither 40 nor 80 acre operations are expected to survive if they have 80% debt to fixed assets.

Results of the consumer preference study indicate that apples, in general, are losing market share to other fruits in the Utah market. In general, apple producers must consider developing new markets, penetrating existing non-accessible markets, expanding current markets, improving the product image of apples, diversifying to meet the variety requirement of the consumers and/or developing more efficient methods of production to provide a less expensive product in an effort to maintain profit margins.

(115 pages)

CHAPTER I

INTRODUCTION

Depressed farm prices, increasing costs of production and increasing apple supplies are causing many farmers to examine their individual circumstances and search for more profitable production alternatives. The current state of the farm economy is affecting most facets of agriculture, including the apple industry. Utah's apple industry is rapidly coming to the realization that changes are needed to stay competitive. Utah apple producers need to adapt to an industry experiencing rapid changes in increasing variable costs, increased local and national yields, changing consumer tastes, consumer health concerns, depressed prices and sophisticated marketing techniques. These factors currently impact or have the potential to impact the long-term profitability of apple production.

The apple industry is an important part of the Utah's agricultural sector but is not necessarily important to Utah's wholesale fresh-fruit market. Utah apple producers need to evaluate the Utah fresh-fruit market to determine potential marketing possibilities. Utah has a limited growing season and must import much of the fresh fruit and produce its population consumes. Utah produces between 0.4 (1986) and 0.7% (1985) of the nation's apple supply (USDAa). Apples are among the few fresh fruit commodities produced in Utah

that are currently stored year round. Local producers could capture a large portion of Utah's fresh-fruit market if it were profitable. Presently, a large portion of the apples grown in Utah are exported to more profitable out-of-state markets.

Washington state is the main force in the production of apples, and Utah is a residual supplier. Apples grown in Washington account for one-third of the total U. S. apple crop. Production in Washington more than doubled from 1970-1972 to 1984-1986 because of large new plantings in the early 1970s. These new plantings were in response to relative profitability and tax benefits (USDAb). According to Tom Schotsko, an industry expert at Washington State University, growers in Washington are continuing to expand acreage.

Currently, Utah is experiencing lower prices in local markets than in markets outside the state (Ferguson). This price differential is a result of low-quality apples being "dumped" into the local markets by local growers (Hatch). Apples grown and sold within the state evade grading procedures and are usually sold at a discount. Local prices force high-quality, graded apples to be shipped out of the state, where they are sold at a premium. Therefore, apples sold in Utah that are not graded are usually smaller in lots or of lower quality. Selling low-quality apples in Utah could consumers to view Utah apples as inferior. The market for

high-quality apples is generally controlled by major out-of-state growers (Hatch).

Utah apple producers experience many problems in the local market. These producers lack the acreage and financial resources necessary to compete in the premium apple markets within the state of Utah. The main problems are the dumping practices of some growers, selling inferior produce on the local market and the fact that other major apple-producing states use sophisticated advertising campaigns and utilize mass media to create a superior product in the minds of consumers.

Given these market conditions, Utah producers should consider long-term strategies for future production. This requires apple producers to forecast industry prices and demand because 5 years are required after planting before an orchard begins production, and 10 years are required to reach full production (Hatch). Producers have found that few areas in Utah have suitable land for high-producing apple orchards. This shortage of suitable land is causing real estate prices to remain high, thus increasing the initial land investment (Ferguson). These conditions require increasingly higher returns to justify the investment.

Another area of concern to the producer is the consumption of fresh fruit in the United States. The consumption of fresh fruit has continued to grow from a low in 1970 of 173 pounds per person (fresh weight equivalent) to

a high of 213 pounds in 1977 (USDAb). Since 1970, U.S. per capita fruit consumption has grown at the moderate rate of 1.3% per year, reaching 212 pounds in 1986. The increase in consumption can be attributed to several factors, including improved distribution and availability of supply, new product forms, better storage, higher disposable income, better marketing techniques, increased advertising and promotion and changes in consumer tastes and preferences (USDAb).

The apple industry has not had the growth that other members of the fruit industry have experienced. The

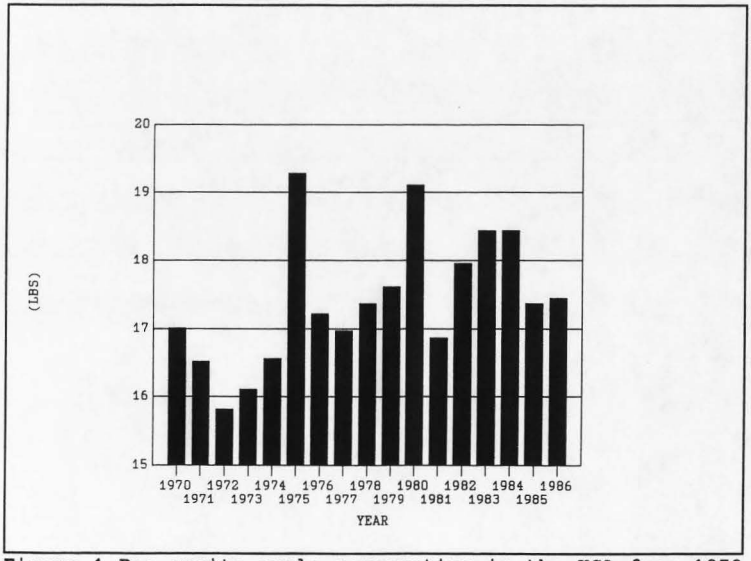

Figure 1 Per capita apple consumption in the USA from 1970 to 1986

consumption of apples over the past 16 years has fluctuated (Figure 1); the highest level of consumption occured in 1975 (19.28 pounds per person), while the low was 15.8 in 1972 (USDAb). Given current consumption trends, producers need to develop strategies to either increase consumption or reduce costs if profits are to be achieved, especially in light of expected large increases in total production during the next 5 to 10 years.

Objectives

The intent of this project was to analyze the long-run profitability of Utah's apple industry. This presumes that the future of Utah's apple industry relates to the industry's ability to accommodate consumer tastes and preferences through marketing, production and quality control. In short, this research attempts to answer the question, Can Utah apple growers produce a marketable product and maintain a reasonable profit margin, given the uncertainty of the industry? The specific objectives of the proposed research were the following:

1. Identify the prevailing characteristics of typical Utah apple-growing operations. This information was used to establish net farm income; the data was also used to develop a model to evaluate the impact of changes, farm profits and expansion in the industry.

2. Identify the potential supply-effect changes of various production trends and associated price trends. This project simulated multiple-year planning horizons for these variations to determine the effect they have on net farm income and other measures of farm health.
3. Identify basic consumer tastes and preferences concerning Utah apples. This information could be used by producers to determine future production and/or marketing strategies.

Procedures

1. Elements of a typical apple farm in southern Utah County, Utah's largest production area were determined. This information was used in developing typical budgets. Growers who were full-time apple producers and resided in the designated geographical area were selected at random from the Utah Farm Bureau Federation's apple growers' list. Each farmer in the sample was interviewed to determine production, marketing, management and financial characteristics of his/her farming operation. From these data, the typical farm characteristics of apple growers in this area were established. An interview with the Utah County extension agent was conducted to determine the characteristics of what he believed to be a typical operation.

2. Components of consumer tastes and preferences were collected to represent typical Wasatch Front consumers. This was accomplished by selecting at random a sample of households from the Salt Lake, Provo-Orem and Ogden areas using telephone directories. Each participant was interviewed by telephone to determine the tastes, preferences and demographic characteristics of his/her household.

3. Producer financial stability was analyzed. The primary measures will related to the farmers' economic survivability and success. Feasible variations in the price trends to be studied were collected from specialists and producers. With these alternatives, enterprise budgets for each practice were prepared and entered into the FLIPSIM V computer model.

4. Multivariate empirical probability distribution functions (pdf's) were defined. Means and standard deviations for the historical data were estimated. Random prices and yields were generated by correlating random deviations from expected prices and yields with the use of a covariance matrix to create the multivariate pdf's.

5. FLIPSIM V, a computer model, was used to simulate a multiple-year (10-year) planning horizon for selected production and marketing strategies. This was accomplished by entering the data into the computer model and running a 10-year simulation. These results were

used to compare the financial position of each operation at the end of each simulation.

Benefits

A major goal of this study was to estimate the long-range financial future of the Utah apple industry. Utah producers are concerned with remaining viable in light of potential increases in supply by major apple-producing states. The financial strength of the Utah apple industry over the next 10 years was evaluated for future planning decisions.

It was also anticipated that this research would help bridge the gap between the producer and the consumer. Many times farmers are producing for some unknown markets only to find that the market doesn't exist. On the other hand, consumers' needs are not met because farmers are not aware of them. It is believed that this study will provide producers with useful techniques and alternatives to current production and marketing practices as well as long term industry projections. It is also hoped that this research will assist producers in providing consumers with the desired produce. The ultimate market would have the farmer producing what the consumer wants, improving total welfare for both.

This thesis includes five chapters. Chapter II analyzes relevant studies dealing with procedures and methodology similar to this project. Chapter III incorporates procedures and methodologies employed in the completion of this study.

Chapter IV encompasses the results of the whole-farm simulations and the findings of the consumer study. Chapter V summarizes and concludes while exploring areas for future research.

CHAPTER II

LITERATURE REVIEW

This study is an analysis of the Utah apple industry, including production and consumption. Numerous studies in this area have been completed as have others for similar industries. It is the intent of this chapter to review past and present literature related to this thesis' area of study in an attempt to build and expound on these studies. These studies are divided into four sections: 1) early studies of the Utah apple industry, 2) current studies of related issues, 3) studies using whole-farm simulation models and 4) studies using FLIPSIM applications.

Early Studies of the Utah Apple Industry

Only two studies have been conducted concerning the marketing of apples in Utah. Both occurred more than 30 years ago.

In early 1955, Ellis W. Lamborn completed a study entitled "Apple Production Costs and Returns in Selected Utah Areas." This research used a static approach to analyze costs, returns, yields, labor efficiency, grading, operation size, costs of production, areas, net returns, variety of apples, production and prices of the apples produced in Utah. In 1955, the average grower in Utah had 8.2 acres of apples and produced 500 bushels per acre; the costs of production

were $1.61 per bushel, and the return was a net of 20 cents per bushel.

In 1955, USU's Agricultural Economics Department and Utah Agricultural Experiment Station conducted research comparing Utah apples to the apples from the Northwest. This study concluded that consumers had no bias either for or against Utah apples when compared with apples produced in the Northwest. Northwest apples held and maintained a market advantage through advertising, rigid production practices and close grading of the product at compared to apples produced in Utah. This study examined the notion that Utah apple producers could produce a product comparable with that grown in the Northwest. It also suggested that there should be no price difference between the Utah apple and apples from other locations. However, the authors did find that consumers buy apples based on appearance or eye appeal. This was true regardless of whether the apples were labeled in a manner that indicated the origin. The author stated,

> If the Utah producer wishes to share in the market for high-quality, high-priced Delicious apples, it is only necessary that they grow and prepare fruit for market that will meet the critical standards set up by the consumer. (Lamborn, p. 4)

A second study was conducted in 1957 by Ellis W. Lamborn in association with William L. Park to establish whether 1) consumers had a preference for different apple sizes when they were priced the same, 2) consumers demand for apples varied when sizes were priced differently, 3) prices explained apple

consumption and 4) measured market changes were associated with major holidays. They determined that consumers' income affected the preference they had for different sizes of apples. Medium- and low-income consumers preferred larger apples, while consumers wiht high incomes divided their purchases more equally between large and small apples. The authors concluded that

> as the price of small apples is decreased relative to that of large apples, the volume of sales of small apples per day increased substantially while little change was apparent in the volume of large apples sold" (Lamborn and Park, p. 5).

However, they noticed that immediately before Thanksgiving consumers preferred large apples.

Another finding of the Lamborn and Park study was that differential pricing benefited the farmers as well as the consumers and retailers. The farmer sells more volume, the consumer buys more and the retailer increases his gross margin on apples (Lamborn and Park).

Current Studies of Related Issues

In 1984, Smallwood and Blaylock studied the effects of income, household size and age composition, race, food-stamp-program participation, geographic region, urbanization of household residence and season of the year on household expenditures of 32 fruit, vegetable and potato products. This study was based on the 1977-78 USDA National Food Consumption Survey using a Tobit data analysis. They found that the

higher-income households spent more money per person on most fruit, vegetable and potato products than lower-income households. By comparison, Northeast and central-city households spent more for fruit, vegetable and potato products than people living in other locations (Smallwood and Blaylock).

Studies Using Whole-Farm Simulation Models

Assorted whole-farm simulation models have been developed to simulate the effects of the changing farm economy on various commodities. These models estimated the impacts of changes in management, cropping patterns, prices, yields, marketing strategies, annual in costs, machinery replacement, farm programs, income taxes, etc., on the profitability and/or solvency of typical farming operations. The subsequent discussion presents the main points in whole-farm simulation studies.

The first real-farm-level simulation model was developed by Halter and Dean. This model used 40 years of range conditions for a simulated ranch and feedlot operation in California. The simulation results were based on 10 years of price relationships, and the results were compared to the actual prices during the study period. This information was used to show that simulation models are capable of providing a "good" approximation of actual conditions faced by farmers. However, the original model did not take into account

stochastic prices, alternative marketing strategies, changing interest rates, farm policy variables or income taxes.

A simulation model for Indiana cash grain and livestock operations was developed by Patrick and Eisgruber. Annual prices and yields were incorporated into the model using a stochastic form together with accounting tools such as partial balance sheets. Solvency was tested as the farm was permitted to grow through purchases of land as sufficient cash was generated.

Hutton and Hinman developed a more general model incorporating most of the features of the Patrick and Eisgruber model. A cash-flow accounting system and the effects of property taxes were added to the model. From this model, Hardin developed a model for cattle and wheat production in Oklahoma. This model included most of the features of the Hutton and Hinman model, but it also incorporated flexible annual percentage changes as well as prices and yields. However, the farm was not permitted to grow or make use of the futures market in marketing decisions.

The next-generation simulation model was developed by Boehlje and Griffin; they simulated cash grain farms in the Corn Belt. For the first time support programs were included for both prices and income in the simulation analysis. Non-stochastic annual crop prices and yields were used in the model.

Richardson and Condra initiated a simulation model for West Texas cotton, grain and vegetable producers. This model incorporated target prices into the model and tested for farm solvency. The farm was not permitted to grow, nor was disinvestment of farmland permitted. The model used a linear program (LP) routine for determining annual cropping patterns and allowed for stochastic annual crop prices and yields as well as flexible annual percentage changes on input costs.

The first whole-farm simulation model for evaluation of alternative marketing strategies was developed by Helmers (as cited in Bailey). The model allowed its farm to raise up to three crops and simulated the period from 1961 to 1975 using stochastic yields and historical prices. The model used historical futures prices for the period and allowed the farm to grow by 80 acres in four randomly chosen years if sufficient funds were available.

The contemporary whole-farm simulation model is the Firm Level Income Tax and Farm Policy Simulation Model (FLIPSIM V). The model, developed by Richardson and Nixon, is a

> recursive, farm-level, stochastic simulation model which simulated the annual production, farm policy, marketing, financial management, growth and income tax aspects of a farm over a multiple-year planning horizon. (Richardson and Nixon 1982, p. 124)

The following section discusses studies that have used and/or modified the original FLIPSIM model.

Studies Using FLIPSIM Applications

FLIPSIM was used by Smith to evaluate the impacts of farm policies on cotton farms in alternative size categories. Based upon Smith's work, FLIPSIM was used to evaluate the impact of farm programs, financial bailout programs, technology and federal income tax provisions on different-size crop farms. These studies took place in Texas, Mississippi, Illinois, Nebraska and the southern Great Plains (Helms). In addition, the FLIPSIM model has been used to evaluate policy issues on differen-size dairy farms in Minnesota, Florida, California and Arizona.

