PROBABILITY OF ECONOMIC SUCCESS FOR NETHERLANDS DAIRY FARMERS MOVING OPERATIONS TO THE UNITED STATES

A Thesis

by

ANTHONY RAY DUNCAN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2004

Major Subject: Agricultural Economics

PROBABILITY OF ECONOMIC SUCCESS FOR NETHERLANDS DAIRY FARMERS MOVING OPERATIONS TO THE UNITED STATES

A Thesis

by

ANTHONY RAY DUNCAN

Submitted to Texas A&M University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Approved as to style and content by:

James W. Richardson (Co-Chair of Committee)	Danny A. Klinefelter (Co-Chair of Committee)
Michael A. Tomaszewski (Member)	A. Gene Nelson (Head of Department)

December 2004

Major Subject: Agricultural Economics

ABSTRACT

Probability of Economic Success for Netherlands Dairy Farmers

Moving Operations to the United States. (December 2004)

Anthony Ray Duncan, B.S., California State University, Fresno

Chair of Advisory Committee: Dr. James W. Richardson

Dairy producers in the Netherlands are struggling to stay in business due to increased environmental legislation, population density, intensity of farming systems, costs of production and quota restrictions. One option available to Netherlands dairy farmers is to liquidate the value of their assets, put the money into an international bank, and buy an established dairy farm in the United States. The primary objective of this research is to compare the economic viability of a Netherlands dairy farmer staying in the Netherlands versus moving to the United States, assuming they will bring over all of their equity to put towards the purchase of a U.S. farm.

The hypothesis that a Dutch dairy farmer would have a greater probability of economic success by relocating to the U.S was tested using a whole farm simulation model (FLIPSIM) to simulate the economic activity of a representative dairy farm in the Netherlands and 23 representative U.S. dairy farms in the major dairy producing regions over the 2002-2011 planning horizon. FLIPSIM generated an empirical probability distribution for net present value to rank the representative farms using stochastic efficiency with respect to a function (SERF) for risk neutral and risk averse decision makers.

The FLIPSIM results showed that six of the twenty-three U.S. dairy farms would give the Dutch farmer a 99% chance of economic success. The added risk on income in the U.S. would result in these U.S. farms having a 1 to 99% chance of negative ending cash reserves (ECR) and a 1 to 99% chance of negative net cash farm income (NCFI). In a complete SERF analysis, seventeen of the twenty-three U.S. farms were preferred over the Dutch farm. In conclusion, the research shows Dutch dairy farmers with adequate equity would be financially better off by relocating to the U.S. if they desire to continue dairying, rather than staying in the Netherlands.

ACKNOWLEDGEMENTS

I would like to thank my major professor and co-chair of my committee, Dr. James W. Richardson, for pushing me to reach my potential and for sharing his vast knowledge and experiences with me. His support has allowed me to successfully complete my graduate degree and has taught me a lot about the kind of person I want to be. I would also like to thank Dr. Danny A. Klinefelter and Dr. Michael A. Tomaszewski for agreeing to serve as members on my committee and for their help throughout the research process.

I am particularly grateful for the support and encouragement of my family and friends that I've met along the way. I have made many new friends in my time here and wish to thank them all. At the risk of leaving someone out, I will not list them here, but will thank them in person.

My deepest love and appreciation are reserved for my two biggest fans, my parents. They have supported fully, sacrificed selflessly, encouraged wholeheartedly, and loved me unconditionally through every endeavor I have ever taken. Without them, I would not be the person I am today. I love you both beyond the depth and breath and height of this world. Thank you.

TABLE OF CONTENTS

Page

ABSTRACT iii

ACKNOWLEDGEMENTS v

TABLE OF CONTENTS vi

LIST OF FIGURES viii

LIST OF TABLES ix

CHAPTER

I INTRODUCTION 1

- Objective 2
- Present Status of Question 2
- Procedure 3
- Structure of Remaining Chapters 4

II REVIEW OF LITERATURE 5

- Farm Level Simulation 5
- Dairy Relocation 7
  - United States vs. Netherlands Dairy Industries 10
- Ranking Risky Investments 12

III METHODOLOGY 15

- Simulation Model 15
- Data Collection 17
- U.S. Dairy Farms 20
- Dutch Dairy Farm 22
- Assumptions/Projections for Dutch Farm 25
- SERF Analysis 28
- Summary 31

IV RESULTS 33

- FLIPSIM Results 33

TABLE OF CONTENTS (CONTINUED)

CHAPTER Page

SERF Results 40
Summary 42

V SUMMARY AND CONCLUSION 44

Problem Statement 44
Objective 44
Procedure 45
Results 45
Conclusion 46

REFERENCES 48

APPENDIX A 52

APPENDIX B 56

VITA 64

LIST OF FIGURES

FIGURE Page

3.1 Location of U.S. Dairy Farms Selected for Analysis. 23

4.1 Probability Density Functions (PDFs) of Milk Price ($/cwt) for the Dutch Dairy and Two Representative U.S. Dairy Farms in 2011................................. 38

4.2 Cumulative Distribution Functions (CDFs) of Milk/Cow/Year (cwt) for the Dutch Farm and Two Representative U.S. Dairy Farms in 2011 38

4.3 Stochastic Efficiency with Respect to a Function (SERF) Ranking of Twelve Dairy Farms Assuming a Negative Exponential Utility Function 41

LIST OF TABLES

TABLE Page

3.1 Summary of Expected Prices for the Representative U.S. Dairy Farms, 2002-2011 ... 18

3.2 Summary of Expected Inflation Rates for the Representative U.S. Dairy Farms, 2002-2011 ... 19

3.3 Summary of Expected Prices for the Representative Dutch Farm, 2002-2011 ... 26

3.4 Summary of Expected Inflation Rates for the Representative Dutch Farm, 2002-2011 ... 27

3.5 Calculations for Market Value (MV) and Liquidation Value (LV) for the Dutch Farm ... 29

3.6 Assets and Debts of U.S. Farms ... 30

4.1 Economic Viability of Representative U.S. Dairy Farms if Purchased in 2002 with a Common Cash Outlay of $1.95 million ... 34

CHAPTER I

INTRODUCTION

Milk is produced in all parts of the world. During the past forty years, the number of dairy cows and dairy operations has decreased, while the average size of dairy farms has trended upward. In the United States, dairy farming is characterized by specialized milk-producing commercial operations (Blayney 2002). Technological advances have led to highly efficient dairy farms with increased output per cow.

The result is an industry in a constant state of change. Many dairy farmers respond to this change by making adjustments to their crop mix, number of cows, level of productivity, and geographic location. Additionally, dairy farmers are forced to decide annually whether or not to remain in the industry due to the forces at work in a competitive market.

Milk production in the Netherlands is dominated by farms with greater than 50 cows. IFCN (2003) showed most countries in the European Union have seen a 50 percent decrease in the number of dairy farms every 10 years. The current rate of decline of E.U. dairies is far greater than corresponding rates of decline in the decade prior to quota introduction. The E.U. quota regime has resulted in a more rapid rate of decline in dairy farms in the region than elsewhere.

Increasing dairy herd size in the E.U. has accompanied the decreasing number of individual herds. It can be assumed these trends will continue after 2007, and could

---

This thesis follows the style and format of the *American Journal of Agricultural Economics*.

accelerate, if a fully-decoupled direct payment policy is adopted by E.U. member states (IFCN 2003).Dairy producers in the Netherlands are struggling to stay in business due to increased environmental legislation, population density, intensity of farming systems, costs of production and quota restrictions (Besten and Hoven 2004). One option available to Netherlands dairy farmers is to sell their operation, put their equity into an international bank and buy a dairy farm in the United States. This study will address the issue of geographical location via economic incentives for migration of dairy farmers from the Netherlands to the United States.

Objective

The primary objective of this research is to compare the economic viability of a representative Netherlands dairy farmer staying in the Netherlands versus moving to the United States, assuming they will bring over the same level of equity to put towards the purchase of a U.S. farm. The hypothesis to be tested is that a Dutch dairy farmer will have a greater probability of economic success by immigrating to the U.S. than staying in the Netherlands. Economic success is defined as the probability of earning a return greater than a five percent discount rate over a ten year planning horizon, i.e. having a positive net present value (NPV).

Present Status of the Question

People choose to relocate due to various push-pull factors. Push factors are the problems of an area that encourage people to leave (i.e. poor housing, lack of employment, and war and persecution) while pull factors are the attractions of an area that encourage people to come and stay (i.e. better medical care, better chance of higher education, and higher wages) (McNeil 2004).

Due to push factors in the E.U. such as population growth, lack of earning potential, and inability for growth, coupled with pull factors in the U.S. such as the opportunity for growth and a higher chance of profitability, there is a constant need to evaluate the options available to economically strained dairy farmers in the Netherlands. Relocation is one possible option available and has become a growing trend for Dutch farmers over the past 40 years due to more pull than push factors. Many of these dairy farmers relocate without having full knowledge of farm sizes and geographic locations in a country so far away. Dutch dairy farmers could make more informed decisions if they had access to probabilistic-based research results that addressed farm size, farm location, and economic viability.

Procedure

An economic viability study of dairy farms in the U.S. versus the Netherlands would require comparing the probability of success across locations, which necessitates a net present value (NPV) for each dairy farm. Currently, there is no published history of NPV for dairy farms and it is unobservable for future time periods. One method for estimating NPV for a business is through Monte Carlo simulation. Monte Carlo simulation is an analytical process meant to imitate a real-life system. Without the aid of simulation, a simple spreadsheet model would only reveal a single outcome, generally the most likely or average outcome (Decisioneering 2004). Simulation calculates multiple outcomes of a model by continually sampling values from probability distributions for the stochastic variables and thus providing a more realistic view of a business.

A whole farm simulation model will be used to simulate a representative Dutch dairy and representative U.S. dairy farms in major production regions for the 2002–2011 planning horizon to estimate the NPV probability distribution for the alternative farms. Location of the U.S. farms is variable and each farm is associated with a different level of risk. The risk for farms in the U.S. is based on historical production and price risk for each region. The model will simulate stochastic yields, prices, and production for 100 iterations (samples) to produce 100 possible NPV's for each farm. From these values, an empirical probability density function (pdf) for NPV can be estimated for each farm.

Structure of Remaining Chapters

The remainder of the thesis is organized into four chapters. Reviews of previous farm-level economic models, U.S. and E.U. dairy structures, and scenario preference methods are presented in Chapter II. An outline of the procedures and data used to complete this study is provided in Chapter III. Chapter IV contains the results of the study. Conclusions of the research are presented in Chapter V.

CHAPTER II

REVIEW OF LITERATURE

The review of literature consists of three main areas: farm level simulation, dairy relocation, and ranking risky investments. The Farm Level Simulation section will review previous studies incorporating the use of a whole-farm simulation model, as well as give a brief description of each study and its conclusions. The second section, a review of literature of dairy relocation will be presented and will consist of examples of relocating dairy farms and structural changes in the E.U. and U.S. dairy sectors. The final section, Ranking Risk Investments, will outline methods for ranking multiple scenarios and define the method that will be used in the analysis.

Farm Level Simulation

Whole-farm simulation models have been used extensively over the past forty years in the areas of financial planning, growth strategies, effects of farm programs, technological change, and investment under uncertainty. These models have traditionally been developed as single-use models focusing on one issue, one farm size, or one location, unable to be applied to multiple locations or farm types.

Halter and Dean (1965) developed the first whole-farm simulation model to evaluate price-forecasting methods for use by a large California cattle ranch with various buyer/seller management decisions. Based on the their results, it was concluded that simulation is a likely tool for risk analysis in the future, particularly if the decision maker's environment is characterized by uncertainty and the data are correlated over time.

Simulation for farm firm risk analysis was expanded by Patrick and Eisgruber (1968), who created a simulation model that incorporated farm firm behavior in a dynamic environment with elements of risk and uncertainty. Their research concluded that a decision-maker's formulation of expectations regarding the future of a business, along with current financial position and economic goals, affects the selection of alternative farm plans (i.e., managerial and capital market structures).

Hutton and Hinman (1971) developed a farm level simulation model that included an added feature, accounting for differences in farm type and geographic location. This added feature allowed analysis of farm economic activity and decision making of a broad range of commodity farms located throughout the United States. However, their model is no longer available.

Richardson and Nixon (1986) developed a generalized farm level simulation model capable of simulating dairy farms in multiple regions and countries. FLIPSIM uses projected mean prices, policy rules and regulations, producer input and macroeconomic data provided by the Food and Agricultural Policy Research Institute (FAPRI) to simulate stochastic economic outcomes for a representative farm. The model is recursive in that it simulates using the ending financial position for year one as the beginning position for the second year.

Since its completion, FLIPSIM has been used in more than 10 countries and 25 universities for hundreds of farm level studies. The Agricultural and Food Policy Center (AFPC) at Texas A&M University has used the model to produce economic outlook reports for agricultural commodities from cotton to rice to dairy cattle, which are distributed throughout the country to producers and policy makers alike.

FLIPSIM has also been used to analyze policy impacts in many Master's theses and Ph.D. dissertations on a wide range of topics (e.g. Yonkers 1989, Zimmel 1994, and Houston 2002). Yonkers used FLIPSIM to analyze the impacts of exogenously-determined variables on dairy farms. Zimmel used the model to analyze the effects of farm program provisions on lease arrangements under uncertainty. Houston used the model to analyze farm level impacts of the U.S. House and U.S. Senate versions of the 2002 farm bill proposals on representative rice farms.

To simulate a dairy farm, FLIPSIM takes actual producer data from a representative farm and runs it through a series of subroutines. Each subroutine performs a different function but is intended to produce output that shows the economic viability of a farm under uncertainty. FLIPSIM was chosen for the present study for its ability to stochastically simulate the annual economic activities of dairy farms in the U.S. and in the Netherlands.

Dairy Relocation

Relocation has become a growing trend for dairy farmers over the past forty years. Once a producer decides to relocate, they are faced with decisions that not only affect the dairy, but also the family that owns and operates the dairy and its employees. Moving a family and adjusting to a new area and possibly a different climate may be difficult for all involved (Monsanto 1999).