A modified version of FLIPSIM was used by Richardson and Bailey to evaluate alternative marketing strategies for cotton producers on the Texas High Plains. These modifications included the use of technical market indicators to signal transactions in the cash and futures markets. This use of FLIPSIM was unique because it included the daily futures and cash prices to simulate technical trading methods for individual marketing strategies. Extending Bailey's methodology, Lippke (as cited in Helms) incorporated the use of options on commodity futures in marketing strategies.

Since its origin FLIPSIM has been used in a wide range of applications, including but not limited to probable impacts of alternative farm policies, alternative levels of price variability, income tax policy, owning versus renting farm

assets, analyzing debt-servicing capacity, impact of natural disasters, alternative tillage practices, and many others that have added to the value of FLIPSIM as a tool in the analyzing process (Davis).

This study extended the use of the FLIPSIM model to analyze the Utah apple industry. The main emphasis was in analyzing long-term profitability with variable debt ratios and prices. Given the apple industy's unique characteristics (a time lag of five years between planting and harvesting and various costs of production and yields caused by tree age), FLIPSIM's stochastic approach was required to accommodate the variations in supply and debt supply.

Early studies of the Utah apple industry allow a comparison of today's market with that of the 1950s. The FLIPSIM studies were useful in adapting the simulation process to the Utah apple industry.

CHAPTER III

METHODOLOGY

This chapter reports the methodology used in this study. This research investigated the financial condition of Utah apple growers, using a whole-farm simulation model. In addition, an analysis of the market development potential on the Wasatch Front for Utah apples was conducted using a consumer survey. The whole-farm simulation investigation examines impacts on Utah apple operations as prices for apples change over time by examining the assumption of large increases in supply of apples. This was done assuming alternative price-trend scenarios. The consumer survey ascertained consumer buying patterns and changes in tastes and preferences for apples relative to other fruits. These two approaches combine to define and explain possible problems and solutions for apple growers in Utah.

This chapter is divided into two main sections--the whole-farm simulation analysis and the consumer preference survey.

Whole-Farm Simulation Modeling

Whole-farm simulation requires the establishment of an initial set of technical parameters for production and marketing by a typical farm. Typical farm characteristics were established for an apple production unit in southern Utah

County, Utah. These characteristics were based on producer surveys and the opinions of industry experts.

The apple industry is relatively important to the economy of Utah accounting for $7,020,000 of total agricultural receipts in Utah during 1987 (Utah Department of Agriculture, 1988 Utah Agricultural Statistics). Apples are Utah County's largest single fruit crop, adding millions of dollars in income to local businesses as a result of a multiplier effect. The Utah fruit industry could have major growth potential in markets intra-state, nationally and internationally if these markets could be developed.

Whole-farm simulation is the method used to analyze the economic health and viability of Utah production apple units from a completely normative perspective. Normative assumes some ethical objective, from this we deduce what ought to be done (Layard and Walters). This enables the communication of research results to the agricultural community based on "real-world" conditions rather than purely theoretical optimization techniques.

Information concerning the economic and sociological conditions of the typical farm were combined in the whole-farm simulation model to examine the impacts of trends in prices of apples on various measures of financial health. These financial measures included after-tax net present value, present value of ending net worth, net cash farm income and overall debt-servicing capability.

An investigation of the possible impacts of different price trends is important, based on recent apple tree plantings in major apple-producing states. For example, it has been estimated that in the state of Washington, 25% of all planted trees are currently nonbearing (Rasmussen). This indicates that a substantial increase in apple production is expected in the next five years. As apple production increases, demand must be expanded and new markets found, or lower prices will occur.

The following sections describe typical farm characteristics including macroeconomic variables (e.g., interest rates and annual percentage changes in costs), debt structure, price regimes, the whole-farm simulation model itself and the methods used to compare the results of the simulations of the various scenarios.

Establishing Typical Farm Characteristics

The typical farm description consists of data representing critical financial, management, marketing and sociological characteristics about the farm and farm family. Our analysis also included assumptions about the long-term price trends and production risks, such as crop failures and the associated price risks, faced by apple producers.

General data concerning farm sizes were provided in interviews with Dr. Anthony Hatch, the state extension horticultural specialist. County agents provided information

about the industry's relative importance to the agricultural economy, long-term trends and growth potential. Since this study deals with farm profitability, the county agent's expertise also aided in formulating long-term planning strategies (husbandry practices, production potential, etc.).

A list of apple growers was obtained from the Utah Farm Bureau Federation (Salt Lake City, Utah). This list includes 120 Red Delicious apple growers in Utah County. These growers were randomly ranked using a random number chart, and the first 20 were selected (after being ranked) after screening out small producers (i.e., only those with more than 3 acres of orchard planted in apple trees were included). This means that the bulk of the producers interviewed were commercial growers with substantial investments in orchards and other capital costs. Enterprise budgets were developed from information in this survey.

The producer survey instrument was designed using information from past surveys and modified to obtain the specific data needed to fulfill the objectives of this study. Personal interviews were conducted with each of the individuals identified above. Each interview lasted approximately 30 minutes. Information was obtained about each operation.

Survey participants were contacted by telephone and interview times determined. The interview was conducted with a question-and-answer format. All 20 producers contacted

agreed to participate in the survey. However, some refused to give specific financial information concerning some portions of their operations. For those who did not respond to all question posed in the survey, public information was substituted (county tax information, equipment dealer price quotes, etc.).

Many apple producers were reluctant to give complete financial information or were uncertain of current input prices. Therefore, additional sources of information were utilized. The Utah County Tax Assessor provided tax records, which were used to obtain property values, assessed values and property tax amounts. Local seed, feed and fertilizer dealers provided information on input costs used in production. Extension specialists provided input concerning husbandry practices. Annual reports of the Utah Department of Agriculture and USDA publications provided information on local prices and yields.

Since individual production costs were not consistent because of differences in farm size, machinery complements, yields, prices received, etc., two representative farm sizes were selected. Enterprise budgets were developed for each farm size, one for a 40-acre operation and one for an 80-acre operation.

A machinery complement for the typical farms was developed based on the producer surveys. The purchase price, expected life, replacement cost, economic life and fair market

value of each piece of machinery was determined from information provided by local implement dealers (Payson Massey Ferguson). This information is important in projecting long-term financial health and replacement strategies for the farm over the planning horizon.

The interviews did not yield reliable measures of farm debt. This was due to the inability or unwillingness of the producers to provide exact information on debt. Given this restriction, it was necessary to assume a level of debt to complete the analysis. Rather than selecting one arbitrary level, several levels were analyzed. The debt levels considered were 20%, 40%, 60% and 80% long-term debt (Table 1). This allowed for a broader investigation of the overall impact of debt by providing a sensitivity analysis of the results relative to various levels of debt.

Interest on debt was calculated based on the current rate paid by farmers through the Farm Credit System. At the time this study was completed (1988) the rate was 11.57%. Since the producers interviewed were more willing to disclose intermediate-term levels, actual average debt was used for machinery loans and other intermediate assets.

Annual percentage changes in costs were used for six variables based on macroeconomic and financial forecasts by the Food and Agricultural Policy Research Institute (FAPRI). The FAPRI outlook forecasts the ensuing 10 years of annual percentage changes in inputs (Table 2). These annual

Table 1. Financial Statement for Typical 40-Acre and 80-Acre Utah County Apple Operations.

		40 acre	80 acre
Long-term Assets:			
Cropland and Farmstead		$282,000	$482,000
Buildings		$35,000	$35,000
TOTAL LONG-TERM ASSETS		$317,000	$517,000
Intermediate Assets:			
Machinery		$53,600	$67,200
TOTAL INTERMEDIATE ASSETS		$53,600	$67,200
TOTAL FARM ASSETS		$370,600	$584,200
Long-term Liabilities:			
Percent Long-term Debt	20%	$63,400	$103,400
Percent Long-term Debt	40%	$126,800	$206,800
Percent Long-term Debt	60%	$190,200	$310,200
Percent Long-term Debt	80%	$253,600	$413,600
Other Liabilities:	30%	$16,080	$20,160
Net Worth:			
Percent Long-term Debt	20%	$291,120	$460,640
Percent Long-term Debt	40%	$227,720	$357,240
Percent Long-term Debt	60%	$164,320	$253,840
Percent Long-term Debt	80%	$100,920	$150,440

percentage changes in costs create a dynamic price environment in the input markets. Five of these variables were identified for specific inputs, and one was used for miscellaneous inputs and was labeled as general.

Once typical farm characteristics were established, the data were reviewed by extension and industry experts for validity. These experts consisted of a banker (Johnson), producers (Ferguson and Farley), extension specialists (Hatch; Bond; and Walker) and an agri-businessman (Muir).

Table 2. Projected Price Changes for Input, 1989 to 1998[a]

	PERCENT									
YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
GENERAL	3.5	4.1	1.8	2.1	2.9	3.3	5.0	4.8	5.2	5.4
FERTILIZER	5.5	6.4	4.6	3.5	4.4	4.5	4.8	5.0	5.7	7.1
SPRAYING	5.0	4.0	2.9	3.2	2.9	3.0	3.2	3.4	3.9	5.0
HARVESTING	3.5	4.1	1.8	2.1	2.9	3.3	5.0	4.8	5.2	5.4
PLANTING	3.0	3.1	3.6	3.0	3.0	3.3	4.0	4.5	5.8	5.9
FUEL COSTS	4.6	5.3	2.5	3.5	5.0	5.0	8.7	6.6	6.8	4.7

[a]Inflation indices for labor was included in all input price changes with the exception of harvesting and fuel costs)

Source: FAPRI

The information gathered was used in the development of characteristicd of the typical apple production unit. These characteristics were utilized in the FLIPSIM model for forecasting purposes.

The Typical Apple Operation

The typical apple operation studied is located in southern Utah County, 70 miles south of Salt Lake City, Utah. This area is one of the few in the state that has the necessary climate for commercial apple production. Apple production in this area is currently the largest of any area in the state. Several commercial storage and processing facilities exist in the study area. Commercial facilities of this type are necessary for large-scale apple production to exist. These commercial facilities consist of sorting, grading and storage units. These facilities are a vital part of providing quality and consistent produce to consumers.

Both the 40-acre operation and the 80-acre operation were analyzed using the Firm Level Policy Simulation Model (FLIPSIM V). These operations were considered to be single-proprietorship operations that and assumed to be managed and operated by family members.

Long-term price trends were analyzed to test debt leel, the impact of changing industry structure and the survivability of Utah apple farms. Tom Schotsko, an extension economist specializing in marketing fruit crops at Washington State University, suggested that no one has had a handle on the future price of apples (Schotsko). This is due to large increases in acres planted to apple trees in the early 1980s by the major apple-producing states. The information regarding the actual acreage is not known or is notfor public use.

Apple price are very responsive to changes in supply because of the inelastic demand (Bailey). Should the supply increase sharply, a corresponding large drop in price would be expected. For this reason different average seasonal apple price trends were assumed to encompass the possible effects of changing supply on apple prices. The price trends analyzed included an annual 3% and 1% decrease in the price level, a level price and a 1% and a 3% increase in the annual price level.

Apple Prices Received by the Producers

It was assumed that each bin would consist of 17 packed boxes (38 pounds per box) of fancy and extra fancy apples, 4 boxes of small and/or poorly colored fruit and approximately 80 pounds of cull fruit. The fancy and extra fancy apples were sold for approximately $12.50 per box for a total of $212.50. Small and/or poorly colored apples were sold for approximately $5.00 per box for a total of $20.00. Cull apples were sold for $50.00 per ton, returning $2.00 per bin. This yielded the typical producer $234.50 per bin of apples.

Long-term prices were estimated using five scenarios. Each scenario represented a long-term price trend for the 10-year planning horizon. These scenarios were:

Scenario 1	3% annual price increase
Scenario 2	1% annual price increase
Scenario 3	Constant price
Scenario 4	1% annual price decrease
Scenario 5	3% annual price decrease

The actual dollar amounts for each scenario are constant in Table 3.

Expected Yields and Costs of Production

Producers surveyed were all established apple producers, indicating a low portion of new or beginning operations. Therefore, an established orchard in full production was

Table 3. Projected Annual Apple Prices per Bin Received by the Producer by Scenario

	PRICE PER BIN										
YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
SCENARIO 1	234.5	241.5	248.8	256.2	263.9	271.9	280.0	288.4	297.1	305.9	315.2
SCENARIO 2	234.5	236.8	239.2	241.6	244.0	246.5	248.9	251.4	253.9	256.5	259.0
SCENARIO 3	234.5	234.5	234.5	234.5	234.5	234.5	234.5	234.5	234.5	234.5	234.5
SCENARIO 4	234.5	232.2	229.8	227.5	225.3	223.0	220.8	218.6	216.4	214.2	212.1
SCENARIO 5	234.5	227.5	220.6	214.0	207.6	201.4	195.3	189.5	183.8	178.3	172.9

considered as typical. Since this operation was in full production, a crop rotation was utilized where one-sixth of the orchard was cleared and replanted every five years. Each rotation is identified as first through sixth in the tables representing trees of the same age. These rotations contain trees from new seedlings to 30 years of age in 5-year increments.

Labor requirements were supplied mainly by family members, with all additional requirements being met by migrant workers on a contract basis. Labor expenses for migrant workers such as pruning and picking, were included as expenses since the work is done on a piece-rate basis. Labor requirements for the larger operations (80 acres) were considered the same since the day-to-day operations were preformed by one individual (the owner), and the major tasks of the operation were performed by the migrant workers.

Since an established orchard was assumed, a continuous tree rotation was also assumed. Consequently, the age of the

trees varied from new seedlings to trees 30 years old or older. As shown in Table 4, trees in this typical operation were replaced every 30 years, with new plantings occurring on an average of every 5 years. Variable costs increased

Table 4. Projected Average Tree Age by Rotation Group

	TREE AGE IN YEARS										
YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
ROTATION[a]											
FIRST	0	1	2	3	4	5	6	7	8	9	10
SECOND	5	6	7	8	9	10	11	12	13	14	15
THIRD	10	11	12	13	14	15	16	17	18	19	20
FORTH	15	16	17	18	19	20	21	22	23	24	25
FIFTH	20	21	22	23	24	25	26	27	28	29	0
SIXTH	25	26	27	28	29	0	1	2	3	4	5

[a]Rotation refers to the growing of different aged trees in succession in one field in a regular sequence.

substantially in years in which plantings occurred. These costs were primarily due to the cost of ground preparation and seedlings. In reference to Table 3, each rotation refers to that portion of the orchard that is being rotated and or of trees of the same age.

Apple production per acre for the study group varied in relationship to the orchard's average tree age, husbandry practices, orchard location and management ability. Consequently, an average base yield for the study group was assumed (Table 5). However, yield was expected to increase over the 10-year planning horizon due to the rotation of higher yielding apple varieties and/or increases in tree density per acre. In this study, tree age determined the

Table 5. Projected Average Orchard Yield per Acre for the Typical Farm

	BINS[a] PER ACRE										
YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
ROTATION											
FIRST	0.00	0.00	0.00	0.00	1.80	6.20	9.20	18.40	27.70	32.30	34.10
SECOND	6.20	9.20	18.40	27.70	32.30	34.10	36.90	41.50	46.10	46.56	47.03
THIRD	32.04	36.41	40.91	41.32	41.73	42.15	42.57	43.00	43.43	43.86	44.30
FORTH	42.15	42.57	43.00	43.43	43.86	44.30	44.74	45.19	45.64	46.10	46.56
FIFTH	36.36	36.72	37.09	37.46	37.84	38.21	38.60	38.98	39.37	39.77	0.00
SIXTH	38.21	38.59	38.98	39.37	39.76	0.00	0.00	0.00	0.00	1.80	6.20
AVERAGE	25.83	27.25	29.73	31.55	32.88	27.49	28.67	31.18	33.71	35.06	29.70

[a]Each bin is approximately 22 bushels, averaging 38 pounds.

orchard's yield and production potential. Consequently, the average yield was lower for the typical orchard in the early portion of the planning horizon and increased over the term of the study. This increase was due to the continuous rotation of younger, higher yielding trees into production and to changing orchard design. Trees in current production were estimated to increase yield by 1% per year due to better husbandry practices.