Four main factors have led to relocation of dairies within the U.S. and around the world (i.e., from the European Union (E.U.) to the United States): environmental regulations, location of cheap inputs (i.e. land, feed, water), the changing dairy policy in Europe, and market access (i.e. location of a dairy to filling milk demand for a new cheese plant). All four factors trade places as to which one is most influential and important to decision makers.

While E.U. dairy farms tend to be very homogenous with little or no movement out of traditional milk producing regions, U.S. dairy farms exhibit a wide range of variability in terms of number of herd size and costs of production, and have expanded to the non-traditional milk producing regions. Most dairy operations in the U.S. are located in the Northeast, Lake States, and Corn Belt regions, generally known as the traditional milk producing areas. In 2000, just over 71% of all U.S. dairy operations were located in these three areas and accounted for 48% of total U.S. milk production (Blayney 2002). However, the concentration of dairy farms in the U.S. has not always been the same.

In the 1960's and early 70's the U.S. dairy industry was characterized by low milk prices and high costs of production. To aid the distressed farmers, the U.S. government implemented an 80% parity support price for milk, which encouraged movement of dairies into non-traditional milk producing areas. Dairy farmers were able to sell high valued land in the traditional dairy producing regions and move to the Mountain and Southern Plains states, where land was cheap, readily available, and in close proximity to a milk market.

Between 1975 and 2000, the Southern Plains, Mountain, and Pacific regions experienced an increase in the share of the U.S. dairy herd from 18% to 37% and an increase in the share total U.S. milk production from 20% to 40% (Blayney 2002). Only the Mountain and Pacific regions have shown relatively consistent large growth in cow numbers. Cow numbers in the Pacific region matched those in the Corn Belt in 1985, and then surpassed the Northeast in 1997 (Blayney 2002).

In November 1998, the top twenty U.S. dairies (based on the number of milk producing cows) were ranked by *Successful Farming* magazine (Looker 1998). The smallest of the farms had 6,500 cows and the largest had 18,500 cows. The average size of a U.S. dairy farm in 2000 was 88 cows (Blayney 2002). U.S. dairy farms are expected to grow, become more concentrated in certain regions, and become more specialized in producing milk (Outlaw et al 1996). The trend toward fewer but larger farms is evident throughout the United States.

A contributing factor to the growth of the U.S. dairy industry has been a number of structural changes in recent history. The number of U.S. dairy operations decreased from 160,640 in 1991 to 97,560 in 2001 (USDA 2002), while milk production per cow has increased from 150 cwt. per cow to more than 181 cwt. per cow over the same time period.

One example of a structural change in the U.S. dairy industry is the adoption of Recombinant Bovine Somatotropin (rbST). Predicted rbST adoption rates from ex ante studies range from 8% to 41% for early adopters, and from 33% to 92% for eventual adopters (Lesser et al 1999; Zepeda 1990; Kinnucan et al 1990; Saha et al 1994).

Adoption rates increase across all of the farm sizes, ranging from as low as 11% of operations with fewer than 50 cows and as high as 65% of operations with 1,000 or more cows (McBride, et al 2002). McBride, et al (2002) found that the use of rbST significantly increased milk production per cow, an average of 30 cwt (17%), after statistically controlling for other factors that would affect milk production.

Another example of structural change in the U.S. dairy industry is in its feeding systems. U.S. dairy farms are becoming larger and more concentrated in certain regions, and are becoming more specialized in producing milk (Blayney 2002). As dairies become more specialized in milk production, they reduce the amount of crops grown on their own farms and therefore purchase more feed from other sources.

United States vs. Netherlands Dairy Industries

The U.S. and Netherlands have seen similar trends over the last 10 to 15 years. The total number of milk cows in the U.S. has declined from 9.8 million in 1991 to 9.1 million in 2001 while the total number of milk cows in the Netherlands declined from 1.8 million to 1.4 million (Bailey 2002, USDA 2002). Average total milk production in the U.S. increased from 1,477 million cwt. in 1991 to 1,655 million cwt. in 2001, while total milk production in the Netherlands increased from 243 million cwt. to 247 million cwt. (UDSA 2002).

Dairy production is one of the most important production sectors of Dutch agriculture. Since land and labor are expensive in the Netherlands, the production systems used in agriculture are highly intensive. The Dutch dairy sector has seen radical changes in focus over the last 40 years. The period between 1960 and 1980 was known for increased productivity and efficiency, while the period between 1980 and 2000 focused on environmental quality and supply controls (Horne and Prins 2002).

Two major developments in E.U. dairy policy have driven up costs of production for farmers and restricted farmers' ability for growth, which has made it very attractive to relocate their operations. First, the E.U. dairy policy introduced more stringent environmental quality regulations in the early 80s aimed at reducing air and water pollution. Dutch dairy farmers had to satisfy the criteria for environmental licenses, requiring waste storage and management investments as well as acreage increases (Horne and Prins 2002).

These environmental regulations require a minimum of approximately 1.24 acres of pastureland per dairy cow (Besten and Hoven 2004), which costs about $13,900 per acre to purchase. If a Dutch dairy is operating at full capacity (i.e. the land requirement is met) and wishes to expand production by purchasing more cows, the dairy has to purchase or rent more land. This will result in an additional expense of $17,236 for land per cow purchased.

Second, the E.U. introduced a milk production quota system in 1983. A production quota was put in place in response to the surplus production of the 1960s and 1970s. Milk production quotas altered the landscape of Netherlands dairy farming, changing the focus from expanding production to reducing costs of production (Horne and Prins 2002). Production quotas also affect the adoption of new technologies. Costs of production increase with a quota system in place, which changes the focus of dairy farmers to increased efficiency (e.g. less cows needed to fill the quota) (Ondersteijn

2004). Between the increased costs from of environmental regulations and production quotas, many dairy farmers left the business altogether.

According to Besten and Hoven (2004), quota is held as an asset. The marginal cost per unit to purchase additional quota is $1.05 per pound. The representative Dutch dairy used for this analysis holds 2.2 million pounds of milk quota worth approximately $2.3 million. This asset is required for the right to produce and sell milk in the European Union. Rate of return on investment (ROI) is calculated as net returns divided by the sum of assets minus debt. As the milk quota value increases, so too does the asset value, which drives down ROI. The increased price of land, the minimum land per cow requirement, and the introduction of the quota system have limited the growth of the Dutch dairy industry.

Ranking Risky Investments

In a stochastic analysis, risky alternatives are ranked based on the trade-off between income and risk. To facilitate the ranking process, the number of variables used to summarize the economic performance of a business is generally reduced to one, namely net present value (NPV). NPV is used because it represents the sum of the present value of annual change in real net worth plus the sum of the present value of owner withdrawals over the planning horizon.

NPV probability distributions for alternative farms can be compared and ranked using a variety of procedures. In the past, stochastic dominance with respect to a function (SDRF) has been used for several simulation studies to rank risky scenarios for different levels of risk aversion, e.g. Kramer and Pope 1981, Lemieux et. al 1982.

Stochastic dominance is a pairwise comparison of distributions for risky alternatives that identifies the efficient set for risk averse decision makers (Hardaker et. al. 1997, Richardson 2004). The risky alternatives in the efficient set are ranked higher or are more preferred to those not in the efficient set.

One advantage of using stochastic dominance is that it uses the entire probability distribution as opposed to only the mean or the variance when ranking scenarios. Another advantage is that it ranks risky scenarios based on a decision maker's utility function for income and risk. The level of risk aversion for decision makers is specified by a risk aversion coefficient (RAC). Positive RAC values denote risk averse decision makers while negative RAC values denote risk loving decision makers (Hardaker et al 1997). The primary problem with generalized stochastic dominance is that it can result in inconsistent efficient sets for the lower and upper RAC values (Hardaker et al 1997). For example, if the cumulative distributions of NPV for two scenarios (A and B) cross then the rankings at the Lower RAC may differ from the rankings at the Upper RAC if a breakeven RAC lies between the Lower and Upper RACs (McCarl 1988).

Stochastic efficiency with respect to a function (SERF) is an alternative procedure for ranking risky scenarios. The SERF method includes all the advantages of SDRF, yet is more transparent and easier to implement. SERF can identify a smaller number of alternatives in the efficient set over a given range of risk aversion and is potentially more discriminating than the pairwise SDRF technique (Hardaker, et al 2004b). Additionally, it is capable of identifying RAC levels where decision makers' preferences will change from one alternative to another. SERF will be used in this research to rank the alternative dairy farms using the NPV distributions estimated by simulating the Dutch farm and alternative representative farms in the United States.

CHAPTER III

METHODOLOGY

This chapter describes the simulation model selected for this study, data collection methods, a description of the alternative dairy farms, and stochastic efficiency with respect to a function (SERF) analysis.

Simulation Model

Each of the representative dairy farms used for this research were simulated using the whole farm simulation model, FLIPSIM (Farm Level Income and Policy Simulator). FLIPSIM is a FORTRAN based computer simulation model that was designed to analyze the possible consequences of alternative farm policies and tax developments on typical or representative farms for a one- to ten-year time period (Richardson and Nixon 1986). The model has been expanded to simulate economic activities for livestock and dairy farms throughout North America and Europe with alterative farm programs, risk management strategies, technological advances, and income tax provisions.

FLIPSIM is broken down into individual parts (subroutines) that work together to simulate a whole farm. Depending on the makeup of the farm, the different subroutines are either used or ignored. FLIPSIM begins by reading input data for a representative farm. Next, the model generates multivariate empirical (MVE) distributions for the stochastic or uncertain variables, which for a dairy farm are crop production (yield), milk production per cow, milk price, purchase- and cull-cow price, and feed price. Random numbers are then drawn from the MVE distributions and used to simulate 100 possible values for the stochastic variables each year.

Due to yields and prices being stochastic each year, costs of production and total receipts are stochastic each year. For example, if a dairy grows a crop that it can either feed or sell and experiences a drought, crop yields will decrease leaving less total production to sell in the marketplace or to feed on the dairy. If less production is available for sale, total receipts to the farm will decrease. If less production is available to be fed, more feed will need to be purchased, causing costs of production to rise. At the end of each stochastic run, FLIPSIM calculates and stores ending financial positions for the farm each year, then generates summary information in a complete set of financial statements.

The deterministic FLIPSIM output file for the Dutch farm may be found in Appendix B. Calculations important to the dairy are milk receipts, total value of the dairy herd, purchased feed expenses, and total dairy receipts. Milk receipts are calculated as the product of stochastic quantity of milk sold and the stochastic price of milk. The total value of the dairy herd is calculated as the sum of values of cows, calves, 12-24 month old heifers, 24+ month old heifers, and bulls, which are calculated as the product of their current weight multiplied by the stochastic prices. Total purchased feed cost is the sum of the quantity of each feed purchased multiplied by their respective stochastic prices. Total dairy receipts are the sum of milk sales and sales of livestock.

FLIPSIM is equipped with general accounting and tax equations capable of calculating beginning and ending financial positions, depreciation on farm equipment and buildings, and appreciation of farm land for each year of the planning horizon. Additionally, FLIPSIM includes all relevant federal and state income tax requirements and is regularly updated to account for the most current tax code provisions and dairy policy. For the end of each year, the model computes a full set of financial statements for the farm. Once all ten years have been simulated, FLIPSIM generates a summary of the financial statements, tax structures, and livestock sectors. The ten year summary of financial statements represents one iteration.

FLIPSIM was chosen for its ability to stochastically simulate the annual economic activities of a representative dairy farm, incorporating risk over the 10 year planning horizon of the farm, and for its ability to simulate dairy farms across the United States. For this study, the model was run stochastically for 100 iterations to produce empirical distributions of key output variables.

Data Collection

The data collected for the U.S. dairies used in this study consists of two types: panel farm data and national level macroeconomic projections. The Agricultural and Food Policy Center (AFPC) at Texas A&M University collected the panel farm data for each of the representative U.S. farms used in this study. The Food and Agricultural Policy Research Institute (FAPRI) provided the August 2004 Baseline macroeconomic projections for the U.S. dairy industry over the 2002-2011 planning horizon. A summary of prices and inflation rates for the U.S. dairy farms may be found in Tables 3.1 and 3.2, respectively.

The reason for beginning with a 2002 start date is two-fold. First, the most

Table 3.1. Summary of Expected Prices for the Representative U.S. Dairy Farms, 2002-2011*

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Projected Prices Culled Cows ($/cwt.)	39.230	46.620	53.570	55.000	52.990	48.630	45.600	43.020	40.640	37.860
Projected Prices Calves ($/cwt.)	86.110	95.210	107.010	106.490	103.080	94.940	88.570	85.840	82.340	80.940
Projected Milk Prices ($/cwt.)										
All Milk ($/cwt.)	12.180	12.550	15.550	13.514	13.121	13.004	13.041	13.126	13.231	13.370
California ($/cwt.)	10.940	11.380	14.100	12.254	11.898	11.792	11.825	11.902	11.998	12.123
Florida ($/cwt.)	15.300	15.300	18.957	16.475	15.996	15.853	15.898	16.002	16.131	16.299
Idaho ($/cwt.)	11.300	11.500	14.249	12.383	12.023	11.916	11.950	12.028	12.124	12.251
Missouri ($/cwt.)	12.300	12.600	15.612	13.567	13.174	13.056	13.093	13.178	13.284	13.423
New Mexico ($/cwt.)	11.900	12.000	14.869	12.921	12.546	12.434	12.469	12.551	12.651	12.784
New York ($/cwt.)	12.800	13.100	16.232	14.106	13.696	13.574	13.612	13.701	13.811	13.956
Texas ($/cwt.)	12.900	13.000	16.108	13.998	13.592	13.470	13.508	13.597	13.706	13.849
Vermont ($/cwt.)	12.700	13.000	16.108	13.998	13.592	13.470	13.508	13.597	13.706	13.849
Washington ($/cwt.)	12.000	12.100	14.992	13.029	12.651	12.538	12.573	12.655	12.757	12.890
Wisconsin ($/cwt.)	12.200	12.900	15.984	13.890	13.487	13.366	13.405	13.492	13.600	13.743
Projected Prices for Crops and Feed ($/ton)										
Corn ($/ton)	82.824	85.680	81.500	84.620	85.648	86.740	87.133	87.122	87.483	87.868
Soybean Meal ($/ton)	173.183	247.990	182.054	177.716	182.011	187.786	186.440	186.212	185.084	185.753
All Hay ($/ton)	92.400	92.900	87.033	89.063	90.805	91.871	92.810	93.347	95.142	96.559
Cotton Seed ($/ton)	101.000	111.000	80.062	82.346	80.463	82.734	82.194	83.206	82.461	82.248

Source: Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri-Columbia and Iowa State University

Table 3.2. Summary of Expected Inflation Rates for the Representative U.S. Dairy Farms, 2002-2011*

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Annual Percentage Change in Prices Paid for Inputs										
Seed		7.120	1.210	0.450	0.740	1.000	0.890	0.870	1.120	1.340
Fertilizer		20.600	-8.830	-4.840	-1.170	2.020	1.560	1.740	2.350	3.060
Chemicals		6.360	-0.160	2.900	2.030	1.090	0.077	0.710	1.130	1.470
Machinery		0.300	0.390	0.400	0.310	0.340	0.340	0.350	0.570	0.840
Non-Feed Costs for Livestock		4.860	-0.760	0.120	0.560	0.960	0.820	0.810	1.190	1.530
Fuel		20.600	-8.830	-4.840	-1.170	2.020	1.560	1.740	2.350	3.060
Labor		0.760	0.730	0.730	0.680	0.690	0.670	0.640	0.640	0.670
Percent change in Prices Paid for Fixed Costs										
Fixed Costs	2.310	1.510	1.780	2.170	2.150	2.190	2.240	2.300	2.490	2.720
Percent change in Prices for Real Estate										
GNP Deflator	2.310	1.510	1.780	2.170	2.150	2.190	2.240	2.300	2.490	2.720
Consumer Price Index Base (2002)										
CPI	190	193	197	201	205	210	215	220	225	231
Annual Interest Rate for Farm Loans (real estate)										
Long-Term Interest Rate	5.400	4.990	5.470	5.850	5.710	5.710	5.980	6.330	6.660	6.580
Annual interest Rate for Non-Real Estate Loans										
Machinery Interest Rate	4.530	3.650	4.340	5.100	5.240	5.360	5.840	6.450	7.010	6.960
Interest Rate Received for Savings										
Savings Interest Rate	1.700	1.110	1.110	1.800	2.170	2.440	3.180	4.150	5.080	5.170

Source: Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri-Columbia and Iowa State University recent update of the representative U.S. dairy farms was conducted in 2002. Second, historical data provided by Besten and Hoven (2004) on the representative Dutch farm was for 2002. To account for the early start date, the model ran the first two years deterministically (with no risk), then incorporated risk over the remainder of the planning horizon by running stochastically.

Historical information and E.U. dairy policy assumptions and projections for the Dutch farm were gathered from the Netherlands Department of Agriculture, Nature, and Food Safety, the Agricultural Economics Institute, the International Farm Comparison Network (IFCN), and research from Wageningen University in the Netherlands. All values were originally reported in Euros per kilogram and have been converted to dollars per pound, per hundred weight (cwt.), or per ton, depending on the value being converted. An exchange rate of 1 Euro / $1.20 U.S. was used for this study, based on the average exchange rate for July to December of 2003.

U.S. Dairy Farms

Twenty-three representative U.S. dairy farms were used for this study. The data used to create these representative farms were collected using a consensus-building process among dairy producers from major production regions across the country. The managers who participated in each panel were chosen by an extension specialist from the primary production areas for each of the 10 states (California, Florida, Idaho, Missouri, New Mexico, New York, Texas, Vermont, Washington, and Wisconsin). The managers normally have a history of participation in land grant university programs, employ excellent management practices, and are respected members of their local farm community. Producers are chosen based on the average size and production for moderate- and large-size farms in the region (Outlaw, et al 2004).

Once formed, the panel meets to collect actual historical producer data in a consensus-building format to accurately describe a farm representative of their group and the region. Information on typical number of cows, production per cow and expected production per cow, price of milk and expected price of milk, acres of land owned and leased, variable and overhead costs of production, and typical farm machinery are obtained from the producers.

Once the data is agreed upon, it is entered into FLIPSIM. Once the preliminary results are checked for accuracy, FLIPSIM generates income statements, balance sheets, and cash flow statements for the representative farm. The panel members review the financial statements to ensure that the data were entered and interpreted correctly. If it is necessary to change any of the data, the FLIPSIM entries are corrected and the farm is simulated again. This process continues until the producer panel is satisfied with the simulated reproduction of their representative farm. The panel of farmers is interviewed every two to three years to obtain data necessary to describe and simulate a farm representative of the panel members. The farms are updated to address changes in farm size, production practices, or cost structure (Outlaw, et al 2004).

The 23 representative U.S. farms to be compared are as follows: CA1710, FLN500, FLS1500, ID1000, ID3000, MO85, MO400, NM2125, NYC110, NYC500, NYW800, NYW1200, TXC500, TXC1300, TXE550, TXE1000, TXN2400, VT134, VT350, WA250, WA850, WI135, and WI700. The naming convention for the farms is:

the state abbreviation is the first two letters followed by a number indicating the number of cows on the dairy. When it is necessary to differentiate geographic location within a state, the third letter reflects compass direction or central location. For example, WA250 represents a 250-cow dairy in Washington and TXE550 represents a 550-cow dairy in eastern Texas. See Figure 3.1 for an approximate location of the representative dairy farms.

Dutch Dairy Farm

Besten and Hoven (2004) described three representative Netherlands dairies from the major dairy producing regions in the Netherlands. The largest of the three farms was selected for analysis in this research.

The representative Dutch dairy farm is a 122-cow, large sized dairy located in the northern grassland area of Noordelijk, Holland (Besten and Hoven 2004). The farm represents a significant number of the farms and a large portion of production in this area of the Netherlands. Number of cows was the most important variable considered by Besten and Hoven when describing the "typical" Dutch dairy. For the present study, milk production per cow was held constant for all historical and expected production due to the E.U. quota system. The representative Dutch dairy generates more than 75% of its gross receipts from selling milk.

The 122-cow representative Dutch dairy has milk production per cow of 181.02 cwt. and total production per year of 22,084 cwt. In 2002 the milk price in the Netherlands was $19.80 per cwt., generating receipts from milk sales of more than $478,000. Milk quota is held as an asset and the marginal cost per unit of quota is $1.05

Figure 3.1. Location of U.S. Dairy Farms Selected for Analysis
Source: Outlaw et al (2004)

per pound bought and $0.095 per pound rented. The marginal cost to rent quota is assumed to remain constant over the planning horizon (Ondersteijn 2004). The representative Dutch dairy has 22,084 cwt. of milk quota, which is worth $2.3 million (roughly $18,885 per cow). The farm initially purchases a level of quota consistent with the total farm's milk production. Due to the cost outlay for quota, any level of production less than the quota is perceived as a loss of revenue to the farm. The quota system is a legislatively implemented supply control to keep milk prices high. The E.U. quota system outlines hefty fines to farms that produce over their quota limit. Therefore, it is assumed that the representative Dutch dairy will produce at its quota level over the planning horizon.

The farm owns 78 acres of land worth $1.08 million ($13,895 per acre) and rents 48 acres of land for $9,859 per year ($205.40 per acre per year). Grass silage is the only crop grown on the 126 acre farm. Total costs of forage production is $32,076 (unit cost of $22.79 per ton). There is an additional 2.47 acres of land where the farmstead and farm buildings are located. The farmstead and farm buildings are valued at $672,000.

While the farm may only grow one crop (grass silage), it feeds four others: corn silage, hay, concentrate A, and concentrate P. The farm produces 1,408 tons of grass silage per year and feeds 1,734 tons per year. This means the dairy has to purchase 326 tons of grass silage per year at a price of $39.14 per ton (total cost, $12,753). The dairy also purchases 851 tons of corn silage at a price of $38.05 per ton (total cost, $32,382), 118 tons of hay at a price of $90.24 per ton (total cost, $10,614), 92 tons of concentrate A at a price of $148.95 per ton (total cost, $13,694), and 108 tons of concentrate P at a price of $180.48 per ton (total cost, $19,461) per year. The prices listed are the weighted average feed prices for 2002, the first year of the planning horizon.

Concentrate A and P are basic low-fiber, high energy premix rations consisting of a mixture of cereal grains, protein sources, and by-product feeds derived from cereal grains. Concentrate A is the standard concentrate containing 940 VEM (Feed Units for Milk), which is equivalent to 6.9 MJ of net energy for lactation (NEL). Concentrate A also has 9 pounds of DVE (Intestine Digestible Protein) per cwt. of dry matter. Concentrate P is a protein rich concentrate which also contains 6.9 MJ NEL, but has 39.7 pounds of DVE per cwt. of dry matter. Due to the higher level of protein content, concentrate P is more expensive per unit than concentrate A.

The farm holds a machinery complement valued at $214,173. The dairy produces and raises its own replacement heifers to hold the herd size constant at 122 cows. The dairy herd is valued at $216,204, or $1,772 per cow.

Assumptions/Projections for Dutch Farm

IFNC (2003) reports the Netherlands dairies currently receive a direct payment (DP) from the federal government of $0.011 per pound of quota. This number is expected to increase to $0.019 per pound of quota as early as 2006. Projected prices and inflation rates for feed, livestock, and milk for the Dutch farm were provided by Besten and Hoven (2004). A summary of prices and inflation rates for the Dutch farm may be found in Tables 3.3 and 3.4, respectively. The projections may also be found in greater detail in Appendix B.

Table 3.3. Summary of Expected Prices for Representative Dutch Farm, 2002-2011*

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Projected Prices Culled Cows ($/cwt.)	48.924	52.749	53.356	51.258	51.918	51.316	51.597	52.257	53.014	53.776
Projected Prices Calves ($/cwt.)	271.801	293.049	296.421	284.767	288.435	285.088	286.652	290.318	294.521	298.755
Projected Prices Heifers ($/cwt.)	103.834	111.951	113.240	108.788	110.189	108.910	109.507	110.908	112.514	114.131
Projected Prices Replace Cows ($/cwt.)	84.258	90.845	91.891	88.278	89.415	88.377	88.862	89.998	91.301	92.614
Projected Milk Prices ($/cwt.)	19.792	18.597	17.776	16.982	16.178	15.938	15.938	15.938	15.938	15.938
Projected Prices for Crops and Feed ($/ton)										
Corn Silage ($/ton)	40.227	42.238	37.200	38.792	38.146	38.688	37.698	37.213	36.668	36.284
Concentrate P ($/ton)	180.476	184.281	169.054	167.524	165.994	164.464	162.934	161.404	159.874	158.344
Concentrate A ($/ton)	148.947	156.557	135.305	132.027	128.748	125.470	122.192	118.913	115.635	112.357
Hay ($/ton)	90.238	92.412	100.683	99.926	99.169	98.412	97.655	96.897	96.140	95.383
Grass Silage ($/ton)	40.227	39.139	35.688	33.498	31.307	29.117	26.927	24.737	22.547	20.356

Source: Besten and Hoven (2004)

Table 3.4. Summary of Expected Inflation Rates for Representative Dutch Farm, 2002-2011*

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Annual Percentage Change in Prices Paid for Inputs										
Seed		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Fertilizer		1.587	2.860	0.070	1.590	1.130	1.190	1.120	1.070	1.120
Chemicals		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Machinery		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Non-Feed Costs for Livestock		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Fuel		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Labor		4.000	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
Percent change in Prices Paid for Fixed Costs										
Fixed Costs		2.250	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Percent change in Prices for Real Estate										
GNP Deflator		10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Consumer Price Index Base										
CPI	133	135	136	137	139	141	143	145	147	149
Annual Interest Rate for Farm Loans (real estate)										
Long-Term Interest Rate	4.890	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Annual interest Rate for Non-Real Estate Loans										
Machinery Interest Rate	4.890	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Interest Rate Received for Savings										
Savings Interest Rate	2.890	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000

Source: Besten and Hoven (2004)

The market value of all assets on the representative Dutch farm in 2002 was $4.53 million (Table 3.5). If the Dutch farmer were to liquidate the representative farm and move to the U.S., they could invest about $1.95 million in a U.S. farm. The difference in asset value and investable funds is due to the farm paying debts, the effect of low auction prices for machinery and buildings, and having to pay a tax on the proceeds for the sale of quota.

Machinery sold at auction was assumed to bring only 60% of its value on the farm's balance sheet. Similarly, the sale value of buildings and other fixed assets lose 26% of their value in a sale. The E.U. requires that producers pay a tax equal to 42% of the value of quota sold, so the net proceeds of quota sold is only 58% of its market value (Ondersteijn 2004). An assumed amount of $50,000 is used to cover travel, site inspection, and relocation costs. For this research, it is assumed the producer applies the total $1.95 million to the purchase of a U.S. dairy and finances the balance (Table 3.6). Table 3.6 shows the market value of assets for the U.S. dairies on January 1, 2002. In addition, the table shows the debt level and cash reserves the relocating Dutch farmer would have when they apply the full $1.95 million.