The budget in Table 6 correlates tree age with expected costs. Rotation refers to the group of trees planted in the same year or in the rotation. A major portion of orchard work consists of manual labor tasks completed by migrant workers. These workers work on a contractual basis doing tasks in the orchard such as pruning, thinning and picking. These workers are contracted on a piece-rate basis, due to different skill levels. For example, pruning is generally paid on a per-tree

Table 6. Projected Operating Budget Based on Tree Age and Yield for the Typical Apple Farm

	COST PER ACRE										
YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
PRUNING COST/ACRE (BY ROTATION)											
FIRST	0	25	30	45	60	75	100	150	175	200	200
SECOND	75	100	150	175	200	200	200	200	200	200	200
THIRD	200	200	200	200	200	200	200	200	200	200	200
FORTH	200	200	200	200	200	200	200	200	200	200	200
FIFTH	200	200	200	200	200	200	200	200	200	200	0
SIXTH	200	200	200	200	200	0	25	30	45	60	75
AVERAGE	146	154	163	170	177	146	154	163	170	177	146
FERTILIZER COST PER ACRE INCLUDING LABOR (BY ROTATION)											
FIRST	0	25	45	45	45	65	65	85	85	105	105
SECOND	65	65	85	85	105	105	105	105	105	105	105
THIRD	105	105	105	105	105	105	105	105	105	105	105
FORTH	105	105	105	105	105	105	105	105	105	105	105
FIFTH	105	105	105	105	105	105	105	105	105	105	0
SIXTH	105	105	105	105	105	0	25	45	45	45	65
AVERAGE	81	85	92	92	95	81	85	92	92	95	81
SPRAYING COSTS PER ACRE INCLUDING LABOR (BY ROTATION)											
FIRST	33	76	95	342	371	396	396	396	396	396	396
SECOND	396	396	396	396	396	396	396	396	396	396	396
THIRD	396	396	396	396	396	396	396	396	396	396	396
FORTH	396	396	396	396	396	396	396	396	396	396	396
FIFTH	396	396	396	396	396	396	396	396	396	396	33
SIXTH	396	396	396	396	396	33	76	95	342	371	396
AVERAGE	336	343	346	387	392	336	343	346	387	392	336
HARVESTING COST PER BIN											
PICKERS	9	9	9	9	9	9	9	9	9	9	9
BINS	4	4	4	4	4	4	4	4	4	4	4
TRAVEL	3	3	3	3	3	3	3	3	3	3	3
STORAGE	25	25	25	25	25	25	25	25	25	25	25
PACKING	25	25	25	25	25	25	25	25	25	25	25
BOXES	21	21	21	21	21	21	21	21	21	21	21
BROKER	26	26	26	26	26	26	26	26	26	26	26
SUB TOTAL	113	113	113	113	113	113	113	113	113	113	113
PER/ACRE	2926	3087	3368	3574	3725	3115	3248	3532	3819	3972	3365
OTHER COSTS											
SOD	15	15	15	15	15	15	15	15	15	15	15
TREES	219	0	0	0	0	219	0	0	0	0	219
BEES	20	20	20	20	20	20	20	20	20	20	20
WATER/PUMP	55	55	55	55	55	55	55	55	55	55	55
SUB TOTAL	309	90	90	90	90	309	90	90	90	90	309
TOTAL PER YEAR											
PER/ACRE	3797	3759	4059	4313	4479	3986	3920	4223	4557	4726	4236

basis based on tree age, while picking is on a per-bin basis. Consequently, expected costs and revenues were correlated with tree age and yields. For example, pruning costs were determined by the age of the tree; whereas, harvesting and processing costs were budgeted using yield (Table 6). Items such as storage costs and processing costs were based on commercial rates per bin or box since orchards of the size considered in this study could not economically justify on-farm storage and/or processing facilities.

This budget is based on the information received from individual farmers in the surveying process and work completed by Hatch, Bond and Walker. In the budgetary process, constant or stochastic prices were assumed in the data set entered into FLIPSIM. However, the model was converted to a dynamic model by introducing annual percentage changes in costs separately, as mentioned previously.

Machinery Complement

The machinery complements for the apple producing units are found in Table 7. These do not include storage and processing equipment since it was assumed that storage and processing would be contracted with local commercial operators. An 80-acre operation utilizes the same equipment as a 40-acre operation, with an addition of those pieces of machinery marked with an asterisk (*) in Table 7.

Table 7. Machinery Complement for 40-Acre and 80-Acre Utah County Apple Operations

	CURRENT VALUE ($)	YEAR PURCHASED	REPLACEMENT PRICE ($)
TRACTOR 50 HP[a]	10000	1984	20000
TRACTOR 50 HP[a]	7000*	1980	20000
TRACTOR 42 HP[a]	6000	1978	15000
MOWER	1500	1986	3000
CHOPPER	1500	1980	3000
REAR LIFT	400	1981	600
FRONT LIFT	2000	1986	4000
SPRAYER 400 GALLON	5000	1985	10000
SPRAYER 400 GALLON	5000*	1979	10000
SPRAYER 100 GALLON	1300	1984	1600
UTILITY TRAILER	1600	1981	2100
5TH WHEEL TRAILER	4000	1982	6000
SELF LOADING TRAILER	3000	1983	4000
PICKUP	11000	1987	16000
PICKUP	1000*	1985	16000
ATV[b]	900	1985	2500
SHOP TOOLS	3000	1983	5500

* Additional machinery for the 80-acre operation

[a]HP=Horsepower
[b]ATV=All-Terrain-Vehicle

Miscellaneous Characteristics

The operator was assumed to be 40 years of age and to declare six exemptions on his income tax. The self-employment tax rate was a constant 13.02% for the entire 10-year planning horizon. The operator had $5,000 in annual off-farm income and an annual family living expense of from $18,000 to $25,000. The typical 40-acre operation had assets including $200,000 in land, $117,000 in additional improvements and $5,000 cash on hand. The typical 80-acre operation had

$400,000 in land, $117,000 in additional improvements and $5,000 cash on hand.

The Farm Level Income Tax and Policy Simulation Model (FLIPSIM V)

This study used FLIPSIM V to evaluate the economic survivability of Utah apple producers. Historical data, base prices and yields were established for the first year of simulation. Using Monte Carlo techniques, random prices and yields were drawn from empirical probability distribution functions (pdf's). These pdf's were based on expected prices and yields. This added realism by simulating the price and yield uncertainty faced by the operation.

Monte Carlo techniques assume perfect or nonexistent correlation between any two activities, with corresponding numerical values of one or zero. This is not a realistic assumption in the apple industry. As a result, the model provided an unrealistic picture of the variability in the analysis. However, if the distribution is not normal, empirical distributions may be simulated by the Monte Carlo method by assuming a uniform distribution between zero and one and selecting interpolated values in the domain of the distribution (Bailey).

Random prices and crop yields were assumed to be non-normally distributed. This required the use of the observed or empirical probability density functions and the selection of random prices and yields based on a uniform distribution.

Random prices and yields were correlated using the correlation matrix as explained by Clemens, et al. The empirical pdf's were constructed for apple prices and yields from observed values between 1978 and 1987 (Table 8).

Table 8. Empirical PDFs (Ranked Percentage Deviations from Mean) for the Typical Utah Apple Operation

PRICE	YIELD
-.3150	-.370
-.3150	-.363
-.2573	-.275
-.1420	-.063
-.0618	0.114
-.0273	0.157
0.0289	0.158
0.2501	0.164
0.4637	0.199
0.4720	0.206

Description of FLIPSIM

The FLIPSIM computer model is perhaps the most comprehensive simulation model available. It was developed by Richardson and Nixon in 1981 at Texas A&M University. The most recent version, FLIPSIM V, currently available for economic research. FLIPSIM V is a firm-level model that simulates the annual production, marketing, financial management, growth and income tax aspects of a farm over a multiple-year planning horizon. This model operates recursively by basing the economic calculations of each successive year upon the economic status of the firm at the

end of the preceding year. An iteration is completed when an entire planning horizon is simulated.

FLIPSIM V is capable of completing a maximum of 300 iterations over a 10-year planning horizon. Upon completion of the concluding iteration, FLIPSIM V performs a statistical analysis of up to 489 output variables, develops cumulative probability distributions (cdf) for these output variables from the values generated for each iteration and estimates the probability of the farm operator remaining solvent for the remainder of the planning horizon. The model analyzes the outcome of a given set of input data for the typical operation. The impacts on survival (ability to remain solvent), success (positive after-tax net present value) and growth of a typical farm were determined from the prices of products, sizes of operations and financial strategies being analyzed.

FLIPSIM V is not a linear programming model; however, it does feature a limited optional capacity to use linear programming to select optimal output combinations. However, the crop mix for this study was fixed since apples were the only crop considered. Most components of the model are based on accounting equations. Virtually no econometric relationships are included.

Basic functions performed annually by a farm manager are specified in the program and conform to accepted farm management, financial and accounting principles. Included

are specific equations necessary to estimate all of the variables in a detailed set of financial statements (income, cash flow and balance sheet). FLIPSIM V was designed to calculate depreciation, federal income taxes and self-employment taxes from the federal tax codes. The interest rates for loans and returns on investment are specified by the analyst. The model also includes behavioral relationships such as farm growth, family living expenses, machinery replacement, timing of cash sales and farm program participation (Balls).

Consumer Preference Study

Many questions regarding consumer preference for fresh produce are unanswered. The economy is constantly changing, causing consumer needs to adjust with changing life styles. Many firms have recognized these changes and profited by supplying the consumer with what the consumer wants. Farms and ranches need to become more familiar with consumer wants and desires.

Increased plantings have created interest in expanding the demand for Utah apples. The apple industry faces the same problems as other segments of agriculture in meeting consumers' needs except for one additional problem, i.e., a longer planning horizon is necessary to adjust production levels. With this additional time lag, fruit farmers are committing relatively fixed resources for a longer period of

time than many other agricultural and nonagricultural enterprises. Consequently, producers should be careful when considering changes in production practices. It is essential for producers to understand the consequences of expanding production when considering increased plantings.

The consumer preference study was conducted to evaluate consumers' attitudes toward fresh apples, with the intent of measuring market stability as well as long-term consumption trends. Given this information, one can more effectively determine optimal long-term production and marketing strategies.

One market that could possibly be expanded exists within Utah, especially along the Wasatch Front. A variety of methods have been used to expand the market in Utah. One of these marketing strategies was the development of brand names. Both the Utah Department of Agriculture and apple growers have been involved in this effort. However, due to the lack of effort, funds and unity among producers, neither group has been successful.

If the Utah apple industry is going to prosper, it needs to determine a marketing plan to maintain or expand its share of the market. Growers and state officials need to develop a strong marketing plan that is workable, enforceable and profitable for those involved.

Discussions with producers indicated that the Wasatch Front market is considered a potential market for fresh

apples. However, providing brand-name fruit of consistent, desirable quality to the Utah market is perhaps the most difficult barrier to be overcome, since no rigid quality-control standards are in place to control the fruit placed on store shelves. Growers have continually sold or "dumped" low-quality, ungraded apples in Utah. This has tended to reduce the price received and given consumers a poor perception of the quality of the apples produced in Utah.

Improving the market is a complex process in Utah due to the multiple marketing channels available. The Utah apple market can be segmented into four groups: retail supermarkets, produce stands, roadside stands and private sales. The retail supermarket is assumed to retain the largest portion of the market, with the other segments claiming only a small portion of the remaining fresh-fruit market. Due to the market structure of the apple industry, major supermarkets have looked out of state for their supply of fresh apples (Muir). It is assumed that this is due to the low quality and inconsistent supply of Utah apples.

The Consumer Survey

In studying the Utah apple market we found many pre-conceived notions. Producers typically view the market with an optimistic bias. In an effort to accurately measure Utah as an apple market, a consumer survey was developed to test market conditions. These conditions consisted of values such

as size, quality, appearance, store display and price. Consumer tastes and preferences provide answers to the demand factors affecting this market.

This study looked into the personal tastes and preferences of individual consumers who live in Weber, Davis, Salt Lake and Utah counties (Wasatch Front). The source of data was 100 telephone surveys of Wasatch Front consumers selected at random from the Salt Lake-, Ogden- and Prove-Orem-area telephone directories. Representatives from Utah State University's Business Administration Department participated in the development of the research instrument to ensure accuracy and usable results.

The consumer survey consisted of two parts, market conditions and demographics. The market portion consisted of questions regarding purchasing habits, consumption, preferences and other elements that enter into the quantitative decision to buy apples. The demographic questions regarded age, income, family size, education and other qualitative questions describing the demographics of the study group.

Consumer Survey Questionnaire

Questions for the consumer survey were developed to elicit unbiased responses to be analyzed by the researcher. Each of these questions has a purpose. The questions were designed to 1) explore and define current market shares for

market outlets for apples along the Wasatch Front, 2) measure apple consumption, 3) establish apple size preference, 4) determine whether consumers know when they are purchasing Utah-grown apples, 5) isolate significant variations unique to the Utah-grown apples, 6) examine consumption trends in the market, 7) determine the perceived nutritional value of apples and fresh fruit, 8) isolate preference traits in consumer buying habits, 9) define the general price relationships among apples and close substitutes, 10) examine loyalty and support for locally grown produce and 11) determine demographics parameters of the study group.

Consumer Survey Analysis

The results of the consumer survey were first examined individually to establish variable frequencies. The frequencies were used to determine which characteristics and factors affect consumer behavior. Each question resulted in a frequency representing some specific characteristic of consumer buying habits. These frequencies were then graphed to isolate unique characteristics of the sample population based on demographics.

Behavioral traits, such as consumption, were compared using frequency tables and multiple regression with the individual's demographic characteristics. This combination of behavioral and demographic characteristics isolated purchasing habits of particular demographic groups. Another

example of these combinations of characteristics is purchase points by income levels. This analysis was performed by using a computerized statistical package (Number Cruncher Statistical System) where a cross tabulation or contingency table analysis was utilized.

The final test of the data was a multiple regression analysis, performed using an array of possible explanatory variables (income, age, family size, etc.) selected using step-wise regression (a method of ranking the most significant variables and using the most significant to build the model) against critical dependent variables (consumption, preference, buying habits, etc). The results were tested for significance and correlation.

CHAPTER IV

RESULTS

The purpose of the whole-farm analysis was to simulate the combined effects of different price trends and various initial debt levels on farm survival and financial strength. This was accomplished by comparing the average values and the distribution of critical financial measures for a typical apple-production operation under different assumed price levels and debt situations.

To achieve the required objective, a stochastic whole-farm simulation model was utilized. Stochastic simulation may more accurately represent real-world conditions than optimization models. Rather than analyzing the industry in a static state, risk and annual percentage changes in costs were considered in the analysis to more accurately represent the potential impact of these factors on the industry. Care was used in the preparation of data used in the whole-farm simulation. Two apple operations were considered, one with 40 acres and another with 80 acres. These operation sizes represent small and intermediate apple-production units. The two operations were evaluated assuming different economic environments (price and debt load) to simulate possible economic conditions and toproject the financial health of the unit over a 10-year planning horizon. The results are presented in this chapter.

The five scenarios represent five assumed long-term price trends. Each scenario examined both the 40- and 80-acre operations at each of the four debt levels (20%, 40%, 60% and 80% debt to asset ratio). The scenarios are briefly defined, followed by a discussion of the impacts on the two typical apple operations.

The second part of this chapter is an analysis of the results of the consumer preference survey conducted to establish consumer preferences for apples along the Wasatch Front. The consumer survey results provide current market conditions as a beginning point to for determining market strategies and the potential for expansion of the fresh-apple market on the Wasatch Front.