SERF Analysis

Stochastic efficiency with respect to a function (SERF) is a risk analysis procedure that orders a set of risky alternatives in terms of certainty equivalents for a specified range of risk aversion. SERF is used to determine which empirical probability distribution (scenario) for NPV will be preferred by the decision maker (Hardaker et al

Table 3.5. Calculations for Market Value (MV) and Liquidation Value (LV) for the Dutch Farm (Source: Besten and Hoven 2004)

	Market value	% of MV for LV	Liquidation Value
Assets			
LAND	$ 1,084,512	100%	$ 1,084,512
MILK QUOTA	$ 2,304,000	58%	$ 1,345,536
OTHER LAND & ASSETS	$ 120,000	74%	$ 88,800
FARM BUILDINGS	$ 672,000	74%	$ 497,280
LIVESTOCK	$ 161,920	100%	$ 161,920
MACHINERY	$ 192,120	60%	$ 114,504
Total Assets	$ 4,534,552		$ 3,292,552
Liabilities			
LOAN	$ 1,290,000	100%	$ 1,290,000
Total Liabilities	$ 1,290,000		$ 1,290,000
Owner Equity	$ 3,244,552		$ 2,002,552
Relocation Adjustment*			$ 50,000
Total Available Equity for Reinvestment			**$ 1,952,552**

* Reflects transportation and relocation costs

Table 3.6. Assets and Debts of U.S. Farms

Farm*	Assets**	Debt***	Cash Reserves****
CA1710	6,968,313	5,015,761	-
FLN500	1,492,683	-	459,869
FLS1500	3,935,384	1,982,832	-
ID1000	2,928,717	976,165	-
ID3000	10,637,128	8,684,576	-
MO85	732,912	-	1,219,640
MO400	1,780,339	-	172,213
NM2125	4,681,886	2,729,334	-
NYC110	423,918	-	1,528,634
NYC500	2,157,271	204,719	-
NYW1200	5,354,343	3,401,791	-
NYW800	3,474,563	1,522,011	-
TXC500	1,311,234	-	641,318
TXC1300	3,185,323	1,232,771	-
TXE550	675,893	-	1,276,659
TXE1000	1,629,191	-	323,361
TXN2400	3,283,224	1,330,672	-
VT134	577,433	-	1,375,119
VT350	2,307,129	354,577	-
WA250	1,353,038	-	599,514
WA850	3,117,893	1,165,341	-
WI135	1,830,453	-	122,099
WI700	2,706,453	753,901	-

* See Appendix A for definitions of representative farms
** Assets are presented as market value on January 1, 2002
*** Debt is presented as Assets - $1.95 million (Value of Dutch Farm after move)
**** Cash Reserves are presented as (-1*Debt) if Debt<0

2004b). For this study, SERF used the cumulative distribution for NPV for ending nominal net worth from FLIPSIM to rank alternative U.S. and Dutch dairy farms for the risk neutral and risk averse decision maker. The SERF analysis required specifying lower and upper RAC levels and selecting a utility function. A negative exponential utility function was assumed. Hardaker et al (2004a) outlined the process of calculating the appropriate RAC values. A lower RAC of zero was assumed to reflect a decision maker who is risk neutral. The upper RAC value was set at 4 / NW, where NW is the nominal net worth of each at the end of the planning horizon. From this calculation, an upper RAC value of 0.000002 was selected.

Summary

The chapter began with a justification for the use of a whole farm simulation model with a general description of the model used for analysis in this research. A representative Dutch dairy and 23 representative U.S. dairy farms were simulated with FLIPSIM using the FAPRI Baseline for the 2002-2011 planning horizon. The data for the U.S. dairies were collected by the Agricultural and Food Policy Center (AFPC) at Texas A&M University using a consensus-building process.

Data for the Dutch farm were reported by Besten and Hoven (2004) who gathered information from various government and university research from the E.U. and the Netherlands. The next section of the chapter described the location and creation of the representative farms. Next, the characteristics of the representative Dutch dairy were terms of size, location, production per cow, land ownership, milk prices, feed costs, and machinery complements. Finally, the chapter described the risk analysis procedure, SERF, used to rank the alternative farms.

CHAPTER IV

RESULTS

The results chapter is divided into three sections. The first section summarizes the results obtained from FLIPSIM. The second section discusses the results of the SERF analysis. The final section summarizes the findings of the study.

FLIPSIM Results

Analysis of economic viability was conducted for the 24 representative dairy farms with FLIPSIM. Each of the farms was simulated over the 2002-2011 planning horizon, and the results are presented in tables and figures in this section. Linear trend forecasts of annual average prices, yields, and milk per cow are used as the means for simulating these variables for the Dutch farm. Results of simulating the 24 dairy farms over the 2002-2011 planning horizon are summarized in Table 4.1. The key output variables (KOVs) from the simulation model are:

- Net cash farm income (NCFI) is total cash receipts minus total cash expenses and does not include depreciation.
- Probability of negative NCFI is found by analyzing the range of simulated values of NCFI in each year and calculating the number of times the value is less than zero.
- Ending cash reserves (ECR) is total cash balance at the end of each year.
- Probability of negative ECR is found by analyzing the range of simulated values of ECR in each year and calculating the number of times the value is less than zero.

Table 4.1. Economic Viability of Representative U.S. Dairy Farms if Purchased in 2002 with a Common Cash Outlay of $1.95 million (See Appendix A for Definitions of Representative Farms)

	CA1710	FLN500	FLS1500	ID1000	ID3000	MO85	MO400	NM2125
Overall Financial Position								
2005-2011 Ranking	Good	Good	Good	Good	Good	Good	Good	Good
Prob. Economic Success								
Over 2002-2011 (%)	99.00	99.00	9.00	95.00	99.00	1.00	80.00	99.00
Net Present Value (NPV) ($1,000)								
2002-2011	3522.86	1545.22	-2246.99	1343.64	9146.25	-1113.49	192.77	7061.59
Std. Dev.	1343.90	421.71	1506.17	745.40	2205.16	46.26	223.50	1317.58
Coef. Var. (%)	38.15	27.29	-67.03	55.48	24.11	-4.15	115.94	18.66
Net Cash Farm Income ($1,000)								
2002	-16.40	512.35	-235.59	94.69	254.32	73.90	237.65	702.84
2003	99.88	359.54	-416.99	90.22	333.10	79.89	242.47	589.44
2004	47.35	269.47	-505.37	110.94	550.01	65.94	228.68	697.18
2005	289.23	450.81	-328.93	196.35	882.43	77.11	263.33	1155.98
2006	430.02	488.75	-299.48	271.54	1194.62	69.64	281.47	1330.78
2007	490.62	495.52	-306.05	303.95	1348.16	69.64	286.74	1417.52
2008	507.04	496.37	-379.71	322.09	1429.80	69.60	291.61	1470.88
2009	524.19	496.12	-453.79	330.85	1468.81	68.14	298.77	1508.64
2010	530.22	503.65	-535.17	328.72	1521.09	67.95	301.95	1552.81
2011	587.30	527.45	-594.11	354.16	1642.17	70.41	309.03	1594.06
Prob. of NCFI < 0 (%)								
2002	99.00	1.00	99.00	1.00	1.00	1.00	1.00	1.00
2003	1.00	1.00	99.00	1.00	1.00	1.00	1.00	1.00
2004	59.00	10.00	81.00	45.00	39.00	1.00	2.00	20.00
2005	38.00	2.00	76.00	33.00	25.00	1.00	3.00	1.00
2006	20.00	1.00	72.00	29.00	16.00	1.00	1.00	2.00
2007	21.00	2.00	70.00	27.00	14.00	1.00	2.00	1.00
2008	28.00	2.00	76.00	24.00	18.00	1.00	2.00	2.00
2009	26.00	3.00	80.00	28.00	15.00	3.00	4.00	3.00
2010	17.00	3.00	85.00	27.00	11.00	2.00	3.00	3.00
2011	18.00	2.00	82.00	25.00	11.00	2.00	2.00	1.00
Ending Cash Reserves ($1,000)								
2002	-335.22	709.71	-335.26	22.03	-268.89	1268.32	301.52	324.21
2003	-434.63	867.62	-831.63	47.06	-324.76	1310.29	417.02	510.77
2004	-663.58	980.52	-1423.34	27.21	-371.90	1341.58	521.97	733.30
2005	-690.61	1218.75	-1845.72	92.68	-180.71	1384.29	647.12	1230.59
2006	-633.40	1464.78	-2267.58	205.65	176.14	1426.52	771.85	1817.07
2007	-563.04	1710.22	-2702.70	307.81	558.67	1470.61	902.60	2439.75
2008	-473.90	1963.53	-3211.46	418.32	976.91	1527.33	1026.87	3097.46
2009	-407.68	2233.76	-3798.82	516.95	1348.22	1584.51	1157.74	3781.31
2010	-321.67	2528.08	-4476.34	602.23	1758.95	1654.51	1300.15	4515.75
2011	-245.45	2841.58	-5214.93	716.34	2217.90	1720.05	1441.58	5313.75
Prob. of ECR < 0 (%)								
2002	99.00	1.00	99.00	1.00	99.00	1.00	1.00	1.00
2003	99.00	1.00	99.00	1.00	99.00	1.00	1.00	1.00
2004	94.00	20.00	99.00	50.00	59.00	28.00	13.00	29.00
2005	85.00	5.00	99.00	52.00	62.00	19.00	7.00	15.00
2006	87.00	6.00	99.00	45.00	53.00	33.00	15.00	11.00
2007	78.00	7.00	99.00	43.00	47.00	42.00	10.00	12.00
2008	77.00	6.00	99.00	50.00	47.00	43.00	16.00	11.00
2009	68.00	11.00	99.00	43.00	43.00	72.00	20.00	13.00
2010	77.00	11.00	99.00	51.00	48.00	73.00	20.00	12.00
2011	69.00	7.00	99.00	48.00	45.00	88.00	25.00	12.00
Real Net Worth ($1,000)								
2011	7318.87	5465.31	528.88	5238.78	13332.26	2678.58	3937.31	11424.62

Table 4.1. Continued

	NYC110	NYC500	NYW800	NYW1200	TXC500	TXC1300	TXE550	TXE1000
Overall Financial Position								
2005-2011 Ranking	Good	Good	Good	Good	Good	Good	Good	Good
Prob. Economic Success								
Over 2002-2011 (%)	1.00	99.00	21.00	42.00	1.00	99.00	2.00	99.00
Net Present Value (NPV) ($1,000)								
2002-2011	-611.13	781.84	-753.11	-85.89	-1219.82	1874.42	-655.99	3477.11
Std. Dev.	58.650431	281.65971	826.16026	1103.6823	386.96981	906.87905	275.01765	679.09948
Coef. Var. (%)	-9.60	36.03	-109.70	-1285.00	-31.72	48.38	-41.92	19.53
Net Cash Farm Income ($1,000)								
2002	189.47	284.52	21.77	32.17	-22.94	212.65	162.29	440.61
2003	173.96	255.67	-3.10	58.32	-36.94	241.38	190.30	515.27
2004	170.64	255.35	-36.80	-19.64	-39.69	240.73	188.52	479.77
2005	188.71	323.57	19.73	56.91	28.30	395.12	230.23	548.46
2006	176.52	353.32	68.57	138.38	42.71	484.39	242.73	611.85
2007	180.01	371.73	78.68	161.52	48.21	520.33	255.95	645.94
2008	183.18	379.48	78.18	154.85	44.38	538.75	266.76	678.18
2009	185.07	381.83	59.27	114.00	34.87	528.71	268.18	690.76
2010	188.35	387.85	35.11	84.79	30.01	530.87	271.70	705.00
2011	190.73	403.40	45.71	97.19	30.94	551.19	281.07	723.19
Prob. of NCFI < 0 (%)								
2002	1.00	1.00	1.00	1.00	99.00	1.00	1.00	1.00
2003	1.00	1.00	99.00	1.00	99.00	1.00	1.00	1.00
2004	1.00	1.00	58.00	60.00	64.00	32.00	17.00	15.00
2005	1.00	1.00	53.00	50.00	47.00	18.00	7.00	5.00
2006	1.00	1.00	46.00	41.00	33.00	11.00	6.00	4.00
2007	1.00	1.00	40.00	36.00	37.00	14.00	7.00	3.00
2008	1.00	1.00	42.00	37.00	40.00	11.00	7.00	4.00
2009	1.00	1.00	52.00	48.00	42.00	17.00	8.00	4.00
2010	1.00	1.00	46.00	45.00	42.00	15.00	7.00	5.00
2011	1.00	1.00	51.00	52.00	50.00	14.00	5.00	2.00
Ending Cash Reserves ($1,000)								
2002	1621.14	136.11	-90.67	-130.22	578.53	14.77	1369.28	567.91
2003	1693.99	249.10	-185.56	-269.31	513.68	116.71	1468.53	896.49
2004	1759.82	362.06	-324.15	-527.48	443.33	168.51	1543.85	1143.72
2005	1849.84	511.26	-469.01	-754.95	429.69	337.72	1658.54	1461.56
2006	1929.27	652.36	-578.93	-931.71	421.77	525.30	1776.93	1803.31
2007	2012.60	786.86	-707.80	-1132.38	425.27	723.70	1901.84	2163.43
2008	2110.31	936.73	-834.88	-1303.39	415.98	928.47	2036.32	2549.92
2009	2216.66	1079.79	-993.75	-1528.17	386.08	1109.73	2181.27	2959.30
2010	2343.68	1234.54	-1144.68	-1761.93	351.70	1310.19	2338.85	3406.96
2011	2473.96	1369.09	-1300.28	-2037.87	317.26	1533.76	2508.40	3864.72
Prob. of ECR < 0 (%)								
2002	1.00	1.00	99.00	99.00	99.00	1.00	1.00	1.00
2003	1.00	1.00	99.00	99.00	99.00	1.00	1.00	1.00
2004	1.00	12.00	88.00	89.00	69.00	38.00	27.00	22.00
2005	1.00	4.00	90.00	92.00	59.00	35.00	18.00	10.00
2006	1.00	5.00	90.00	92.00	56.00	33.00	17.00	8.00
2007	1.00	6.00	90.00	91.00	52.00	29.00	21.00	11.00
2008	1.00	7.00	91.00	95.00	55.00	28.00	21.00	12.00
2009	7.00	14.00	85.00	87.00	63.00	31.00	26.00	14.00
2010	10.00	12.00	96.00	98.00	63.00	35.00	35.00	11.00
2011	11.00	17.00	88.00	92.00	65.00	32.00	32.00	13.00
Real Net Worth ($1,000)								
2011	3164.53	4529.17	2691.35	3479.87	2270.56	5515.56	3886.13	7438.37