Organization of Whole-farm Simulation Results

The whole-farm simulation results are reported for each of the five assumed long-term price trends. Scenarios representing price trends were investigated, ranging from a high of a 3% price increase per year to a low of a 3% price decrease. The reason for assuming different price trends was to simulate the range of possible price regimes that might exist during the next 10 years. An analysis of the impact of price trends is critical to understanding future viability of the Utah apple industry. For example, large plantings of apple trees in major apple-producing states have the potential of significantly altering the supply of apples. Without a

corresponding increase in demand, relatively large decreases in apple prices are expected, certus paribus.

Analysis of Price-Trend Scenarios

The reporting format for the five scenarios consists of a brief description of each scenario by operation size, followed by simultaneous comparisons of each operation using key financial measures. These simultaneous comparisons allow for a visual representation of industry occurrences under the various scenarios.

Scenario 1 (3% price increase)

Scenario 1 analyzes the financial performance of the typical apple operation in a market where the price of apples increases 3% per annum over the 10-year planning horizon. Most operators would consider this a very optimistic estimate given recent history and the generally anticipated outlook for apple prices. However, the potential for substantial price increases exists, if certain phenomena occur to significantly reduce the quality of apples supplied. History indicates that this is an unlikely scenario since substitution of other products is likely to occur. The possibility of such a price increase occurring requires a major expansion in demand.

The whole-farm simulation demonstrated that producers would experience large financial gains if prices were to increase substantially over the next 10 years. The initial

debt level of the typical farmer would not be considered a critical element of success for either farm size if a relatively rapid increase in price were to occur. The typical farm experienced success (positive after-tax net present value) and survived (solvent) the entire 10-year planning horizon for all four debt loads considered (Tables 9 and 10). The results indicate that if apple prices were to increased

Table 9. Measure of Financial Health of a 40-Acre Apple Operation Assuming a 3% Price Increase (Scenario 1)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	100
SUCCESS (%)	100	100	100	100
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	430814	383676	334804	299049
STD. DEV.[b]	76042	74152	73124	73003
PRESENT VALUE OF ENDING NET WORTH				
MEAN	569472	492647	414510	348293
STD. DEV.	62525	61118	60277	60025
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	88316	82114	75880	74763
STD. DEV.	11294	11297	11303	11718

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

3% per year a 100% chance of economic survival and a 100% chance of economic success would exists (Table 9). The typical apple operation would remain solvent for all 10 years. After-tax net present value estimates ranged from $430,814 with 20% debt to $299,049 with 80% debt for the 40-acre

operation. Similar variations were found in the present value of ending net worth and net cash farm income (Table 9).

Price increases of 3% would have a similar effect on the 80-acre operation (Table 10). However, because of decreased fixed costs per acre decreased, the profits for the 80-acre

Table 10. Measure of Financial Health of an 80-Acre Apple Operation Assuming a 3% Price Increase (Scenario 1)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	100
SUCCESS (%)	100	100	100	100
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	1075662	990430	907250	850264
STD. DEV.[b]	162795	1624401	161082	159437
PRESENT VALUE OF ENDING NET WORTH				
MEAN	1199428	1067311	936777	829568
STD. DEV.	134371	133943	133090	132082
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	171441	161354	151253	150198
STD. DEV.	22592	22592	22589	22622

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

operation would experience a greater growth on a per-acre basis than for a 40-acre farm. The after-tax net present value for the 80-acre operation would range from $1,075,662 with 20% debt to $850,264 with 80% debt. Similar variations were evident for the other measures of financial health. The financial position of the 80-acre operation would improve markedly because of greater utilization of existing equipment

and required facilities. This would cause lower fixed costs per acre, allowing the producer to take advantage of the market conditions.

Differences in net cash farm income are a reflection of debt-servicing expenses and taxing structures as income increased. The overall debt position for the farm operator improved for all debt levels. The typical farmer would have more than adequate cash flow to cover debt servicing even if initial long-term debt were 80% of asset value under these assumptions. Producers who were highly leveraged would have lower net cash income because of debt-servicing payments but would experience higher returns. Producers would decrease long-term debt with the additional income generated.

These results indicated that highly leveraged farms would be very profitable if apples prices were to increase significantly over the next 10 years. Consequently, an optimistic price-trend forecast would provide incentives for producers to expand their operations.

Scenario 2 (1% price increase)

The results of a 1% increase in prices were similar to a 3% increase except lower values for average annual net cash farm income (Tables 11 and 12) were attained. This price trend is optimistic yet feasible for the producers.

The 40-acre operation exhibited financial strength regardless of the initial debt load under these assumptions.

Tests at each debt level indicated a 100% chance of economic survival. Probability of success was 100% for the three lower debt levels (20%, 40% and 60%). However, highly leveraged (80% debt) operations began to show signs of weakening with a slight change to a 98% probability of success. Although this change only amounts to a 2% decrease in the probability

Table 11. Measure of Financial Health of a 40-Acre Apple Operation Assuming a 1% Price Increase (Scenario 2)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	100
SUCCESS (%)	100	100	100	98
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	263473	213597	161953	119731
STD. DEV.[b]	62325	60523	59524	68163
PRESENT VALUE OF ENDING NET WORTH				
MEAN	422220	343029	262294	189804
STD. DEV.	49361	48147	47716	56026
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	59503	53294	46951	42878
STD. DEV.	8915	8924	9073	11424

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

of success, it is the first sign of weakness in the financial position of these farms.

Operators with 80-acre operations maintained a positive profit trend. These operators remained profitable under these assumptions and exhibited no signs of financial weakness (Table 12). Chances of survival and success were 100% over

Table 12. Measure of Financial Health of an 80-Acre Apple Operation Assuming a 1% Price Increase (Scenario 2)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	100
SUCCESS (%)	100	100	100	100
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	714226	631304	551531	493912
STD. DEV.[b]	135761	132891	127691	129768
PRESENT VALUE OF ENDING NET WORTH				
MEAN	881157	750878	623207	515282
STD. DEV.	108236	105908	101871	103922
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	113812	103723	93613	92236
STD. DEV.	17830	17833	17836	18283

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

all debt levels. It is evident that the 80-acre operation has advantages over the 40-acre operation in scenario 2. These advantages are probably a result of economies of size as average total costs decline relative to the 40-acre operation.

The 80-acre apple production units would be profitable if a positive price trend were to occur over the next 10 years (even if the trend were modest). This size of farm would remain in operation and could potentially expand. This could be considered an optimistic outlook that is potentially feasible.

Scenario 3 (level price)

This scenario is a middle-of-the-road projection for the future based on past apple-price performance. Level prices

are a feasible long-term projection given the past history of the apple industry. Past apple prices exhibit no significant trend after adjustment for extreme increases and decreases in short-term supply and seasonal prices (Utah Department of Agriculture). Shocks to short-term supply are generally caused by natural elements (frost, hail, moisture, etc.).

Scenario 3 consists of level prices over the 10-year planning horizon. The results illustrate that financial problems could become important for the 40-acre operation (Table 13) if prices do not increase. The probability of survival and success in the more high leveraged operations decreased relative to scenarios 1 and 2. Operators in more

Table 13. Measure of Financial Health of a 40-Acre Apple Operation Assuming Level Price (Scenario 3)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	92
SUCCESS (%)	100	100	90	66
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	180616	130448	80278	21712
STD. DEV.[b]	57647	56494	59644	79763
PRESENT VALUE OF ENDING NET WORTH				
MEAN	349166	269505	189867	101791
STD. DEV.	44990	44667	48019	67796
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	46205	39897	32992	26822
STD. DEV.	7905	8048	8689	11105

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

high leveraged situations having 40 acres had marked decreases in the probabilities of survival and success relative to the two earlier scenarios. This was particularly true for operations with 80% debt to total assets, where the chance of success decreased to 66 percent.

The operation with 80 acres under performed much better financially than the one with 40 acres scenario 3. The 80-

Table 14. Measure of Financial Health of an 80-Acre Apple Operation Assuming Level Price (Scenario 3)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	100
SUCCESS (%)	100	100	100	100
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	548190	464156	381143	313879
STD. DEV.[b]	123918	120699	121359	128284
PRESENT VALUE OF ENDING NET WORTH				
MEAN	735031	603504	472742	355896
STD. DEV	97116	94728	95753	102835
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	87219	77128	67012	63871
STD. DEV	15807	15814	15826	18109

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

acre operation maintained at the price levels assumed (Table 14). The 80-acre operation showed greater financial stability through the first 3 scenarios because of economies of size. As would be expected, profit margins (net cash farm income)

decreased when prices were assumed to remain constant compared with when prices increased (scenarios 1 and 2).

Scenario 4 (1% price decrease)

A price decrease averaging 1% per year is considered a realistic scenario given increased plantings in major apple-producing states. If 25% of all trees in the Washington are not bearing at this time (Rasmussen), prices could follow this trend or even be lower if changes in projected supply or no increase in demand occurs. If supply increases under existing market conditions, one would expect decreases in price.

When a 1% decrease in price per year was assumed, the financial health of the 40-acre operation was stressed (Table

Table 15. Measure of Financial Health of a 40-Acre Apple Operation Assuming a 1% Price Decrease (Scenario 4)

DEBT TO ASSET RATION (%)	20	40	60	80
SURVIVAL (%)	100	100	98	38
SUCCESS (%)	100	78	38	18
YEARS SOLVENT	10	10	10	9.62
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	104650	53401	-8335	-106332
STD. DEV.[b]	54555	55436	64598	92406
PRESENT VALUE OF ENDING NET WORTH				
MEAN	281945	200973	110670	-15943
STD. DEV.	42566	44054	53117	81439
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	33517	26695	18869	12716
STD. DEV.	7135	7702	8600	8803

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

15). Forty-acre operations with low debt (20% to 40%) were able to remain in operation. However, operations with more that 20% debt were weakened substantially. The highly leveraged 40-acre operation (80% debt to total assets), was particularly stressed, having only a 38% chance of survival, 18% chance of success and projected ability to remain solvent for less than 10 years. Highly leveraged, small producers will not be profitable if prices decrease, even modestly. These producers need to find other sources of income (off-farm employment, selling assets, etc.) to support the farming operation if they are to remain solvent. In other words, off-farm income would be needed to subsidize the apple operation or the operation would need to be liquidated.

The 80-acre unit was able to remain operational with a decrease in prices of 1% per annum. The financial health of the 80-acre operation remained sound over the planning horizon with only a slight weakening exhibited by those farms heavily in debt (80% long-term debt). With other levels of debtit had 100% probability of success and survival over the 10 years, as indicated in Table 16.

Scenario 5 (3% price decrease)

Although producers view this scenario as pessimistic, it could occur if new markets were not developed and apple supplies increased. Utah apple-industry representatives need

Table 16. Measure of Financial Health of an 80-Acre Apple Operation Assuming a 1% Price Decrease (Scenario 4)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	100	100	92
SUCCESS (%)	100	100	100	80
YEARS SOLVENT	10	10	10	10
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	382702	298090	210180	121233
STD. DEV.[b]	115426	115330	116114	150138
PRESENT VALUE OF ENDING NET WORTH				
MEAN	589133	457177	321574	183296
STD. DEV.	89037	89949	91662	125962
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	62010	51913	41332	34776
STD. DEV.	14041	14061	14656	18490

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

to consider the possible ramifications should such a trend develop.

The following results suggest that fairly large decreases in price would have a disastrous effect on Utah's apple industry. A 3% price decrease would cause major problems for both sizes of operations (Table 17). The results also show serious financial problems for all debt levels. If prices were to decrease by 3% per annum, the only survivors would be those operations with relatively large initial capital bases such as the 80-acre operation and 20% original debt (Tables 17 and 18).

The 40-acre operation would have little or no chance of success, and only farms with 20% or 40% debts would survive

Table 17. Measure of Financial Health of a 40-Acre Apple Operation Assuming a 3% Price Decrease (Scenario 5)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	62	62	6	0
SUCCESS (%)	2	0	0	0
YEARS SOLVENT	10	10	9.18	7.96
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	-57829	-159411	-214550	-172223
STD. DEV.[b]	52227	96163	49946	33550
PRESENT VALUE OF ENDING NET WORTH				
MEAN	137051	7282	-74833	-74655
STD. DEV.	40423	85146	47443	35329
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	8430	25	-2321	4218
STD. DEV.	6667	7421	3769	4343

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

the full 10 years (Table 17). For average annual net cash income, the farm with 80% debt showed a positive cash flow, while the farm with 60% debt cash flowshowed a negative cash flow. Operations with 80% debt would sell assets to remain solvent.

The 80-acre operation would experience serious financial problems if more than a 20% long-term debt level were to exist (Table 18). Highly leveraged operations (60% or 80% debt) would not remain solvent for 10 years. As was the case for the 40-acre operation, the 80-acre operation at the 80% debt level was forced to sell assets to remain solvent.

Table 18. Measure of Financial Health of an 80-Acre Apple Operation Assuming a 3 Percent Price Decrease (Scenario 5)

DEBT TO ASSET RATIO (%)	20	40	60	80
SURVIVAL (%)	100	90	30	0
SUCCESS (%)	74	34	12	0
YEARS SOLVENT	10	10	9.82	8.9
AFTER-TAX NET PRESENT VALUE				
MEAN[a]	58254	-53868	-246856	-259738
STD. DEV.[b]	104812	140948	174306	62357
PRESENT VALUE OF ENDING NET WORTH				
MEAN	301837	142141	-92832	-160071
STD. DEV.	80376	117815	150514	69454
AVERAGE ANNUAL NET CASH FARM INCOME				
MEAN	15534	2465	-9761	-2515
STD. DEV.	12236	13452	13402	6603

[a]MEAN = AVERAGE VALUE
[b]STD. DEV. = STANDARD DEVIATION

Summary of Whole-Farm Simulation Results

Signs of financial stress are best illustrated in a financial health matrix. This allows determination of the point at which financial stress begins for each assumption of price level and debt. Comparing key financial health indicators in matrix form also allows determination of areas of stress to the operation caused by changing price levels and debt variables.

40-Acre Operation

The present value of ending net worth for the 40-acre operation showed signs of trouble when effects of a 3% price decrease (Scenario 5) were assumed. Negative present values

Table 19. Overview of Simulation Results for the 40-Acre Apple Farm

DEBT TO ASSET RATIO (%)	+3%	+1%	00%	-1%	-3%
20 PERCENT	100	100	100	100	62
40 PERCENT	100	100	100	100	62
60 PERCENT	100	100	100	98	6
80 PERCENT	100	100	92	38	0
		SUCCESS (%)			
20 PERCENT	100	100	100	100	2
40 PERCENT	100	100	100	78	0
60 PERCENT	100	100	90	38	0
80 PERCENT	100	98	66	18	0
		YEARS SOLVENT			
20 PERCENT	10	10	10	10	10
40 PERCENT	10	10	10	10	10
60 PERCENT	10	10	10	10	9.18
80 PERCENT	10	10	10	9.62	7.97
		AVERAGE AFTER-TAX NET PRESENT VALUE ($)			
20 PERCENT	430814	263473	180616	104650	-57829
40 PERCENT	383676	213597	130448	53401	-159411
60 PERCENT	334804	161953	80278	-8335	-214550
80 PERCENT	299049	119731	21712	-106332	-172223
		AVERAGE PRESENT VALUE OF ENDING NET WORTH ($)			
20 PERCENT	569472	422220	349166	281945	137051
40 PERCENT	492647	343029	269505	200973	7282
60 PERCENT	414510	262294	189867	110670	-74833
80 PERCENT	348293	189804	101791	-15943	-74655
		AVERAGE ANNUAL NET CASH FARM INCOME ($)			
20 PERCENT	88316	59503	46205	33517	8430
40 PERCENT	82114	53294	39897	26695	25
60 PERCENT	75880	46951	32992	18869	-2321
80 PERCENT	74763	42878	26822	12716	4218

for ending net worth for operations with 60% or 80% debt indicated possible forced liquidation by lending institutions (Table 19). Figure 2 compares the beginning net worth (as defined by the initial data set for the first year) to the present value of ending net worth, allowing the analysis of individual scenarios based on increases in the operations wealth. Price must have remained at least flat for the 40-acre operation to remain at status quo as shown by Figure 2. If prices were to decline as in scenarios 4 and 5, the operation would have to have a declining net worth over the planning horizon. The operator's asset base would decrease over time in order to stay in business and service debt. This illustrates serious concerns for apple orchards in Utah County because a large number would be in this range. A long-term decline in price could be withstood by those with lower levels of debt.

The effects of price trend and initial debt, shown in the financial health matrix (Table 19), allowed inspection for weakening of the 40-acre operation. In terms of survival, problems occurred for the 40-acre operation when prices were level and the operation had 80% debt. Regardless of price level, the 40-acre operation would experience serious financial difficulty if a negative 3% per annum price decrease were to occur (Table 19). The 40-acre operation would have no chance of survival if the operation were to have 80% debt and experience a negative 3% per annum price decrease over

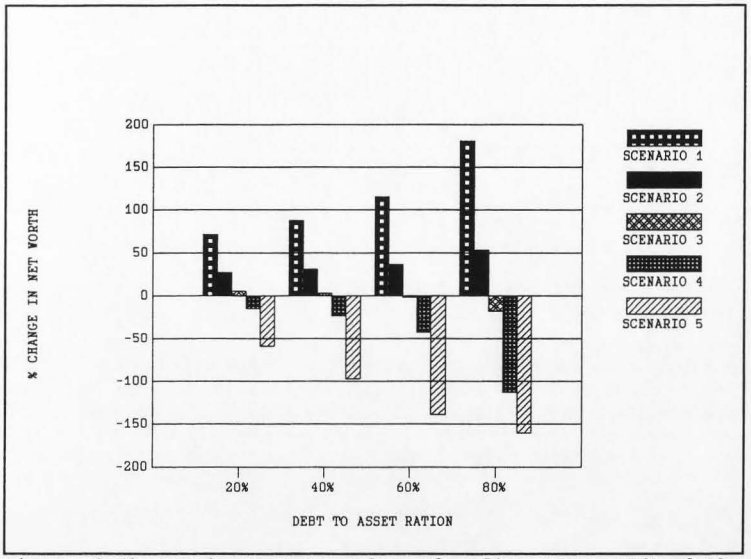

Figure 2 Change in present value of ending net worth of the 40-acre operation, expressed as a percentage of beginning net worth (beginning net worth is represented as zero)

the 10-year planning horizon. The operation would be expected to survive all 10 years with all except three of the combinations. These three all 80% debt with negative 1% and negative 3% debt and 60% debt with negative 3% debt.

The operation success was affected at the 80% debt level and all levels of debt with negative 3% price (Table 17). If the operation were to be submitted to a 3% per annum price decrease over the 10-year planning horizon, the operation would have little or no chance of success.

Areas of concern in after-tax net present value were the results of higher debt levels (60% and 80%) in Scenario 4 and all levels of debt in scenario 5, in which all values were negative (Table 19). These negative values indicate areas where a financial institution would force liquidation.

Average annual net cash farm income remained positive to a 3% price decrease and 60% debt. This indicates that the operation was covering variable costs of production and adding some to fixed costs (Table 19). Net cash income with 80% debt and negative 3% price was positive, but net worth changes indicate selling of assets to remain solvent.

In general it can be stated that an operation with 80% debt is most susceptible to financial problems if price has a negative long-term trend. If price were to approach the long-term negative price trend of 3%, all operations would suffer from the effects of the price drop and be forced out of operation.

80-Acre Operation

The 80-acre operation exhibited similar results, with the exception of a higher level of tolerance for the various price levels. Tolerance for lower prices was demonstrated, exhibiting the ability to withstand higher levels of stress. The 80-acre operation withstood higher levels of financial stress than the 40-acre operation. Indications were that the

80-acre operation utilized its asset base and employed economies of scale to further its position.

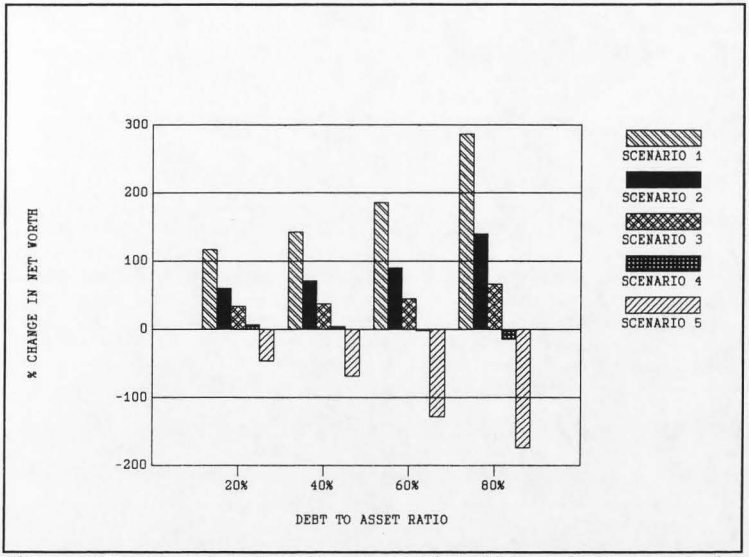

Figure 3 Change in present value of ending net worth of the 80-acre operation expressed as a percentage of beginning net worth (beginning net worth is represented as zero)

Figure 3 illustrates the 80-acre operation's ability to succeed if lower prices are received (Scenarios 4 and 5). The present value of ending net worth was similar to that of the 40-acre operation, with a higher return to total assets invested (beginning net worth). The operation was able to withstand higher amounts of debt and/or lower prices before the present value of ending net worth became negative. The 80-acre operation was affected mainly by Scenario 5 (3% price

decrease). Because of economies of scale and its large financial base, the operation would be able to withstand the effects of Scenario 4 (1% price decrease). Major concerns would be the difficulties experienced with a 3% price decrease, as shown in Scenario 5. In each of the scenarios, it became evident that the highly leveraged operation would capitalize on positive price trends and have major problems with negative price trends as compared to the almost debt-free operation that had little fluctuation in net worth over the various scenarios. It is evident that the higher the debt load the higher the risk.

The financial health matrix (Table 20) shows that the operation was able to survive at all levels of debt and price with the exception of 80% debt and a negative 3% per annum price decrease, where it had no chance of survival. Chances of survival were acceptable except for the higher levels of debt and negative prices. The 80-acre operation remained solvent for all 10 years of study except with a negative 3% price decrease. If the operation were to experience a 3% per annum price decrease and to have 60% or 80% debt, it would not be in operation at the end of the 10-year planning horizon.

Success for the 80-acre operation was strong through the level price trend and up to the negative 1% price decrease with 80% debt. The 3% negative price trend resulted in

Table 20. Overview of Simulation Results for the 80-Acre Apple Farm

DEBT TO ASSET RATIO (%)	+3%	+1%	00%	-1%	-3%
20 PERCENT	100	100	100	100	100
40 PERCENT	100	100	100	100	90
60 PERCENT	100	100	100	100	30
80 PERCENT	100	100	100	92	0
		SUCCESS (%)			
20 PERCENT	100	100	100	100	74
40 PERCENT	100	100	100	100	34
60 PERCENT	100	100	100	100	12
80 PERCENT	100	100	100	80	0
		YEARS SOLVENT			
20 PERCENT	10	10	10	10	10
40 PERCENT	10	10	10	10	10
60 PERCENT	10	10	10	10	9.82
80 PERCENT	10	10	10	10	8.9
		AVERAGE AFTER-TAX NET PRESENT VALUE ($)			
20 PERCENT	1075662	714226	548190	382702	58254
40 PERCENT	990430	631304	464156	298090	-53868
60 PERCENT	907250	551531	381143	210180	-246856
80 PERCENT	850264	493912	313879	121233	-259738
		AVERAGE PRESENT VALUE OF ENDING NET WORTH ($)			
20 PERCENT	1199428	881157	735031	589133	301837
40 PERCENT	1067311	750878	603504	457177	142141
60 PERCENT	936777	623207	472742	321574	-92832
80 PERCENT	829568	515282	355896	183296	-160071
		AVERAGE ANNUAL NET CASH FARM INCOME ($)			
20 PERCENT	171441	113812	87219	62010	15534
40 PERCENT	161354	103723	77128	51913	2465
60 PERCENT	151253	93613	67012	41332	-9761
80 PERCENT	150198	92236	63871	34776	-2515

problems at all levels of debt, with the 80% debt operation having no chance of success.

After-tax net present value was positive unless the operation had more than 20% debt and had experienced a 3% decreasing price trend. At the point where an operation has a negative after-tax net present value, many financial institutions force the operation to be liquidated (Table 20).

In general, the 80-acre operation was able to withstand the changes in market conditions except when there were higher amounts of debt and negative 3% price decreases per annum.

Results of the Consumer Preference Study

In April of 1988 a telephone survey was administered to 100 Wasatch Front households to establish consumer tastes and preferences for fresh apples. Telephone numbers were selected at random using directory page numbers and columns from the Ogden, Provo and Salt Lake City telephone directories.

The results of the survey were tested for frequency of response and cross frequency to demographic responses and regressed against the demographic questions for prediction potential. The results of the regression were not significant, showing correlation in only isolated instances. Therefore, the majority of the regression and correlation results were not reported. The results are as follows:

Demographics

The sample group was asked questions regarding taste, preferences and demographics. The demographic questions included inquiries about age, income and other information that might influence a family's purchase of fresh apples.

The results of the survey show the average age of the respondents to be 43.1 years of age (Figure 4). It is important to note that 17% of Utah population is over the age

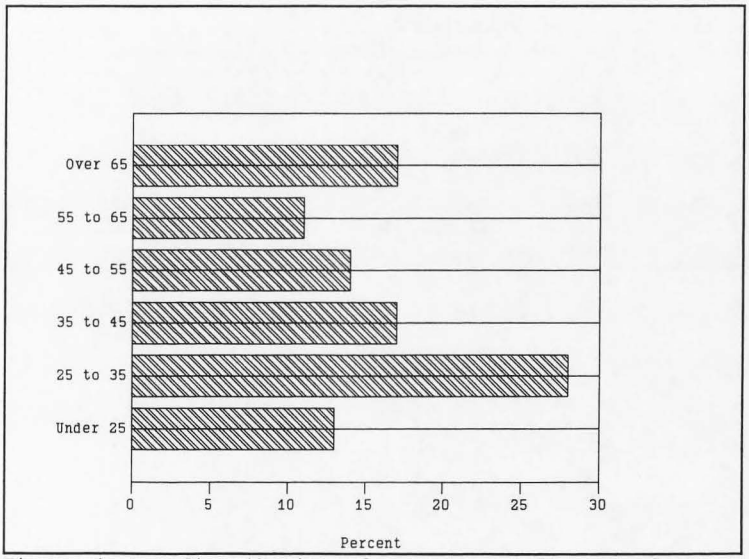

Figure 4 Age distribution of consumer study respondents

of 65, and 11% between the ages of 55 and 65. As expected, the largest group of respondents was between 25 and 35 years of age. Thirty-seven and one-half percent of the population of Utah is currently under the age of 18, which could alter these figures dramatically in the future (U. S. Department of Commerce).

The average respondent had lived in the area 29 years, indicating a relatively stable, stationary society (Figure 5). The high proportion of people living in the area for an

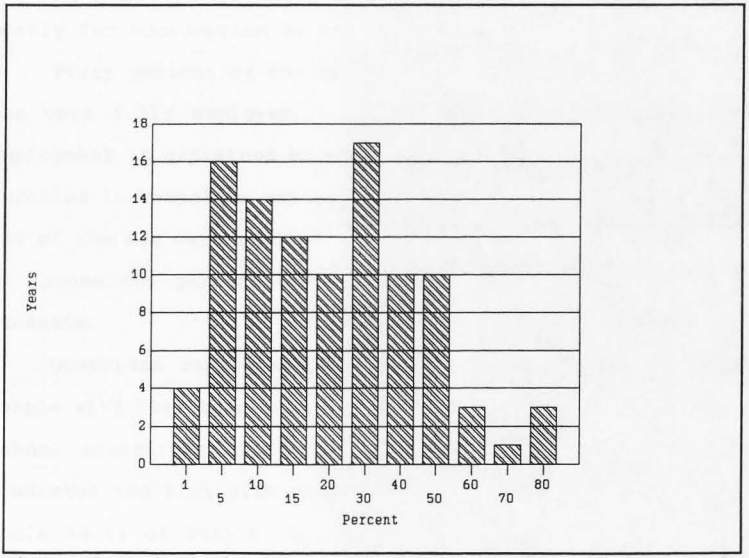

Figure 5 Number of years respondents to the consumer study had lived in the area

extended period of time indicates that most people are familiar with the local fresh produce markets and the produce available for sale.

Questions regarding martal status showed that 77% of the respondents were married, 3% were divorced, 9% were widowed and 11% had never married. The unmarried group (23%) were be carefully considered, since these people in many cases have lower total family incomes, less education and may tend to have less desirable employment status. Singles may also purchase fewer apples per capita if fresh apples are purchased mostly for consumption by children.

Fifty percnet of the women in the sample and 48% of the men were fully employed. The low percentage of full-time employment is explained by the number of respondents who were enrolled in school or retired. Nine percent of the women and 15% of the men were retired (Figure 6). These may be changes in income and purchasing habits among respondents who were students.

Questions regarding level of education found 7% of the sample with less than high school educations, 27.6% with high school educations, 34.4% with some college, 24.9% college graduates and 5.6% with graduate degrees (Figure 7). On the whole 64.9% of Utah's population has some post-high school education. This indicates that the population is well educated, which might influence consumers to be more selective in consumption decisions.

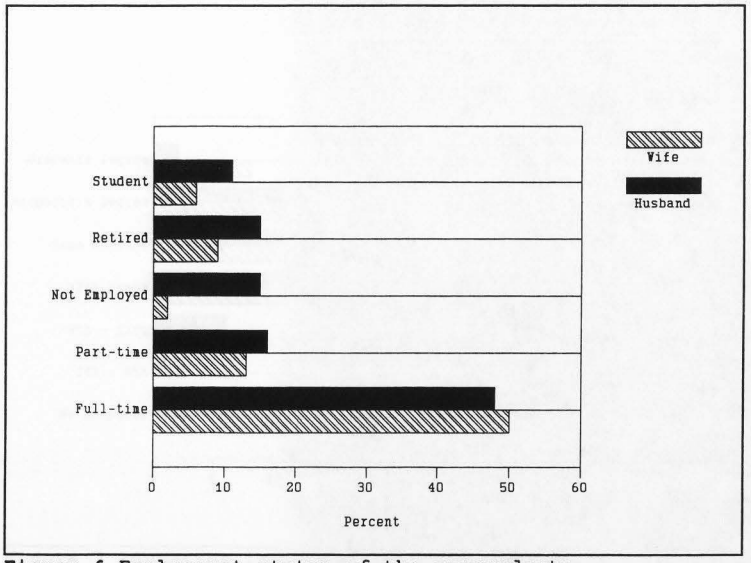

Figure 6 Employment status of the respondents

The average sample household contained 3.41 people, of which 1.5 were children. It is important to note that 45% of the households surveyed were without children. Utah is known for its high birthrate. However, in this sample sizeable portion did not have children at home. This indicates that any general promotion effort should be broader than the traditional family-based schemes. Also, if an aging population is unwilling to increase its consumption of fresh apples, then the market share of apples may decrease over time.