Table 4.1. Continued

	TXN2400	VT134	VT350	WA250	WA850	WI135	WI700	D122
Overall Financial Position								
2005-2011 Ranking	Good	Good	Good	Good	Good	Good	Good	Good
Prob. Economic Success								
Over 2002-2011 (%)	99.00	1.00	1.00	1.00	9.00	1.00	98.00	1.00
Net Present Value (NPV) ($1,000)								
2002-2011	8463.35	-868.32	-766.42	-629.71	-2072.87	-867.75	1077.19	-805.14
Std. Dev.	1507.4828	78.455738	286.28461	218.93325	1328.056	90.784532	538.73884	60.928772
Coef. Var. (%)	17.81	-9.04	-37.35	-34.77	-64.07	-10.46	50.01	-7.57
Net Cash Farm Income ($1,000)								
2002	604.73	103.63	51.28	128.11	-134.33	100.29	153.51	197.04
2003	696.56	116.68	22.21	95.83	-218.32	109.55	241.99	159.50
2004	712.74	109.03	21.92	90.47	-260.46	113.82	245.55	168.99
2005	962.10	135.77	68.35	141.59	-141.08	126.60	300.53	155.95
2006	1169.54	125.18	72.69	141.78	-112.75	117.51	345.87	158.25
2007	1235.17	127.94	81.11	150.21	-113.67	122.23	369.70	153.06
2008	1282.23	131.70	84.62	154.53	-131.89	127.03	396.26	153.66
2009	1287.99	133.27	83.62	159.61	-174.23	127.12	402.66	157.40
2010	1302.38	131.98	81.35	163.27	-222.39	116.64	411.23	158.76
2011	1348.66	136.43	86.19	173.43	-232.62	115.60	435.95	160.65
Prob. of NCFI < 0 (%)								
2002	1.00	1.00	1.00	1.00	99.00	1.00	1.00	1.00
2003	1.00	1.00	1.00	1.00	99.00	1.00	1.00	1.00
2004	18.00	1.00	46.00	31.00	69.00	1.00	31.00	1.00
2005	8.00	1.00	27.00	11.00	67.00	1.00	17.00	1.00
2006	5.00	1.00	26.00	9.00	66.00	1.00	15.00	1.00
2007	3.00	1.00	24.00	8.00	61.00	1.00	14.00	1.00
2008	4.00	1.00	24.00	10.00	60.00	1.00	14.00	1.00
2009	5.00	1.00	27.00	16.00	68.00	1.00	16.00	1.00
2010	5.00	1.00	28.00	8.00	70.00	1.00	11.00	1.00
2011	4.00	1.00	31.00	8.00	67.00	3.00	10.00	1.00
Ending Cash Reserves ($1,000)								
2002	333.73	1423.72	-20.91	632.62	-278.17	183.73	43.80	104.63
2003	743.20	1477.48	-37.07	664.85	-574.76	234.67	164.37	170.90
2004	1108.10	1523.63	-54.56	680.17	-920.56	284.93	231.51	233.90
2005	1654.22	1590.50	-51.84	739.78	-1167.54	334.43	345.86	284.74
2006	2311.70	1643.04	-50.66	791.23	-1422.98	374.47	468.89	334.97
2007	2979.20	1699.63	-49.85	853.37	-1687.90	415.35	593.30	374.39
2008	3684.68	1758.26	-52.75	909.74	-1956.19	461.68	747.37	411.46
2009	4404.90	1829.12	-64.30	977.01	-2310.28	509.69	881.34	457.44
2010	5192.27	1913.62	-66.04	1054.70	-2709.45	535.29	1031.60	492.28
2011	6034.17	1993.50	-83.92	1140.11	-3092.01	552.28	1194.41	527.49
Prob of ECR < 0 (%)								
2002	1.00	1.00	99.00	1.00	99.00	1.00	1.00	1.00
2003	1.00	1.00	99.00	1.00	99.00	1.00	1.00	1.00
2004	28.00	6.00	69.00	44.00	99.00	11.00	41.00	1.00
2005	14.00	1.00	72.00	23.00	97.00	5.00	34.00	1.00
2006	7.00	9.00	69.00	29.00	97.00	21.00	32.00	1.00
2007	11.00	10.00	68.00	26.00	95.00	17.00	32.00	2.00
2008	9.00	20.00	69.00	33.00	98.00	17.00	31.00	1.00
2009	17.00	29.00	69.00	34.00	93.00	24.00	34.00	1.00
2010	12.00	31.00	79.00	35.00	97.00	49.00	38.00	3.00
2011	13.00	47.00	77.00	38.00	94.00	54.00	38.00	1.00
Real Net Worth ($1,000)								
2011	12650.75	2904.07	2939.07	2989.48	967.06	2900.55	4758.08	5676.78

- Net Present Value (NPV) is the sum of the present value of owner withdrawals plus the sum of the annual changes in real net worth over the planning horizon.

Average NPV for the Dutch farm is -$805 thousand over the planning horizon and the farm has a one percent probability of a positive NPV or economic success (Table 4.1). The Dutch farm also has a one percent probability of a negative cash farm income in each year of the planning horizon and only a three percent probability of negative ECR over the same period.

The low probabilities of negative NCFI and ECR and the low probability of refinancing deficits are due to the relatively low amount of risk in the Netherlands relative to the U.S. with respect to milk price and production per cow. The Netherlands has almost zero variability in milk price with a difference of less than $1.50 per cwt. of milk in any given year. However, the U.S. experiences variability in milk prices across different milk producing regions and has variability of greater than $3.00 per cwt. of milk within each region in any given year. Figure 4.1 shows the distribution of milk prices in year ten of the planning horizon for the Dutch farm and two representative U.S. dairies located in different production regions. (FLN500 and ID3000).

The Dutch farm also has negligible variability in terms of production per cow due to milk production quotas. With severe penalties for production greater than the quota level and a loss in income to the farm for production less than the quota level, the farm produces at quota 80% of the time and produces within seven pounds per cow per year under quota the rest of the time. The U.S. farms are characterized by wide variable production per cow each year. Figure 4.2 shows the range of milk production per cow

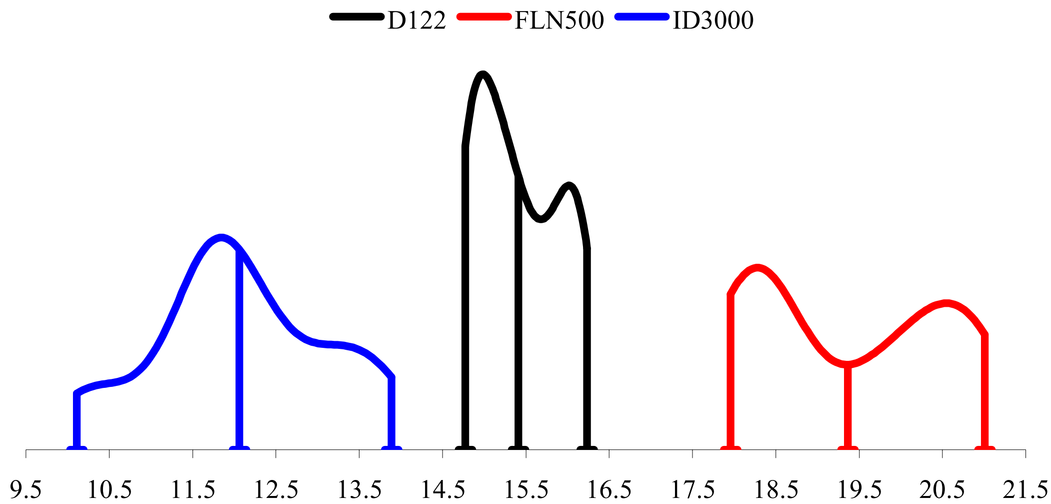


Figure 4.1. Probability Density Functions (PDFs) of Milk Price ($/cwt) for the Dutch Dairy and Two Representative U.S. Dairy Farms in 2011

Note: See Appendix A for Definitions of Representative Farms

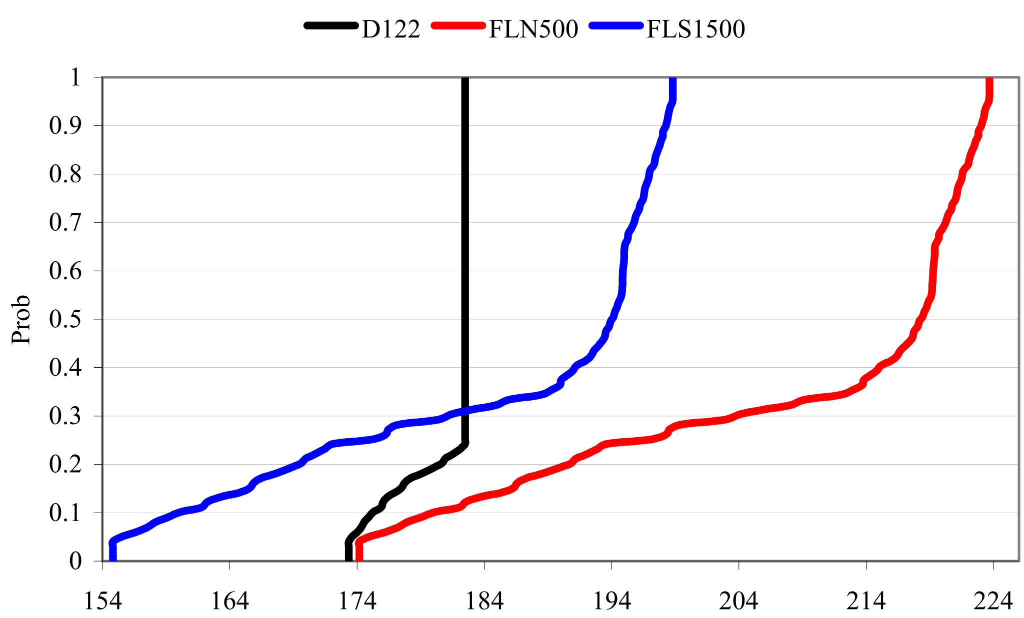


Figure 4.2. Cumulative Distribution Function (CDFs) of Milk/Cow/Year (cwt) for the Dutch Farm and Two Representative U.S. Dairy Farms in 2011

Note: See Appendix A for Definitions of Representative Farms and the probability of producing a certain amount of milk in year 10 of the planning horizon in the Netherlands and on two U.S. dairies (FLN500 and FLS1500).

NPV on real net worth is negative due largely to the amount of assets held in the form of quota by the Dutch farm. Quota value makes up 51% of assets and is held constant over the planning horizon, so wealth invested in quota does not benefit the farm with increases in real net worth. Quota value will go to zero in 2014 if the proposed legislation for the Common Agricultural Program in the E.U. passes (Ondersteijn 2004). The result is a return to the farm of less than 5% per year, which is less than the discount rate.

The U.S. farms with the highest average NPVs are the ID3000 ($9.1 million) and TXN2400 ($8.5 million) (Table 4.1). These two farms have significantly more risk than the Dutch farm as evidenced by the coefficient of variation (CV) on NPV. The Idaho farm has a CV on NPV of 24.11% and the Texas farm has a CV of 17.81%, while the Dutch farm has a CV of -7.57%. The higher CV on NPV for the U.S. farms is due to much greater risk on milk price, feed prices, and milk production per cow.

The probability of negative annual NCFI ranges from 1% to 39% on the ID3000 farm (Table 4.1). On the TXN2400 dairy farm the probability of negative annual NCFI ranges from 1% to 18%. NYC110, NYC500, VTD134, and D122 dairies have a one percent probability of negative annual NCFI over the full period and the probability of negative NCFI on the MO85, MO400, and WI135 dairies is less than 4% over the same time.

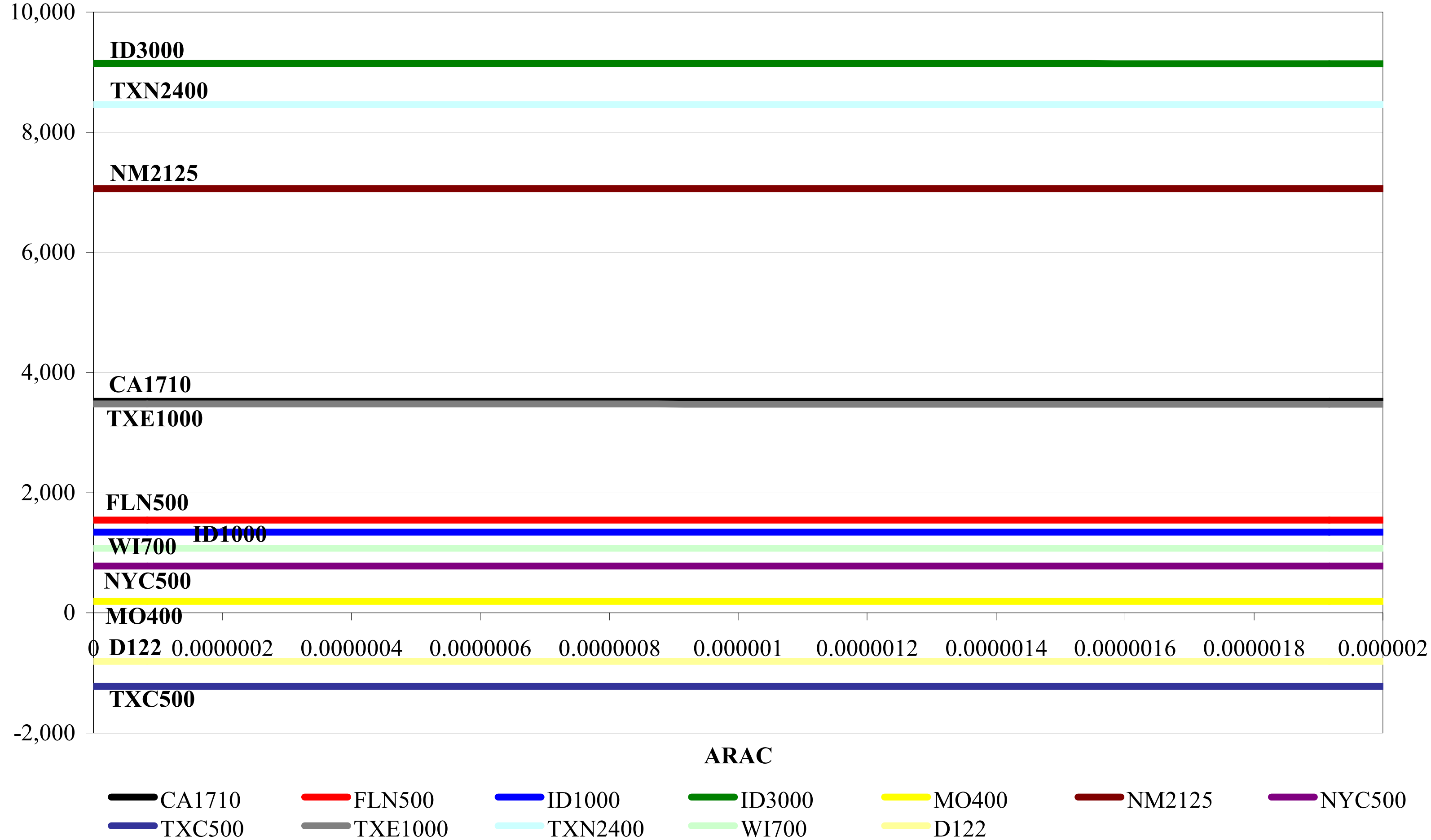
If a farm has adequate ECR, a negative NCFI may not require refinancing assets (e.g. VT134). When cash reserves plus NCFI are not adequate to cover cash outflows for principal payments, owner withdrawals, income taxes, and machinery replacement, the farm will experience negative ECRs and must refinance to remain in business (e.g. VT350). On the Dutch farm, the probability of negative annual ECR never reaches higher than 3%.