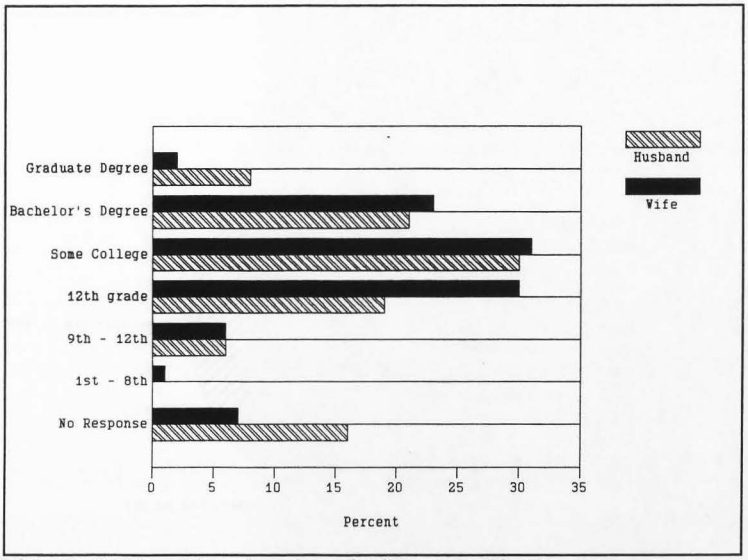

Figure 7 Education levels of the respondents

Annual household income varied, with 13% of the sample earning under $10,000, 21.7% with $10,000 to $20,000, 22.8% with $20,000 to $30,000, 15.2% with $30,000 to $40,000, 9.8% with $40,000 to $50,000 and 17.4% with income over $50,000 (Figure 8). Average income was approximately $23,800 per household. In 1980, Utah's average income was $22,797 as compared to the United States average of $23,177. However, fully-one third of this sample had annual family income under $20,000. This may affect the market for fresh apples since low-income consumers will likely be willing to purchase lower quality fruit at a lower price.

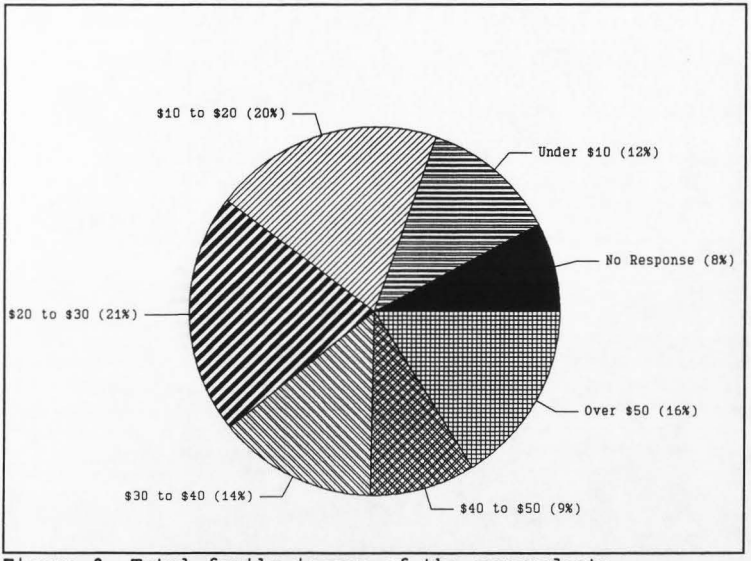

Figure 8. Total family income of the respondents

From the demographic portion of the survey, characteristic were derived for consumers living in the Wasatch Front marketing area. Utah's average consumer 43 years old, had lived in the area 29 years, was married; both husband and wife worked full time, both had some college education, couples earned $23,800 a year and had 1.5 children. These demographics are important to apple producers since these parameters likely determine the demand for apples.

Tastes and Preferences

When the 100 respondents were asked "Where do you obtain your fresh fruit?," 96 indicated the supermarket, 17 at a produce stand, 7 at a seasonal roadside market, 15 home grown and 4 from friends or family (Respondents were allowed more than one response, and the responses were converted to the percentages in Figure 9.). This indicates that supermarkets

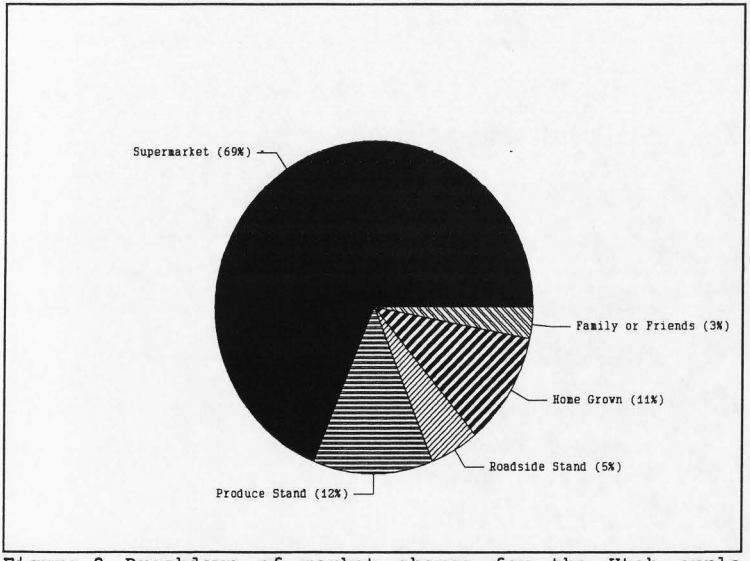

Figure 9 Breakdown of market shares for the Utah apple market

control the majority of the local fresh-apple market, and where consumers make most apple-buying decisions. If "point of sale" promotion were pursued, supermarkets would be the best location.

Figure 10 shows consumers responses to the question "How many apples does your family consume in a normal week during the apple season (September to December)?" Results show that

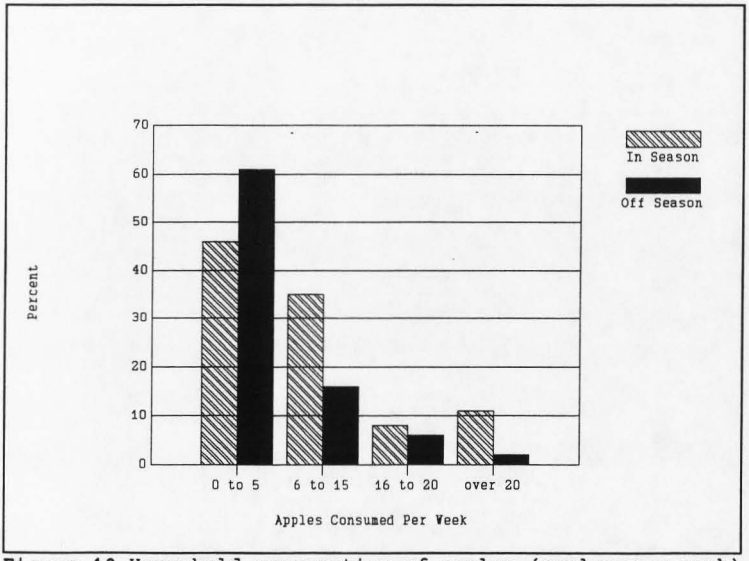

Figure 10 Household consumption of apples (apples per week)

46% consumed 0 to 5 a week, 35% consumed 5 to 15, 8% consumed 15 to 20 and 11% consumed more than 20 apples during a normal week. This may be of interest to producers since almost half of these consumers purchase no or fewer apples during the peak marketing season. This means that consumers are either not purchasing fresh fruit, are purchasing of fruits or are using home storage. These responses coincide closely with the results obtained when the sample was asked the question "How many apples does your family consume in a normal week during the off-season (December to July)?" The results show that 61% consumed 0 to 5 a week, 16% consumed 5 to 15, 6% consumed 15 to 20 and 2% consumed more than 20 apples during a normal week in the off-season (Figure 10). From in-season to off-season, 15% of the respondents shifted to low-usage categories, and overall usage decreased during the off-season. This indicates that some substitution with other products had occurred.

Size preference responses indicated that 29% of the consumers preferred large apples, 58% preferred medium apples and 18% preferred small apples (Figure 11). The selection can be explained by a variety of reasons, for example, the age of respondents, childrens' age (smaller apples for younger children), price and taste. Given these results, a substantial market for medium-size apples probably exists along the Wasatch Front.

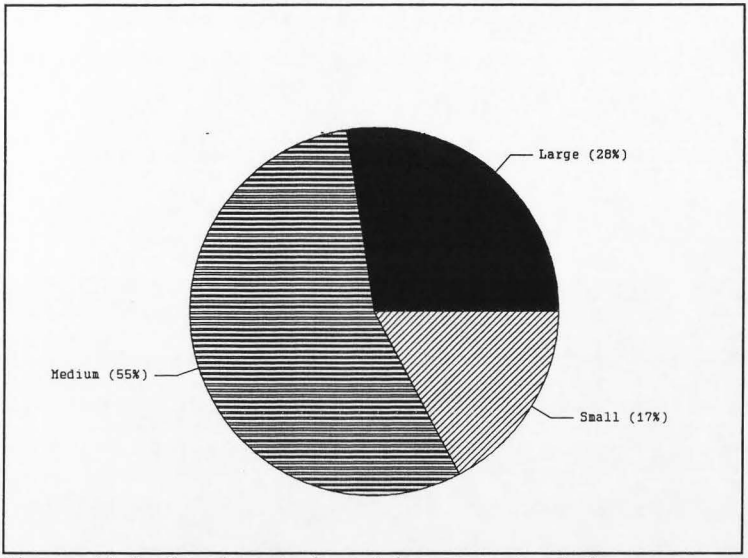

Figure 11 Apple size preferred by consumer study group

To establish long-term trends in usage and market perceptions, participants were asked whether their households were using more apples than a few years ago (Figure 12). At a different point in the survey the same question was asked with regard to fresh fruit in general. Apple purchases were growing at a slower rate than fresh fruit purchases in general. Thus, apples may be losing their share of the fruit market to other varieties of fresh fruits (Figure 12). One reason for this trend is the consumer's desire for a wider variety of fresh fruit. From a market standpoint, this may indicate that producers need to consider growing a wider

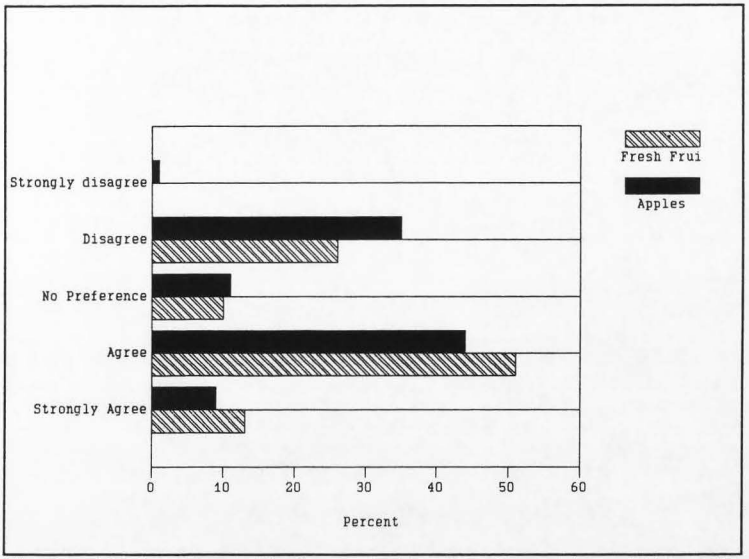

Figure 12 Consumer study group's responses to statements regarding increased household purchases in the past few years

variety of produce or to enhance the perception of apples relative to other fruit.

Figure 13 illustrates the respondents' perceived nutritional values of apples and of fresh fruit in general. The question was asked at two points in the survey, replacing the word apples with fresh fruits. Apples were perceived as not providing as much nutritional value as other fresh fruits. This suggests an inferior position for apples in the fresh-fruit market. This also suggests that educational efforts

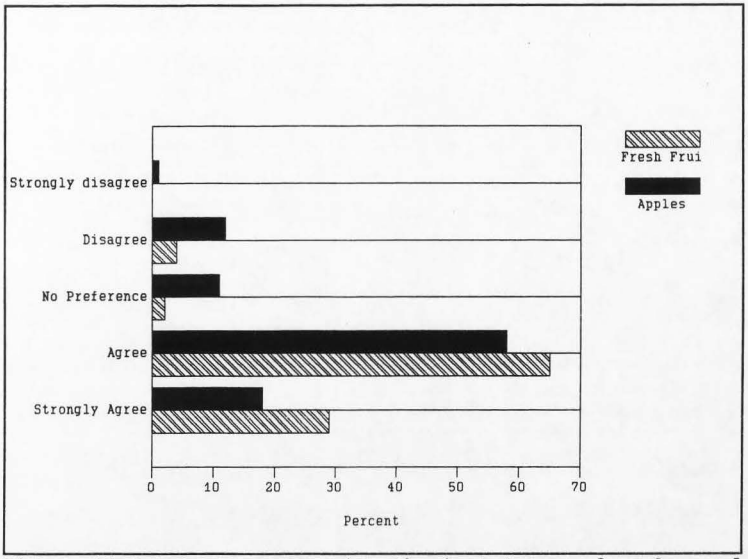

Figure 13 Responses concerning the importance of apples and fresh fruit in the family's nutritional diet

emphasizing the nutritional value of apples might be effective in enhancing the competitive position of apples.

Figure 14 shows the importance of particular traits. Respondents were asked to complete to the statement: "When buying apples, the following qualities are important to me: color, large size, appearance, taste and store display." In general, all of the traits proved to be important. However, they were not equally important. For example, taste ranked first, then large size, and store display was the least important (Figure 14). It is interesting to note that taste

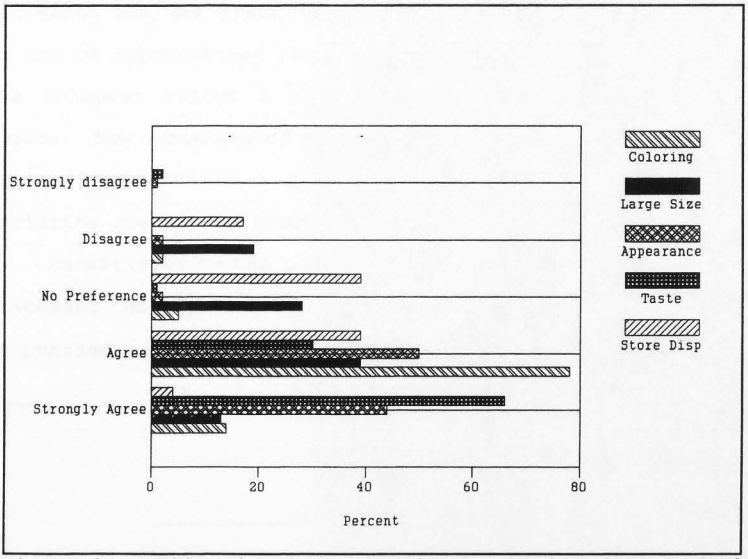

Figure 14 Quality important in the purchasing decision of apples

ranked the highest, but the consumer does not taste the produce when shopping. This indicates that a large part of the consumer's apple-purchase decision is likely based at least in part on past experiences with apples. Effective apple advertising might include taste samples, education as to how to choose a "good" apple or name-brand recognition.

The response for store display regressed against income predicted the consumer's response with 95% confidence. As income increased, the importance of store display also increased. However, income had an inverse relationship with color; as income increased the importance of apple color

decreased and was predicted with a 94% confidence interval. It can be hypothesized that as education and income increase the consumer enjoys a wider variety of different colored apples. New varieties of apples have entered the marketplace, giving the consumer a choice. Many of these other apple varieties are not colored the traditional dark red.

Sensitivity to the price of apples was established by the statement "When purchasing apples the price of apples affects my purchasing habits." The results indicate that 75% of the

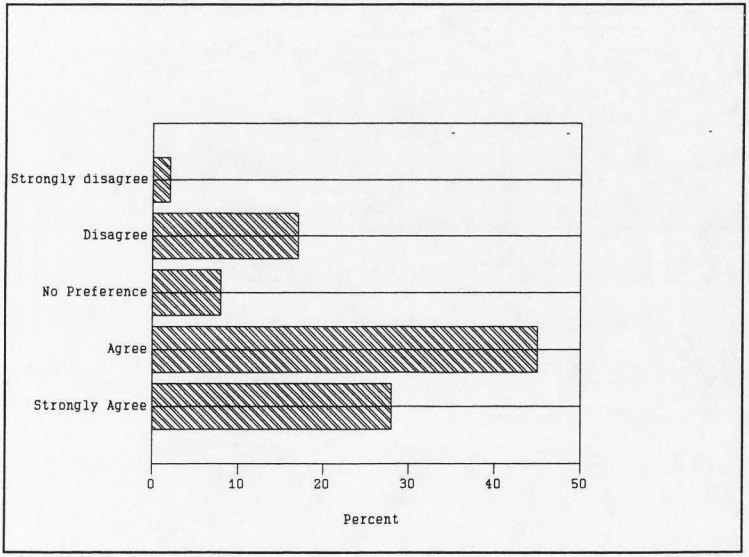

Figure 15 Prices affect the decision to buy and alter the buying habits

75% of the respondents agreed with the statement (Figure 15). This suggests that consumers are very price sensitive regarding apples, and they alter purchasing habits accordingly. Therefore, apples are easily substituted for by other similar products.

The respondents were given a series of statements to complete to establish the substitution effects between apples and oranges or bananas. The first set stated "If the price for oranges is high compared to the price of apples, it causes me to purchase more apples" and then replaced the word "oranges" with "bananas." Forty-four percent agreed with the statement with oranges and 53% with bananas (Figure 16). However, this indicates that almost half of the respondents make purchase decisions independently of apple prices. When this question was regressed against income a 93% correlation was shown. That is, as income increases consumers substitute apples, and oranges are not in the price range of lower-income families and are not considered in the buying decision.

Similar questions were asked concerning the price of substitutes in comparison to the price of apples. The results closely paralleled the results of the question on the high price of substitutes (Figure 17). Almost 50% of the respondents disagreed with the statement and indicated that the price of the substitutes did not affect their purchase of apples.

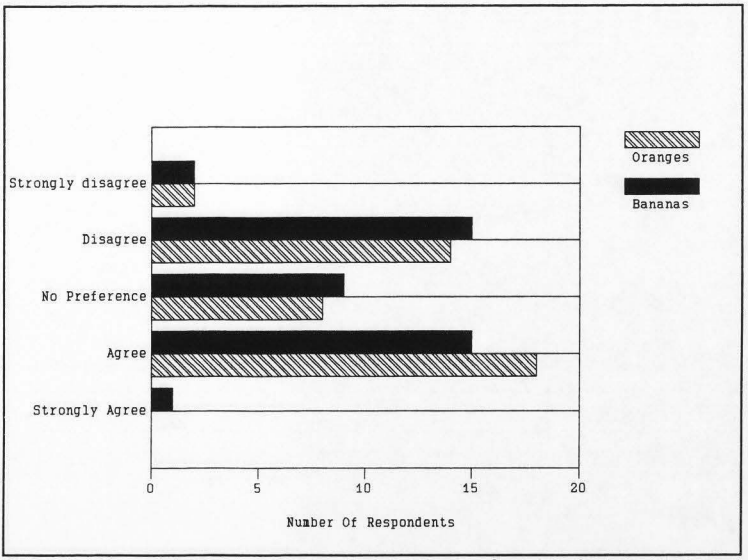

Figure 16. Response to the low price of substitutes was to purchase fewer apples

The answers to this series of questions indicate that consumers are very sensitive to the price fluctuation of apples and only partially sensitive to changes in apple consumption when the prices of oranges and bananas change. Apples, according to the results of this study, are in a market only partially affected by orange and banana markets.

The respondents were given the statement, "When shopping I prefer Utah-grown produce compared to that of other states." In response, 59% agreed and 7% disagreed (Figure 18). Consumers apparently want to support the Utah economy and prefer locally grown produce. However, they also indicate

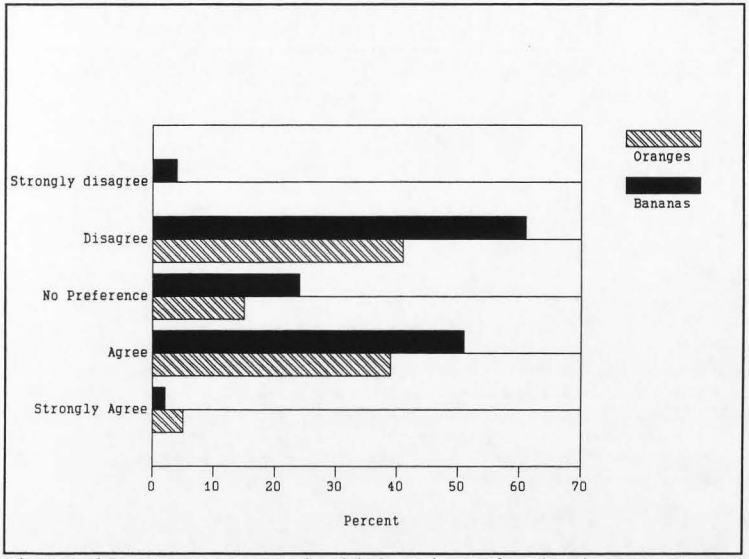

Figure 17. Response to the high price of substitutes was to purchase more apples

that they are very price sensitive, and this effects purchasing habits. Consumers are loyal to Utah commodities, but when price is involved, this loyalty is questioned.

The people surveyed were given a screening statement to isolate a group familiar with Utah apples. However, when they were given the statements "When purchasing apples, I know when I am buying Utah grown produce," only 21% said they knew when they were buying Utah apples, and 5% sometimes said they knew (Figure 19). This leaves 73% not knowing when they are buying Utah apples. Which indicates that recent attempts to establish name recognition (Utah Snapples, etc.) have resulted

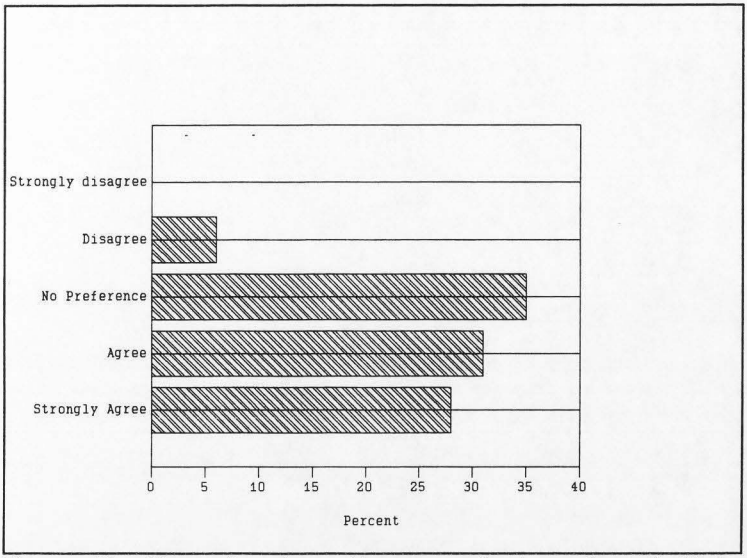

Figure 18. When shopping, the respondent preferred Utah-grown produce to that of other states

in very little market penetration. Respondents who indicated that they knew when they were buying Utah apples were asked other questions regarding Utah apples. However, only 27% responded to these questions. As a result, these data are not reported.

The results of this survey show that with few exceptions, apples have no significant strengths in the market. Apples can be compared to items such as eggs, potatoes, flour, sugar or other normal goods. When regressing consumption traits and preferences against demographic variables, nothing significant

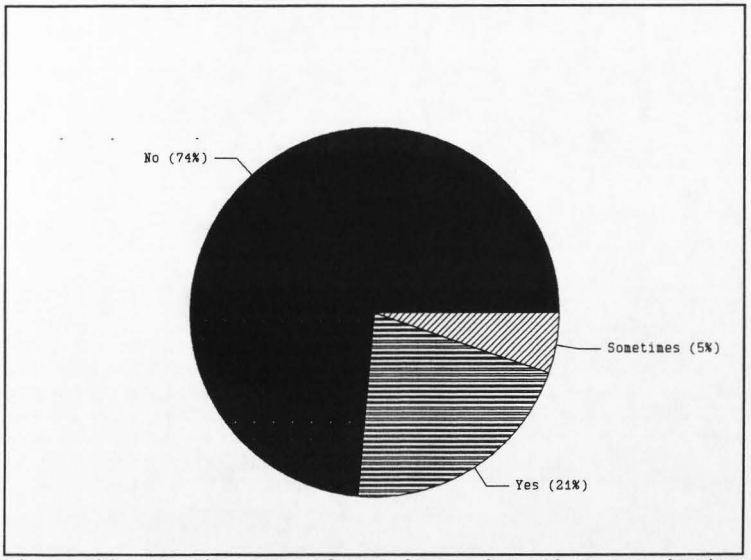

Figure 19. Do the respondents know when they are buying Utah-grown apples?

was shown. This suggests that apples have no significant traits that distinguishes them in the market.

CHAPTER V

SUMMARY AND CONCLUSIONS

Chapter V presents an overview of this study and its findings. The problem statement will be recounted, followed by a brief review of the results. Finally, suggestions for future research, which could expand on the findings of this research and further benefit the Utah apple industry will be presented.

Problem Statement

Given the current farm economy, which includes depressed prices, food surpluses and higher fixed costs, many farmers are striving to increase the efficiency raising crops. Concerns regarding the viability of Utah's apple industry have surfaced. Those concerns relate to the vulnerability of the industry to market changes.

Even with its problems, the apple industry is an important part of Utah's agricultural sector. Utah produces between 0.4% (1986) and 0.7% (1985) of the nation's apple supply (USDAa). Utah, with its limited growing season, is forced to import much of its fresh fruit and produce. Apples are one of the few fresh-fruit commodities produced in Utah that can be stored year round. Presently, a large portion of apples grown in Utah are exported to more profitable markets out of state. Local producers could probably capture a larger portion of Utah's fresh-fruit market if it were profitable.

Utah producers need to evaluate the local Utah market to determine potential marketing possibilities.

Currently, Utah apple producers are receiving lower prices in local markets than in markets outside of the state. This price differential is a result of low-quality apples being "dumped" in the local markets by local growers. Apples grown in state can evade grading procedures imposed on apples packed for out-of-state shipment, so growers sell low-quality, ungraded apples in the local market. High-quality, graded apples are shipped out of state and sold at a premium. The selling of low-quality apples in state could cause consumers to view Utah apple as inferior. The market for high-quality apples in state is generally controlled by major out-of-state growers. Utah producers, with their limited supply, are experiencing problems competing with these higher-quality apples within the state of Utah.

Washington State growers are the main source for apples in the western United States with Utah being a residual supplier. Apples grown in Washington account for one-third of the total U.S. apple crop. Production in Washington more than doubled from 1970-1972 to 1984-1986 because of large new plantings in the early 1970s. These new plantings were a result of relative profitability and tax benefits (USDAb). According to Tom Schotsko, an industry expert at Washington State University, growers in Washington are continuing to expand acreage. Since Utah producers are relatively small

players in the apple market increased production in Washington or elsewhere could have a devastating impact on the Utah apple industry.

Another area of concern to apple producers is the relative share of the fresh-fruit market in the United States currently held by apples. The consumption per capita of fresh fruit has continued to grow since a low in 1970 of 173 pounds per person (fresh weight equivalent) to a high of 213 pounds in 1977. Since 1970, U.S. per capita fruit consumption has grown at the moderate rate of 1.3% a year, reaching 212 pounds in 1986. The increase in consumption can be attributed to several factors including improved distribution and availability, new product forms, better storage, higher disposable income, better marketing techniques, increased advertising and promotion and changes in consumer tastes and preferences (USDAb).

The intent of this research was to analyze the long-term profitability of the Utah apple industry. This presumes that the industry's future relates to its ability to accommodate consumer tastes and preferences through quality, marketing, production and quality control. In short, this research attempted to answer the question "Can Utah apple growers produce a marketable product and maintain a reasonable profit margin?"

Objectives

The objectives of the research were:

1. Identify the prevailing characteristics of typical Utah apple-growing operations. This information was used to establish net farm income and to develope a model to evaluate change and expansion in the industry.
2. Identify possible financing, production and marketing alternatives for the Utah apple industry. This included determining the feasibility of a marketing order and mandatory grading standards for Utah producers and retailers. This project will simulate a multiple-year planning horizon for these alternatives to determine whether they would increase net farm income and other measures of farm health.
3. Identify basic consumer tastes and preferences about Utah apples. This could be used by the producers to determine future production and/or marketing strategies.

Summary

A whole-farm simulation model (FLIPSIM) was used to evaluate and test variations in price, debt load and size of Utah apple production units. These variations examined the effects of various market and financial conditions that producers could face in the future given the current situation of the apple industry. FLIPSIM was used to demonstrate the stochastic nature of prices and yields experienced by producers in Utah County, Utah. Five scenarios, representing

long-term nominal price trends, were examined using FLIPSIM to test for financial health of the industry under the various situations. Each scenario investigated the impact of different price trend assumptions on a 40-acre and an 80-acre apple production unit under different initial debt loads.

Consumer tastes and preferences for apples were determined through the use of a survey conducted with consumers along the Wasatch Front. This survey established general consumer preferences and attempted to measure consumer behavior given various options. The results of this survey allow the producer to begin to understand the habits of consumers purchasing their product.

Results indicated that as long as prices continue to increase to counter the escalating prices of inputs, the typical producer will experience success. If prices do not continue to increase, producers will experience financial difficulties. This suggests that these apple producers in Utah are currently producing output near a level where average total costs equal the expected output price. Consequently, major increases in supply without corresponding increases in demand would reduce prices below break-even levels. These difficulties especially affect those producers with high debt loads and small operations (40 acres). If prices were to remain level, small producers with 40 acres and 80% debt would experience severe financial problems. If prices were to decline, these financial problems become general for all debt

levels. Eighty-acre operations would be expected to withstand lower prices better than 40-acre operations, with problems beginning to arise if prices were to decrease by 1% and with 80% debt. If prices were to decline by 3% per year, both sized operations would be expected to experience major financial problems. If the price were to drop by 3% per annum, neither 40- nor 80-acre operations would be expected to survive with 80% debt to fixed assets.

Results of the consumer preference study indicate that apples, in general, are losing market share in the Utah market to other fruits. In general, apple producers need to consider developing new markets, penetrating existing nonaccessible markets, expanding current markets, improving the product image of apples, diversifying to meet the variety requirement of the consumers and/or developing more efficient methods of production to provide a less expensive product in an effort to maintain profit margins.

The Utah apple industry needs to evaluate its current situation, plan for the future and act accordingly. Efforts need to be made to guarantee adequate profit margins, high standards of consumer perception, market position and low costs of production.

Current Happenings in the Apple Industry

The National Farm Finance News reports in its April 14, 1989, issue that recent concerns about Alar residue in fresh

apples has cut apple shipments from the state of Washington by 15.8% and reduced prices by 8% since the end of February. The panic about Alar-treated apples began after CBS News' 60 Minutes publicized a controversial report by the National Resources Defense Council alleging that residues of the chemical on apples could cause cancer in thousands of children. Consumer faith that apples are safe to eat fell to a historic low of 43% compared to 95% in the past years, according to John O'Donnell, marketing director for the New York and New England Apple Institute (Warren).

Although the 60 Minutes report was broadcast on February 26, apple sales did not actually plunge for more than two weeks (March 15), when newspapers reported the discovery of cyanide in some grapes from Chile (O'Donnell as cited by Warren, p.1). "Apples were moving along at a normal rate until March 15," O'Donnell said. "The Chilean thing brought it to a head. It meant that all fruits were suspect." As a result, he stated, "Sales literally stopped in the produce department all across America that Wednesday."