Six of the representative U.S. dairies are characterized by a high probability of economic success and a low probability of negative ECR (FLN500, MO400, NM2125, NYC500, TXE1000, and TXN2400). Each of the six farms has a 99% chance of economic success (e.g. NPV>0) and less than a 29% probability of negative ECR in any year of the planning horizon.

The probability of negative ECR is quite low (<11%) on the NYC110 farm over the planning horizon. On the FLN500 farm the probability of negative ECR ranges from 1% to 20% over the period. In contrast the FLS1500 farm has a 99% chance of negative ECR over the period. A similar cash flow problem is observed for the probability of negative ECR on the NYW1200 dairy where the probability reaches a high of 99% and a low of 87% in 2009.

SERF Results

The NPV empirical probability distributions for the 24 dairy farms generated from the stochastic analyses were ranked using SERF. The chart in Figure 4.3 displays the results of the SERF rankings of the Dutch farm and the U.S. dairies with a



Note: See Appendix A for Definitions of Representative Farms

Figure 4.3. Stochastic Efficiency with Respect to a Function (SERF) Ranking of Twelve Dairy Farms Assuming a Negative Exponential Utility Function

probability of economic success greater than 80%. All risk neutral and risk averse decision makers (RAC < 0.000002) would prefer the ID3000 dairy. The second and third choice over the same RAC range would be the TXN2400 dairy and NM2125 dairy, respectively. Of particular interest is that the Dutch dairy is ranked second to last for all levels of risk aversion among the farms. Not only is it ranked low, but it is in the negative range of certainty equivalents.

If the alternative dairies are ranked based on mean NPVs, the top four farms are ranked as: ID3000, TXN2400, NM2125, and TXE1000. On the other hand, ranking the farms based on minimum standard deviation for NPV results in MO85, NYC110, D122, and VT134 as the top four farms. Basing the rankings on the lowest probability of negative ECR results in the D122 farm being first followed by the NYC110 farm. Ranking the farms based on probability of economic success results in nine dairies being tied with a 99% probability.

Summary

Two methods of preference ranking were used for this study: average NPV and probabilities of key output variables, and stochastic efficiency with respect to a function (SERF) analysis of NPV probability distributions. With the first method, inconsistent preferences across variables made it difficult to determine overall preference. While the Dutch farm had a low probability (1%) of negative NCFI and only as high as a 3% chance of negative ECR, it is projected to have an NPV of -$1.75 million and a 1% probability of economic success over the planning horizon. If rank were based on low probabilities of negative NCFI and ECR, the Dutch farm might be preferred over alternatives. However, if rank is based on mean NPV, the results will likely differ.

The SERF analysis of the NPV distribution across all dairies allowed for a clear preference ranking for risk neutral and risk averse farmers. The SERF results show 11 of the representative U.S. dairy farms were preferred to the Dutch dairy over the given range of risk aversion (Figure 4.3). In a complete SERF analysis with all 23 U.S. dairies, 17 were preferred to the Dutch farm over the same level of risk aversion. The six that were less preferred were FLS1500, MO85, TXC500, VT134, WA850 and WI135. These six dairies were less preferred due to a combination of costs in the form of environmental compliance regulation, variable costs per cow higher in the U.S. than in the Netherlands, and greater variability in terms of production per cow and price of milk. For example, the south Florida dairy is less preferred because it faces input costs of production almost twice that of the Dutch farm and high environmental compliance regulations. WA850 is less preferred because it too faces variable costs of production per cow almost twice that of the Dutch farm and receives a much lower price for its milk (about 60%).

CHAPTER V

SUMMARY AND CONCLUSION

Problem Statement

Dairy producers in the Netherlands have been struggling to stay in business due to increased environmental legislation, population density, intensity of farming systems, costs of production and quota restrictions. Due to the changing nature of dairy policy in the E.U., there is a constant need to evaluate the options available to economically strained dairy farmers. Relocation is one possible option available and has become a growing trend for Dutch farmers over the past 40 years. This study explored the probability of economic success of relocating Dutch dairy farmers to the United States.

Objective

The objective was to analyze the economic viability of a 122-cow dairy farm continuing to operate in the Netherlands versus immigrating to the U.S and applying the same level of equity towards the purchase of a dairy farm. Twenty-three different dairy operations in the U.S. were analyzed in a stochastic simulation framework assuming the Dutch farm invested $1.95 million in each farm and financed the balance as long-term debt. The results of the stochastic simulations were used to estimate empirical probability distributions for NPV to calculate the probabilities that annual NCFI and ECR are positive and to rank the NPV probability distributions for risk averse decision makers.

Procedure

A whole farm simulation model, FLIPSIM, was used to simulate a representative Dutch dairy and 23 representative U.S. dairy farms in major production regions for the 2002–2011 planning horizon to estimate the NPV probability distribution for the alternative farms. The model simulated stochastic yields, prices, and production for 100 iterations (samples) to produce 100 possible NPV's. From these values, an empirical probability density function (pdf) for NPV was estimated for each farm.

The FLIPSIM results for the cumulative distribution of NPV for nominal net worth were compared using stochastic efficiency with respect to a function (SERF) to determine preference rankings for risk neutral and risk averse decision makers with a given range of risk aversion. A lower RAC value of zero was assumed to reflect a decision maker who is risk neutral. The upper RAC value (0.000002) was set at 4/Average NW, where NW is the nominal net worth of each farm at the end of the planning horizon.

Results

Results of the analysis show that the Dutch farm has an average NPV of -$805 thousand over the 2002–2011 period, while 11 of the 23 U.S. farms had positive average NPVs. The Dutch farm has a 1% probability of economic success (as defined by having a positive NPV) but only a 1% chance of having negative NCFI and ECR. This result can be explained by the low level or risk in the Netherlands in terms of milk prices and production, as well as the amount of assets held by the farm as quota. Forty-one percent of the Dutch farm's asset value is held as quota, which does not inflate over time, while land values inflate at 10% per year (Besten and Hoven 2004, Ondersteijn 2004).

Purchasing one of the following six U.S. dairy farms, FLN500, MO400, NM2125, NYC500, TXE1000, and TXN2400 would give the Dutch farmer a 99% chance of economic success. The added risk on income in the U.S. would result in these U.S. farms having a 1 to 99% chance of negative ECR and a 1 to 99% chance of negative NCFI.

The 11 representative U.S. dairies with greater than a 80% probability of economic success were compared to the Dutch farm using SERF. The SERF analysis of the 12 dairy farms indicates that for all decision makers with RAC levels over the range of 0 to 0.000002, the ID3000 dairy is preferred, followed by TXN2400 and NM2125, respectively. Ten of the eleven U.S. dairy farms are ranked higher by risk neutral and risk averse decision makers than the Dutch farm. The SERF results also show that of the 23 U.S. farms a Dutch farmer could purchase, only six were less preferred over the risk neutral to risk averse RAC range.

Conclusion

In a complete SERF analysis, seventeen of the twenty-three U.S. farms were preferred to the Dutch farm for the risk neutral and risk averse decision maker. The SERF results show the four most preferred farms were ID3000, TXN2400, NM2125, and CA1710 dairy for all decision makers with RAC values between 0 and 0.000002. In conclusion, Dutch dairy farmers who have adequate equity would be much better off financially to immigrate to the U.S. if they want to continue dairying, rather than staying in the Netherlands.

REFERENCES

Anderson, J.R., J.L. Dillon, and J.B. Hardaker. *Agricultural Decision Analysis*. Ames, IA: Iowa State University Press, 1977.

Bailey, K.W., "U.S. Market Structure: The Dairy Industry in the 21st Century." Paper presented at 66th Annual Meeting of the International Association of Milk Control Agencies, July 14-17, 2002.

Besten, M. and Hoven, P. "Dairy Migration into the United States: What Are the Probabilities of Success for Dutch Dairy Farmers Moving into the United States of America Versus Staying in the Netherlands?" MS Thesis, Wageningen University, Wageningen, Netherlands, 2004

Blayney, D.P., "The Changing Landscape of U.S. Milk Production." Report #: SBN-978. U.S. Department of Agriculture, Economic Research Service, Washington, DC. June, 2002.

Bouamra-Mechemache, Z., J.P. Chavas, T.L. Cox, and V. Requillart. "Interregional Analysis of the Impacts of Eliminating European Union Milk Production Quotas." Paper Presented at AAEA Annual Meeting, Quebec, Canada, 6 August 2001.

Decisioneering, Inc. "Risk Analysis Overview: What Is Monte Carlo Simulation?" Denver, CO: Decisioneering, Inc., Available at http://decisioneering.com/monte-carlo-simulation.html, April, 24, 2004.

FAPRI. "Baseline Projections, August 2004." Food and Agriculture Policy Research Institute, University of Missouri-Columbia, August 2004

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

Hardaker, J.B., R.B.M. Huirne, and J.R. Anderson. *Coping with Risk in Agriculture*. New York: CAB International, 1997.

Hardaker, J.B., R.B.M. Huirine, J.R. Anderson, and G. Lien. *Coping with Risk in Agriculture*. Second Edition. New York: CAB International, 2004a.

Hardaker, J.B., J.W. Richardson, G., Lien, and K.D. Schumann. "Stochastic Efficiency Analysis with Risk Aversion Bounds: A Simplified Approach." *Australian Journal of Agricultural and Resource Economics* 48(2004b):253-70.

Horne, P. van, H. Prins. "Development of Dairy Farming in the Netherlands in the Period 1960-2000." Report# 2.02.07, The Hague, Agricultural Economics Research Institute (LEI), 2002.

Houston, C.M. "Farm-Level Economic Impacts of the House of Representatives Farm Bill Proposal, H.R. 2646, and the Senate Farm Bill Proposal, S. 1731, for Representative Rice Farms." MS Thesis, Texas A&M University, College Station, 2002.

Hutton, R.F., and H.R. Hinman. "Mechanics of Operating the General Agricultural Firm Simulator." in *Agricultural Production Systems Simulation*, ed. V.R. Eidman, Stillwater: Oklahoma State University Press, Stillwater. 1971. pp.21-64.

(IFCN) International Farm Comparison Network, "Dairy Report: For a Better Understanding of Dairy Farming World-Wide." IFCN Centre. Braunschweig, Germany. 2003.

Kinnucan, H., U. Hatch, J.J. Molnar, and M. Venkateswaran. "Scale Neutrality of Bovine Soatotropin: Ex Ante Evidence from the Southeast." *Southern Journal of Agricultural Economics* 8(December 1990):1-12.

Kramer, R.A. and R.D. Pope. "Participation in Farm Commodity Programs: A Stochastic Dominance Analysis." *American Journal of Agricultural Economics* 63(1981): 119-128.

Lemieux, C.M., J.W. Richardson, and C.J. Nixon. "Federal Crop Insurance vs. ASCS Disaster Assistance for Texas High Plains Cotton Producers: An Application of Whole-Farm Simulation." *Western Journal of Agricultural Economics* 7(1982): 141-153.

Lesser, W., J. Bernard, and K. Billah. "Methodologies for Ex Ante Projections of Adoption Rates for Agbiotech Products: Lessons Learned from rbST." *Agribusiness*. 15 (1999): 149-62.

Looker, D., "Milk Meisters: Top 20 Dairy Farms." Successful Farming. Available at http://www.agriculture.com/sfonline/1998/November/milk/milk_meisters/chart.html, April, 23, 2004.

McCarl, B.A. and D. Bessler. "Estimating an Upper Bound on the Pratt Risk Aversion Coefficient When the Utility Function Is Unknown." *Australian Journal of Agricultural Economics* 33(1989):56-63.

McBride, W.D., S. Short, and H. El-Osta. "The Adoption and Impact of Bovine Somatotropin on U.S. Dairy Farms." *Review of Agricultural Economics.* Forthcoming 2004.

McNeil, D. Standard Grade Geography: "Population: Migration." Available at http://www.scalloway.org.uk/popu14.htm, September 25, 2004.

Monsanto. Production and Profitability. "Relocation – A Growing Trend." Available at http://www.moomilk.com/archieve/prod_prof_33.htm, April 15, 2004

Ondersteijn, C., Personal Communication. Professor in the Department of Business Economics at Wageningen University in the Netherlands. Oct. 13-15, 2004.

Outlaw, J.L., R.E. Jacobson, R.D. Knutson, and R.B. Schwart, Jr. "Structure of the U.S. Dairy Farm Sector." in Dairy Markets and Policy: Issues and Opinions #M-4. Cornell University Press: Ithaca, NY. March 1996.

Outlaw, J.L., Richardson, J.W., Herbst, B.K., Anderson, D.P., Sartwelle, J.D., Raulston, J.M., Feldman, P., Schumann, K., Klose, S.L., Schwart, R.B., Zimmel, P. "Representative Farms Economic Outlook for the January 2004 FAPRI/AFPC Baseline." Agricultural and Food Policy Center, Department of Agricultural Economics, Texas A&M University, College Station. February 2004.

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

Richardson, J.W., and C.J. Nixon. "The Farm Level Income and Policy Simulation Model: FLIPSIM." Texas Agricultural Experiment Station, Department of Agricultural Economics, Departmental Technical Report. No. 81-2. Texas A&M University, College Station. 1981.