Alar is the trade name for daminozide, a widely used plant growth regulator (not a pesticide) that orchardists spray on some apple crops. It helps produce bigger apples and makes harvesting easier by adding a week or two to the time it takes for fruit to ripen and fall off the trees.

Although the total impact is not known, Utah apple growers could be affected extensively by the "Alar Scare."

Utah lacks the financial strength to complete in mass media educational campaigns and reestablish the fruit's reputation, as are other major apple producing states.

Suggestions for Further Research

This research evaluated only the general practices of the typical apple producer in Utah County. Additional studies should be completed using the specialized production and marketing strategies currently available to producers. Many of these options have not been accepted by producers because of their uncertainty. Such options, if researched, could prove beneficial to the producers.

Findings of this study began to answer questions concerning marketing of fresh fruit and particularly apples. However, the answers themselves created more questions concerning the tastes and preferences of the purchasing public. The consumer study only brought answers to general questions. Future studies could refine the answers asked in this study and delve further into such areas as 1) estimating the demand curve for apples and subsequent price elasticities, 2) developing the cross price elasticities for the various substitutes, 3) estimating the impact of income on the decision to purchase (income elasticizes), 4) evaluating the potential for new market development and further market penetration and 5) estimating potential of further processed products in the market place.

REFERENCES

Bailey, D.V. "Economics Analysis of Selected Marketing Strategies for Cotton in the Texas Southern High Plains: A Whole-Farm Simulation Approach." Ph.D. Dissertation, Texas A&M University, August 1983.

Balls, M.R. "Economic Simulation of Selected Management Strategies for a Typical Dairy Farm Faced with Declining Milk Prices." Masters Thesis, Utah State University, 1988.

Boehlje, M.D. and S. Griffin. "Financial Impacts of Government Support Price Programs." American Journal of Agricultural Economics. 61(1979):285-96.

Bond, L.H. Professor, Department of Economics, Utah State University, Logan, Utah. Personal Communication, June, 1988.

Clemens, A.M., Jr., H.P. Mapp, Jr., and V.R. Eidman. A Procedure for Correlating Events in Farm Firm Simulation Models. Technical Bulletin T-131, Oklahoma Agricultural Experiment Station, 1971.

Davis, R.M. "The Impact of Alternative Management Strategies for Two Typical Ranches in Southeastern Utah: An Economic Simulation of Retained Ownership." Masters Thesis, Utah State University, 1988.

FAPRI, Ten Year International Agricultural Outlook. Food and Agricultural Policy Research Institute, Iowa State University, Ames, Iowa, March, 1988.

Farley, K. Apple Grower, Payson, Utah. Personal Communication, June, 1988.

Ferguson, W. Apple Grower, Payson, Utah. Personal Communication, May, 1988.

Halter, A.N. and G.W. Dean. "Rules of Simulation in Evaluating Management Policies Under Uncertainty: Application to a Large Scale Ranch." Farm Economics. 47(1965):557-73.

Hardin, M.H. "A Simulation Model for Analyzing Farm Capital Investment Alternatives." Ph.D Dissertation, Oklahoma State University, 1978.

Hatch, A. Extension Specialist, U.S.U. Agricultural Extension, Orem, Utah. Personal Communication, April, 1988.

Helms, G.L. "Economic Simulation of Selected Production and Marketing Strategies for Three Typical Farms and Ranches in Northern Utah." Masters Thesis, Utah State University, 1985.

Hutton, R.F. and H.R. Hinman. "Mechanics of Operating the General Agricultural Firm Simulator." Agricultural Production Systems Simulation, ed. V.R. Eidman, Stillwater: Oklahoma Agricultural Experiment Station, 1971.

Johnson, D. Loan Officer, Production Credit Association of Utah, Logan, Utah. Personal Communication, June, 1988

Lamborn, E.W. "Apple Production Costs and Returns in Selected Utah Areas." Utah State University Agricultural Experiment Station, U.S.U., Logan, Utah, November 1955.

Lamborn, E.W. and W.L. Park. "Consumer Preference and Demand For Different Sizes of Red Delicious Apples In Retail Stores, Salt Lake City, Utah." Utah State University Agricultural Experiment Station, U.S.U., Logan, Utah, March 1957.

Layard, P.R.G. and A.A. Walters. Micro-Economic Theory. New York: McGraw-Hill Book Company, 1987.

Muir, P. Muir Roberts Inc., Salt Lake City, Utah. Personal Communication, September, 1986.

Patrick, G.F. and L.M. Eisgruber. "The Impacts of Managerial Ability and Capital Structure on Growth of the Farm Firm." American Journal of Agricultural Economics, 50(1968)491-506.

Payson Massey Ferguson, Tractor Dealership. Personal Communication, July, 1988

Rasmussen, V.R. Professor, Department of Soil Science and Bio Meteorology, Utah State University, Logan, Utah, Personal Communication, July, 1988.

Richardson, J.W. and D. Bailey. "Debt Servicing Capacity of Producers in the Plainview-Hereford Area." Contract Completion Report. Department of Agricultural Economics, Texas A&M University, College Station, Texas, 1982.

Richardson, J.W. and G.D. Condra. "Farm Size Evaluation in the El Paso Valley: A Survival/Success Approach." American Journal of Agricultural Economics. 63(1981):430-37.

Richardson, J.W. and C.J. Nixon. "Producers Preference for a Cotton Farmer Owned Reserve: An Application of Simulation and Stochastic Dominance." Western Journal of Agricultural Economics, 7(1982):123-32.

---------- The Farm Level Income and Policy Simulation Model: FLIPSIM. Departmental Technical Report 81-2, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, 1981.

Schotsko, T. Professor, Washington State University, Pullman, Washington. Personal Communication, March, 1988.

Smallwood, D.M. and J.R. Blaylock. "Household Expenditures for Fruits, Vegetables, and Potatoes." National Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin NO. 1690, 1984.

Smith, E.G. "Economic Impact of Current and Alterative Farm Programs on Farm Structure in the Southern High Plains of Texas." Ph.D. Dissertation, Texas A&M University, College Station, Texas, 1983.

U.S. Department of Agriculture. Agricultural Statistics. Washington D.C., 1987a.

U.S. Department of Agriculture. Fruit Situation and Outlook Yearbook. Washington D.C., July 1987b.

U.S. Department of Commerce. State and Metropolitan Area Data Book 1986. Washington D.C., 1986.

Utah Department of Agriculture. Utah Agricultural Statistics. Salt Lake City, 1988.

Walker, D.R. Professor, Department of Agriculture, Utah State University, Logan, Utah. Personal Communication, May, 1988.

Warren, B. "Alar Scare Prompts Major Losses in Washington State's Apple Country." National Farm Finance News, 1-12(April 14, 1989):2-3.

Zimmerman, Dean R. Sentence Sermons. Salt Lake City, Utah; Deseret Book Company, 1978

APPENDICES

Appendix 1. Consumer Survey Questions

1. Where do you obtain you
   ____ Supermarket
   ____ Produce stand
   ____ Seasonal roadside market
   ____ Home grown
   ____ Friends or family
   ____ Other (please specify)

2. How many apples does your family consume in a normal week during the apple season? (September to December)
   ____ 0 to 5
   ____ 5 to 15
   ____ 15 to 20
   ____ More than 20

3. How many apples does your family consume in a normal week during the off-season? (December to July)
   ____ 0 to 5
   ____ 5 to 15
   ____ 15 to 20
   ____ More than 20

4. What size of apples do you prefer?
   ____ Large
   ____ Medium
   ____ Small

5. When purchasing apples I know when I am buying Utah grown produce?

   ____ No go to question 10
   ____ Yes
   ____ Sometimes

6. In general, I can tell the difference in quality between Utah grown apples and those grown in other states.
   ____ Strongly agree
   ____ Agree
   ____ No preference
   ____ Disagree
   ____ Strongly disagree

7. In general, I feel that the quality of apples grown in Utah is better than that grown in other states.
   ____ Strongly agree
   ____ Agree
   ____ No preference
   ____ Disagree
   ____ Strongly disagree

8. How would you compare the quality of Utah apples to apples grown in other states in the following categories.

   With 5 being much better, 3 being no difference and 1 being much worse.

Coloring	5-----3-----1
Large size	5-----3-----1
Appearance	5-----3-----1
Taste	5-----3-----1
Store displays	5-----3-----1

9. When shopping I can always identify Utah grown apples.
   ____ Strongly agree
   ____ Agree
   ____ No preference
   ____ Disagree
   ____ Strongly disagree

10. Is your household using more apples than it did a few years ago?
   ____ Strongly agree
   ____ Agree
   ____ No preference
   ____ Disagree
   ____ Strongly disagree

11. Apples are an important part of our families nutritional diet?
   ____ Strongly agree
   ____ Agree
   ____ No preference
   ____ Disagree
   ____ Strongly disagree

12. When buying apples the following qualities are important to me:

Coloring	5-----3-----1
Large size	5-----3-----1
Appearance	5-----3-----1
Taste	5-----3-----1
Store display	5-----3-----1

13. When purchasing apples the price of apples effects my purchasing habits?

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

14a. If the price for oranges is high compared to the price of apples, it causes me to purchase more apples.

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

14b. If the price for oranges is low compared to the price of apples, it causes me to purchase fewer apples.

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

15a. If the price for bananas is high compared to the price of apples, it causes me to purchase more apples.

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

15b. If the price for bananas is low compared to the price of apples, it causes me to purchase fewer apples.

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

16. Fresh fruit is an important part of our families nutritional diet?

____ Strongly agree
____ Agree
____ No preference
____ Disagree
____ Strongly disagree

17. When shopping I prefer Utah grown produce compared to that of other states.
    ____ Strongly agree
    ____ Agree
    ____ No preference
    ____ Disagree
    ____ Strongly disagree

18. Is your household purchasing a wider selection of fresh fruits than it did a few years ago?
    ____ Strongly agree
    ____ Agree
    ____ No preference
    ____ Disagree
    ____ Strongly disagree

19. How many years have you lived in the area?
    _____ years

20. Are you?
    ____ Under 25 years old
    ____ 25 to 35
    ____ 35 to 45
    ____ 45 to 55
    ____ 55 to 65
    ____ Over 65 years old

21. Are you presently:
    ____ Married
    ____ Divorced
    ____ Separated Skip to question 23
    ____ Widowed
    ____ Never married

22. Is your spouse currently employed full-time or part-time?
    ____ Full-time
    ____ Part-time
    ____ Not employed
    ____ Retired
    ____ Student

23. Are you currently employed full-time or part-time?
    ____ Full-time
    ____ Part-time
    ____ Not employed
    ____ Retired
    ____ Student

24. What is the highest grade you finished in school?

Self	Spouse	
____	____	1st - 8th
____	____	9th - 12th
____	____	12th grade
____	____	Some college
____	____	Bachelor's degree
____	____	Graduate degree

25. How many people live in your household including yourself? _____

26. How many children under 18 live in your household?
_____

27. Sex of respondent:
____ Male
____ Female

28. Would you describe yourself as
____ White
____ Black or Afro-American
____ Hispanic
____ Oriental
____ Other (specify)_____

29. Is your entire family income:
____ Under $10,000
____ $10,000 to 20,000
____ $20,000 to 30,000
____ $30,000 to 40,000
____ $40,000 to 50,000
____ Over $50,000

Appendix 2. Producer Survey Questions

1. What does your farming operation comprise (acres and numbers)

Apple _____ Pear _____ Cherry _____ Peach _____
Sour cherry _____ Other fruit _____ Row crops _____
Hay _____ Grain _____ Livestock _____ Dairy _____
Other_____

2. Number of acres of apples _____
   Acres of Red Delicious _____
   Acres of other types _____

3. Average number of trees per acre _____
   Type Dwarf _____ %
   Semi dwarf _____ %
   Semi standard _____ %
   Standard _____ %
   Average age of trees in orchard _____

Age of trees	Red del.	Others
0 to 5	_____	_____
5 to 10	_____	_____
10 to 15	_____	_____
15 to 20	_____	_____
over 20	_____	_____

4. Type of irrigation system_____
   Average number of days between watering _____
   Number of waterings per year _____
   Hours per year to irrigate operation _____

5. Owned apple storage facilities N/A_____
   Cold storage _____ sq. ft.
   _____ bu. capacity
   _____ cost per day
   Controlled atmosphere _____ sq. ft.
   _____ bu. capacity
   _____ cost per day

6. Owned processing facility N/A_____
   Building size _____ sq. ft.
   Equipment
   Make and type_____
   People required to operate _____ #
   Capacity _____ bu. per hour
   Hours per year operated _____
   Purchase price _____ $

7. Spraying program
   Number of times a season _____ #

   Type of spray
   1 _____
   2 _____
   3 _____
   4 _____
   5 _____

8. What is your general marketing plan_____
   _____
   _____
   _____

9. Grade and average price received of apples:
   Total bushel of apples produced _____
   Total bushel of apples purchased _____

How does the price of your apples compare with the industry.

	Price	% Sold
August to October	_____	_____
November to January	_____	_____
February to April	_____	_____
May to July	_____	_____

Grading

	Percent
Ex. Fancy	_____
Fancy	_____
No. 1	_____
No. 2	_____
Cider	_____
Not Graded	_____
Total	100%

Where do you market your apples

	Percent
U-pick	_____
Private	_____
Wholesale	_____
Broker	_____
Processor	_____
Other	_____
Total	100 %

10. Livestock interests

	Beef	Dairy
Cows	_____	_____
Feeders	_____	_____
Calves	_____	_____
Replacement heifers	_____	_____

11. What is the value of your non-farm investments.

1. Under $5,000.00
2. $5,000 to $9,999
3. $10,000 to $24,999
4. $25,000 to $49,999
5. $50,000 to $99,999
6. Over $100,000.00

12. Business Organization

Sole Proprietorship _____
Partnership _____ Number of shares
_____ Producers share

Corporation _____ Type
_____ Number of shares
_____ Producers share

_____

13. Land Tenure

	Irrigated	Not Irrigated
Acres owned	_____	_____
Acres on cash rent basis	_____	_____
Acres on share rent basis	_____	_____
Total	_____	_____

14. Current Interest Rates

Long-term	_____%
Intermediate	_____%
Operating	_____%
Received for cash reserves	_____%

15. Cash Rental costs for land <u>per acre</u>

Annual cash rent for cropland _____$
Annual cash rent for pastureland _____$

16. Variable Costs (not including depreciation)
Total cash expenditures (from 1040F) _____$

17. Fixed Costs

Accountant and legal fees _____$
Maintenance costs _____$
Insurance on machinery _____$
Misc fixed costs _____$

Annual interest costs Long-term _____$
Intermediate _____$
Operating _____$

18. Family Information
Number of income tax exemptions claimed _____$
Average annual off-farm income _____$
Normal family living expense _____$
Other farm income net of costs _____$

19. Hired Farm Labor
Number of full time employees _____$
Annual salary including Social Security _____$
Fringe benefits _____$

Hourly wages rate for part time employees _____$
Total part time labor expense _____$

20. Last year of formal education completed _____

21. What Question would your like us to ask Utah Consumer on a telephone Survey?

VITA

Jodie R. Harris was born on July 8, 1961, in Logan, Utah. He is the son of Frank E. and Emma R. Harris, who currently live in Logan, Utah and operate a cow/calf operation. Mr. Harris is married to the former Jeanette Reaveley and has three children. He attended public schools in Cache County School District, in Cache County, Utah. He spent a considerable amount of time in agriculture, having been raised on a ranch and is currently a partner in that operation. He also worked for Utah Farm Bureau Federation as the Northern Regional Manager and other various positions in agriculture. He received his Bachelors of Science degree in Agricultural Economics from Utah State University in 1985. He worked as a research assistant at Utah State University until receiving his M.A.I. degree in 1988.

In January 1989, Mr. Harris accepted a position with Western Farm Credit Bank as a Loan Officer. He is currently working as an Assistant County Supervisor for Farmer Home Administration and pursuing a Master of Business Administration at Utah State University. His permanent mailing address is:

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