Richardson, J.W., and C.J. Nixon. "Description of FLIPSIM V: A General Firm Level Policy Simulation Model." Bulletin B-1528, Texas Agricultural Experiment Station, Texas A&M University, College Station. July 1986.

Richardson, J.W. "Simulation for Applied Risk Management." Agricultural and Food Policy Center, Texas A&M University, January 2004.

Saha, A., H.A. Love, and R. Schwart. "Adoption of Emerging Technologies Under Output Uncertainty." *American Journal of Agricultural Economics* 76(Nov 1994):836-46.

United States Department of Agriculture, APHIS, VS, CEAH, NAHMS. "Dairy 2002. Part II: Changes in the U.S. Dairy Industry, 1991-2002." Fort Collins, CO., 2002

Yonkers, R.D. "Impacts of Exogenously-Determined Variables on Dairy Farms: A Simulation Modeling Approach." Ph.D. Dissertation, Texas A&M University, College Station, 1989

Zepeda, L. "Predicting Bovine Somatotropin Use by California Dairy Producers." *Western Journal of Agricultural Economics* 15(July 1990):55-62.

Zimmel, P.T. "The Effects of Farm Program Provisions on Lease Arrangements Under Uncertainty." MS Thesis, Texas A&M University, College Station, 1994

APPENDIX A

- CA1710: A 1,710-cow, large-sized central California (Tulare County) dairy. The farm plants 525 acres of hay/silage for which it employs custom harvesting. Milk sales generated 91 percent of 2003 total receipts for the farm.
- FLN500: A 500-cow, moderate-sized north Florida (Lafayette County) dairy. The diary grows 130 acres of hay each year. All other feed requirements are purchased in a pre-mixed ration. Milk sales accounted for 93 percent of the farm receipts in 2003.
- FLS1500: A 1,500-cow, large-sized south central Florida (Okeechobee County) dairy. FLSD1500 plants 500 acres of hay annually. Milk sales represented 95 percent of 2003 total receipts.
- ID1000: A 1,000-cow, moderate-sized Idaho (Twin Falls County) dairy. This farm plants no crops. All replacements are custom raised off the farm, while ownership is retained. Milk sales accounted for 89 percent of IDD1000's gross receipts for 2003.
- ID3000: A 3,000-cow, large-sized Idaho (Twin Falls County) dairy. This farm plants 500 acres for silage, 500 acres for wheat, and 1,000 acres of alfalfa hay annually. During 2003, milk sales accounted for 92 percent of this farm's gross receipts.

- MO85: An 85-cow, moderate-sized southwest Missouri (Christian County) diary. The farm plants 200 acres of hay and 30 acres of silage. Milk accounted for 79 percent of 2003 gross farm receipts.
- MO400: A 400-cow, large-sized southwest Missouri (Christian County) dairy. The farm plants 315 acres of hay, 135 acres of silage, and 150 acres of improved pasture annually. Milk accounted for 91 percent of gross farm receipts in 2003.
- NM2125: A 2,125 cow, large-sized southern New Mexico (Dona Ana and Chaves Counties) dairy. This farm purchases all commodities necessary for blending its own total mixed ration and plants no crops. Milk sales accounted for 92 percent of 2003 total receipts.
- NYC110: A 110-cow, moderate-sized central New York (Cayuga County) dairy. The farm plants 80 acres for hay, 64 acres for corn, and 131 acres for silage annually. Milk accounted for 85 percent of gross receipts on this dairy for 2003.
- NYC500: A 500-cow, large-sized central New York (Cayuga County) dairy. This farm plants 714 acres of hay and haylage and 386 acres of silage. Milk sales made up 92 percent of the total receipts for this dairy in 2003.

- NYW800: An 800-cow, moderate-sized western New York (Wyoming County) dairy. This farm plants 690 acres of silage and 750 acres of haylage annually. Milk sales accounted for 92 percent of the gross receipts in 2003 for this farm.
- NYW1200: A 1,200-cow, large-sized western New York (Wyoming County) dairy. This farm plants 2,160 acres for silage annually. Milk sales accounted for 92 percent of the 2003 gross receipts for this farm.
- TXC500: A 500-cow, moderate-sized central Texas (Erath County) dairy. TXC500 plants 500 acres of hay each year. Milk sales represented 90 percent of this farm's gross receipts in 2003.
- TXC1300: A 1,300-cow, large-sized central Texas (Erath County) dairy. TXC1300 plants 215 acres of silage annually. Milk sales accounted for 92 percent of 2003 gross receipts.
- TXE550: A 550-cow, moderate-sized northeast Texas (Hopkins County) dairy. This farm has 300 acres of improved pasture and 50 acres of hay. Milk sales represented 88 percent of annual receipts in 2003.
- TXE1000: A 1,000-cow, large-sized northeast Texas (Hopkins County) dairy. This farm plants 875 acres of hay/silage. This farm generated 88 percent of receipts from milk sales in 2003.
- TXN2400: A 2,400-cow, large-sized diary located in the South Plains of Texas (Bailey County). This farm plants 180 acres for silage annually. Milk sales accounted for 89 percent of 2003 gross receipts.

- VT134: A 134-cow, moderate-sized Vermont (Washington County) dairy. VT134 plants 30 acres of hay, and 190 acres of silage annually. Milk accounted for 85 percent of the 2003 gross receipts for this farm.
- VT350: A 350-cow, large-sized Vermont (Washington County) dairy. This farm plants 40 acres of hay and 660 acres of silage annually. Milk sales represented 89 percent of VT350's gross receipts in 2003.
- WA250: A 250-cow, moderate-sized northern Washington (Whatcom County) dairy. This farm plants 200 acres of silage and generated 91 percent of its gross receipts from milk sales in 2003.
- WA850: An 850-cow, large-sized northern Washington (Whatcom County) dairy. This farm plants 605 acres for silage annually. 92 percent of this farm's gross receipts came from milk in 2003.
- WI135: A 135-cow, moderate-sized eastern Wisconsin (Winnebago County) dairy. The farm plants 297 acres of hay, 184 acres of corn, and 99 acres of soybeans. Milk constituted 84 percent of this farm's 2003 receipts.
- WI700: A 700-cow, large-sized eastern Wisconsin (Winnebago County) dairy. The farm plants 696 acres of hay and 454 acres of silage each year. Milk sales comprised 92 percent of the farm's receipts in 2003.
- D122: A 122-cow, large sized Dutch (Noordelijk, Holland) dairy. The farm plants 126 acres for grass silage annually. Milk sales represented 75 percent of its gross receipts in 2003.

APPENDIX B

10/15/04 20:32 PAGE 1 AFPC/TAES Ver2004.03.1(C)
INCOME STATEMENT FOR YEARS 2002 - 2011
NO.100DD122 03-Feb-04 Dutch Dairy VE1 08/25/04

YEARS 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CASH INCOME (NET OF SHARE LEASE)										
C(470) CASH RECEIPTS FOR CROPS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(348) DAIRY RECEIPTS	480922.	457666.	440033.	420779.	403564.	397771.	398001.	398542.	399159.	399786.
EP(1307) LUMP SUM PAYMENTS	0.	0.	24283.	24283.	41943.	41943.	41943.	41943.	41943.	41943.
C(469) INDEMNITY PAYMENTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(476) OTHER FARM INCOME	12000.	12000.	12000.	12000.	12000.	12000.	12000.	12000.	12000.	12000.
C(107) TOTAL CASH RECEIPTS	492922.	469666.	476316.	457062.	457507.	451714.	451944.	452484.	453101.	453729.
CASH FARM EXPENSE (NET OF SHARE LEASE) CROP PROD & HARVEST COSTS										
C(201) SEED COSTS	1530.	1565.	1581.	1612.	1644.	1677.	1711.	1745.	1780.	1816.
C(202) FERTILIZER COSTS	10284.	10451.	10746.	10754.	10925.	11048.	11179.	11305.	11426.	11554.
C(203) HERBICIDE COSTS	979.	1001.	1011.	1032.	1052.	1073.	1095.	1117.	1139.	1162.
C(204) INSECTICIDE COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(205) IRRIGATION FUEL COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(206) OTHER PRODUCTION COSTS	19283.	19716.	19914.	20312.	20718.	21132.	21555.	21986.	22426.	22874.
C(207) HARVESTING COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(208) FUEL & LUBE COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(209) TOTAL CROP PROD COST	32076.	32734.	33252.	33709.	34339.	34931.	35540.	36153.	36770.	37405.
C(518) DAIRY COSTS	30479.	31165.	31476.	32106.	32748.	33403.	34071.	34753.	35447.	36157.
C(519) DAIRY FEED COSTS	85384.	89419.	87427.	82744.	82202.	80728.	79491.	77531.	75839.	74159.
C(419) PURCHASED DAIRY STOCK	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(110) CASH RENT FOR LAND	9818.	9818.	9818.	9818.	9818.	9818.	9818.	9818.	9818.	9818.
C(192) RENT STATE/PRIVATE PAST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(1032)MANAGEMENT COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(1067)MANAGEMENT BONUS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(1101)ADDED MANAG. COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(109) HIRED LABOR COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(116) PROPERTY TAXES	2113.	2113.	2113.	2113.	2113.	2113.	2113.	2113.	2113.	2113.
C(46+438)PERSONAL PROPERTY TAX	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(189) SALES TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(47) OTHER TAXES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(48) ACCOUNTANT & LEGAL FEES	3780.	3865.	3904.	3982.	4061.	4143.	4226.	4310.	4396.	4484.
C(49) UNALLOCATED MAINTENANCE	18000.	18405.	18589.	18961.	19340.	19727.	20121.	20524.	20934.	21353.
C(352) UTILITIES	1026.	1049.	1060.	1081.	1102.	1124.	1147.	1170.	1193.	1217.
C(60) OTHER FUEL & LUBE	5400.	5522.	5577.	5688.	5802.	5918.	6036.	6157.	6280.	6406.
C(50) LIABILITY INSURANCE	3240.	3313.	3346.	3413.	3481.	3551.	3622.	3694.	3768.	3844.
C(51) MISCELLANEOUS COSTS	15600.	15951.	16110.	16433.	16761.	17097.	17438.	17787.	18143.	18506.
C(360) CAT PREMIUMS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(59) OTHER FARM EXPENSES	20400.	20859.	21068.	21489.	21919.	22357.	22804.	23260.	23726.	24200.
C(150) CROP STORAGE COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(567) CONSERVATION COMPLIANCE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(645) ENVIRONMENTAL COMPLIANC	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(468) CROP INSURANCE PREMIUMS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(392) SUB-TOTAL OF CASH COSTS	227316.	234212.	233740.	231536.	233688.	234910.	236429.	237270.	238429.	239662.
C(111) INTEREST ON LONG-TERM D	45000.	44323.	43612.	42865.	42081.	41257.	40393.	39485.	38532.	37532.
C(112) INTEREST ON INTERMED. D	16680.	15183.	14965.	13640.	11548.	10662.	9214.	6862.	5813.	4414.
C(481) INTEREST ON OPERATING D	6883.	4448.	2489.	0.	0.	0.	0.	0.	0.	0.
C(297) INTEREST ON CARRYOVER D	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(119) TOTAL CASH EXPENSES	295879.	298167.	294806.	288041.	287316.	286829.	286036.	283618.	282774.	281607.
C(131) NET CASH FARM INCOME	197043.	171499.	181510.	169020.	170191.	164885.	165907.	168867.	170327.	172122.

C(121) DEPRECIATION	-74099.	-46940.	-69280.	-53873.	-39856.	-64204.	-56020.	-38976.	-63129.	-42136.
C(120) NET FARM INCOME	122945.	124559.	112230.	115147.	130335.	100681.	109887.	129891.	107198.	129986.

10/15/04 20:32 PAGE 2 AFPC/TAES Ver2004.03.1(C)

CASHFLOW STATEMENT FOR YEARS 2002 - 2011

NO.100DD122 03-Feb-04 Dutch Dairy VE1 08/25/04

YEARS 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
C(129) BEGINNING CASH RESERVES	0.	104629.	182909.	258522.	322717.	385448.	437459.	487722.	546318.	594061.
				PLUS:						
C(131) NET CASH FARM INCOME	197043.	171499.	181510.	169020.	170191.	164885.	165907.	168867.	170327.	172122.
C(76) OFF-FARM SALARY INCOME	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(77) OFF-FARM NON-SALARY INC	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(126) NON-TAXABLE INCOME	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(126) INTEREST ON CASH RESERV	0.	790.	1381.	2156.	3109.	4047.	4821.	5573.	6449.	7161.
C(57) NEW CAPITAL INVESTED IN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(272) SELL MACH. & LIVESTOCK	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(462) PROCEEDS FROM FARMLAND	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(167) TOTAL CASH AVAILABLE	197043.	276918.	365800.	429698.	496017.	554379.	608187.	662162.	723095.	773344.
				MINUS:						
C(31) CASH DIFF MACH REPLACED	936.	0.	5713.	0.	0.	5632.	2877.	348.	8108.	2413.
C(657) PAYOFF MACHINERY BOUGHT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(544) REG. PRINCIPAL LT LOAN	13546.	14224.	14935.	15682.	16466.	17289.	18153.	19061.	20014.	21015.
C(545) PRE-PAY PRINCIPAL LT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(546) REG. PRINCIPAL IT LOAN	29932.	31429.	37898.	41857.	43949.	43134.	47858.	44146.	47912.	53914.
C(547) PRE-PAY PRINCIPAL IT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(298) OPERATING LOAN CARRYOVE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(118) FAMILY WITHDRAWALS	48000.	48356.	48732.	49442.	50154.	50865.	51577.	52288.	52999.	53710.
C(322) TOTAL CASH OUTFLOWS	92414.	94009.	107278.	106981.	110569.	116920.	120465.	115844.	129034.	131053.
C(514) ANNUAL CASH POSITION	104629.	78280.	75613.	64195.	62731.	52011.	50263.	58596.	47743.	48230.
C(39) CUMMUL CASH POSITION	104629.	182909.	258522.	322717.	385448.	437459.	487722.	546318.	594061.	642291.
C(129) CUMMUL CASH RESERVES	104629.	182909.	258522.	322717.	385448.	437459.	487722.	546318.	594061.	642291.

CURRENT MARKET VALUE BALANCE SHEET FOR 2001 AND FOR SIMULATED YEARS 2002 - 2011

YEARS 2001 - 2011	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					ASSETS:						
C(129) CASH RESERVES	0.	104629.	182909.	258522.	322717.	385448.	437459.	487722.	546318.	594061.	642291.
C(52) CROP INVENTOR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(53) CROPS IN CCC	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(55+56)LIVESTOCK	0.	216204.	227931.	229797.	223361.	225386.	223542.	224402.	226427.	228746.	231087.
C(127) REAL ESTATE	1756512.	1755790.	1850728.	1956931.	2075005.	2206608.	2352889.	2515286.	2695380.	2894912.	3115798.
C(128) MACHINERY	192125.	214173.	200252.	220014.	217114.	203002.	221675.	224326.	210907.	228468.	235961.
C(135) OTHER ASSETS	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.	2424000.
C(136) TOTAL	4372637.	4714796.	4885820.	5089264.	5262198.	5444443.	5659566.	5875736.	6103032.	6370188.	6649136.
					LIABILITIES:						
C(137) LONG-TERM	900000.	886454.	872230.	857295.	841614.	825148.	807859.	789706.	770645.	750631.	729616.
C(138) INTERMEDIATE	300000.	309749.	278624.	273009.	245196.	201959.	182797.	152323.	103681.	81019.	51274.
C(656) SHORT-TERM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(53+54CCC LOANS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
C(140) TOTAL	1200000.	1196202.	1150854.	1130304.	1086810.	1027107.	990656.	942029.	874326.	831650.	780890.
C(141) NOM NET WORTH	3172637.	3518594.	3734966.	3958961.	4175389.	4417336.	4668910.	4933708.	5228706.	5538538.	5868246.
C(264) REL NET WORTH	3172637.	3459927.	3672692.	3929839.	4143265.	4353778.	4602684.	4864705.	5156586.	5463184.	5789477.

C(141/383) NET WORTH/BEG NET W	1.109	1.177	1.248	1.316	1.392	1.472	1.555	1.648	1.746	1.850
C(290) ANNUAL CUMMUL % CHANGE	9.055	7.881	7.956	7.648	7.446	7.512	7.619	7.817	8.022	8.248
C(477) ANNUAL % CHANGE IN NET	10.904	6.149	5.997	5.467	5.795	5.695	5.672	5.979	5.926	5.953
C(285) ANNUAL % CHANGE IN CPI	0.000	0.017	0.007	0.008	0.015	0.014	0.014	0.014	0.014	0.014
C(597) CUMML. % CHANGE IN CPI	1.000	1.017	1.024	1.032	1.048	1.063	1.078	1.093	1.108	1.123
C(494) ANNUAL % CHANGE IN LAND	0.000	0.000	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
C(571) CUMML. % CHANGE IN LAND	1.000	1.000	1.100	1.210	1.331	1.464	1.611	1.772	1.949	2.144
C(472) LONG-TERM EQUITY TO ASS	0.788	0.796	0.804	0.813	0.822	0.831	0.840	0.849	0.859	0.868

C(142) TOTAL DEBT TO ASSET RAT	0.254	0.236	0.222	0.207	0.189	0.175	0.160	0.143	0.131	0.117
C(259) EQUITY TO ASSETS RATIO	0.746	0.764	0.778	0.793	0.811	0.825	0.840	0.857	0.869	0.883
C(525) DEBT TO EQUITY (LEVERAG	0.340	0.308	0.286	0.260	0.233	0.212	0.191	0.167	0.150	0.133
C(250) RATE OF RETURN ON ASSET	0.033	0.050	0.047	0.047	0.050	0.046	0.048	0.052	0.049	0.053
C(254) RATE OF RETURN ON EQUIT	0.039	0.062	0.058	0.059	0.063	0.056	0.058	0.063	0.059	0.063
C(261) OPERATING PROFIT MARGIN	0.291	0.298	0.262	0.267	0.292	0.225	0.239	0.274	0.217	0.261
C(532) NIA RATIO - TOTAL EQUIT	0.000	0.000	0.000	1.000	1.051	1.111	1.174	1.245	1.319	1.397
C(534) GOV"T PAYMENTS TO CASH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

10/15/04 20:32 PAGE 3 AFPC/TAES Ver2004.03.1(C)

SUMMARY OF DAIRY ENTERPRISE FOR YEARS 2002 - 2011

NO.100DD122 03-Feb-04 Dutch Dairy VE1 08/25/04

YEARS 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
D(150)NUMBER MILK COWS	122.	122.	122.	122.	122.	122.	122.	122.	122.	122.
D(151)COWS CULLED	36.	36.	36.	36.	36.	36.	36.	36.	36.	36.
D(5)COWS THAT DIED	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
D(144)DESIRED CHANGE HERD S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(136)REPLACEMENTS NEEDED	38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
D(132)RAISED REPLACEMENTS	46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
D(57)REPLACEMENTS BUY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(130)REPLACEMENTS SOLD	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(99)EXTRA COWS CULLED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CALVES TO 12 MONTH HEIFERS										
D(148)CALVES BORN ALIVE	119.	119.	119.	119.	119.	119.	119.	119.	119.	119.
D(146)BABY CALVES SOLD	72.	72.	72.	72.	72.	72.	72.	72.	72.	72.
D(7)REPL. CALVES DIED	3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
D(147)REPL. CALVES 1-12 YEA	44.	44.	44.	44.	44.	44.	44.	44.	44.	44.
REPLACEMENTS 12-24 MONTHS										
D(78)NUMBER JAN. 1	44.	44.	44.	44.	44.	44.	44.	44.	44.	44.
D(131)NUMBER CULLED	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
D(6)NUMBER DIED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(149)NUMBER DEC. 31	42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
REPLACEMENTS 24+ MONTHS										
D(79)NUMBER JAN. 1	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(141)MATURED DURING YEAR	42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
D(132)ELIGIBLE ENTER HERD	46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
D(136)NEEDED REPLACEMENTS	38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
D(130)SURPLUS HEIFERS SOLD	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(79)NUMBER DEC. 31	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(169)NUMBER OF BULLS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(76)BULLS CULLED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(64)BULLS DIED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(65)BULLS PURCHASED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(66)PURCHASE PRICE	998.	998.	1123.	1032.	1145.	1168.	1136.	1107.	1080.	1055.
D(129)COST REPL BULLS BOUGH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(57)REPLACEMENT COWS BUY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(33)PURCHASE PRICE	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(228)PURCHASE WEIGHT	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.
D(123)COST REPL COWS BOUGHT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(150)NUMBER MILK COWS	122.	122.	122.	122.	122.	122.	122.	122.	122.	122.
D(75)MILK/COW/YEAR (CWTS)	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02
D(117)MILK PRODUCTION (CWTS	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.
D(31)MILK PRICE ($/CWT)	19.7920	18.5970	17.7760	16.9820	16.1780	15.9380	15.9380	15.9380	15.9380	15.9380

CASH RECEIPTS FOR DAIRY ENTERPRISE

D(121)MILK SALES	437095.	410704.	392573.	375038.	357282.	351982.	351982.	351982.	351982.	351982.
D(119)BABY CALVES	17280.	18631.	18845.	18105.	18338.	18125.	18224.	18457.	18724.	18994.
D(120)CULLED HEIFERS	2039.	2114.	2126.	2085.	2098.	2086.	2092.	2105.	2120.	2135.
D(118)SURPLUS HEIFERS	5069.	5255.	5285.	5183.	5215.	5185.	5199.	5231.	5268.	5306.
D(123)CULLED COWS	19439.	20961.	21204.	20369.	20631.	20393.	20504.	20766.	21064.	21370.
D(125)CULLED BULLS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(58)TOTAL DAIRY RECEIPTS	480922.	457666.	440033.	420779.	403564.	397771.	398001.	398542.	399159.	399786.

CASH RECEIPTS CALCULATIONS BY COMPONENT

D(146)NO. OF CALVES SOLD	72.	72.	72.	72.	72.	72.	72.	72.	72.	72.
D(35)PRICE OF CALVES	2.7180	2.9305	2.9642	2.8477	2.8844	2.8509	2.8665	2.9032	2.9452	2.9876
D(226)CALF SALE WEIGHT	88.	88.	88.	88.	88.	88.	88.	88.	88.	88.
D(119)TOTAL CALF RECEIPTS	17280.	18631.	18845.	18105.	18338.	18125.	18224.	18457.	18724.	18994.
D(131)12-24 MO REPLACEMENTS	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
D(34)PRICE OF CULL HEIFERS	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(227)HEIFER SALE WEIGHT	982.	982.	982.	982.	982.	982.	982.	982.	982.	982.
D(120)TOTAL 12-24 MO RECEIP	2039.	2114.	2126.	2085.	2098.	2086.	2092.	2105.	2120.	2135.
D(130)24+ MO REPLACEMENTS	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(34)PRICE OF CULL HEIFERS	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(228)SPRINGER SALE WEIGHT	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.
D(118)TOTAL 24+ MO RECEIPTS	5069.	5255.	5285.	5183.	5215.	5185.	5199.	5231.	5268.	5306.
D(151)CULLED COWS SOLD	36.	36.	36.	36.	36.	36.	36.	36.	36.	36.
D(99)EXTRA COWS CULLED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(32)CULLED COW PRICES	0.4892	0.5275	0.5336	0.5126	0.5192	0.5132	0.5160	0.5226	0.5301	0.5378
D(225)CULLED COW SALE WEIGH	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.
D(123)CULLED COW RECEIPTS	19439.	20961.	21204.	20369.	20631.	20393.	20504.	20766.	21064.	21370.

10/15/04 20:32 PAGE 4 AFPC/TAES Ver2004.03.1(C)

SUMMARY OF DAIRY ENTERPRISE FOR YEARS 2002 - 2011

NO.100DD122 03-Feb-04 Dutch Dairy VE1 08/25/04 □□□□□□□□

YEARS 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CONTINUE CALCULATIONS FOR CASH RECEIPTS BY COMPONENT										
D(76)CULLED BULLS SOLD	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(36)CULLED BULL PRICES	0.5824	0.6206	0.6267	0.6057	0.6123	0.6063	0.6091	0.6157	0.6233	0.6309
D(229)CULLED BULL SALE WEIG	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.
D(125)CULLED BULL RECEIPTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(117)MILK SOLD	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.	22084.
D(31)MILK PRICES	19.7920	18.5970	17.7760	16.9820	16.1780	15.9380	15.9380	15.9380	15.9380	15.9380
D(121)MILK RECEIPTS	437095.	410704.	392573.	375038.	357282.	351982.	351982.	351982.	351982.	351982.
CALCULATIONS FOR VALUE OF DAIRY HERD										
D(150)NO. OF COWS	122.	122.	122.	122.	122.	122.	122.	122.	122.	122.
D(32)CULLED COW PRICES	0.4892	0.5275	0.5336	0.5126	0.5192	0.5132	0.5160	0.5226	0.5301	0.5378
D(225)CULLED COW WEIGHT	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.	1104.
D(34)CULLED HEIFER PRICES	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(228)CULLED HEIFER WEIGHT	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.
WTD. AVG. VALUE OF A COW	904.	948.	955.	931.	938.	931.	935.	942.	951.	960.
D(152)VALUE OF ALL COWS	110237.	115661.	116526.	113548.	114484.	113633.	114030.	114966.	116037.	117121.
D(149)NO. 12-24 MO HEIFERS	42.	42.	42.	42.	42.	42.	42.	42.	42.	42.
D(34)12-24 MO HEIFER PRICE	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(227)12-24 MO SALE WEIGHT	982.	982.	982.	982.	982.	982.	982.	982.	982.	982.
D(153)12-24 MO HEIFER VALUE	42824.	44400.	44652.	43786.	44058.	43810.	43926.	44198.	44512.	44825.

D(79)NO. 24+ MO HEIFERS	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
D(34)24+ MO HEIFER PRICES	1.0380	1.0762	1.0823	1.0613	1.0679	1.0619	1.0647	1.0713	1.0789	1.0865
D(228)24+ MO SALE WEIGHT	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.	1221.
D(135)24+ MO HEIFER VALUE	5069.	5255.	5285.	5183.	5215.	5185.	5199.	5231.	5268.	5306.
D(147)BABY CALVES 1-12 MO	44.	44.	44.	44.	44.	44.	44.	44.	44.	44.
D(35)CALF PRICES 1-12 MO	2.7180	2.9305	2.9642	2.8477	2.8844	2.8509	2.8665	2.9032	2.9452	2.9876
D(230)CALF SALE WEIGHT	486.	486.	486.	486.	486.	486.	486.	486.	486.	486.
D(154)VALUE OF CALVES 1-12	58074.	62614.	63334.	60845.	61629.	60913.	61247.	62031.	62928.	63834.
D(169)NUMBER OF BULLS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(36)CULLED BULL PRICES	0.5824	0.6206	0.6267	0.6057	0.6123	0.6063	0.6091	0.6157	0.6233	0.6309
D(229)BULL SALE WEIGHT	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.	1545.
D(170)VALUE OF BULLS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUMMARY OF DAIRY HERD VALUE FOR BALANCE SHEET										
D(152)VALUE OF COWS	110237.	115661.	116526.	113548.	114484.	113633.	114030.	114966.	116037.	117121.
D(154)VALUE OF CALVES	58074.	62614.	63334.	60845.	61629.	60913.	61247.	62031.	62928.	63834.
D(153)VALUE OF 12-24 MO HEI	42824.	44400.	44652.	43786.	44058.	43810.	43926.	44198.	44512.	44825.
D(135)VALUE OF 24+ MO HEIFE	5069.	5255.	5285.	5183.	5215.	5185.	5199.	5231.	5268.	5306.
D(170)VALUE OF BULLS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
D(155)TOTAL VALUE	216204.	227931.	229797.	223361.	225386.	223542.	224402.	226427.	228746.	231087.
PURCHASED FEED EXPENSES ($/COW)										
GRASSSILAGE	104.428	102.225	95.098	88.146	82.314	76.481	70.649	64.816	58.984	53.152
CORNSILAAGE	240.159	269.989	267.632	247.913	253.817	252.080	252.287	246.558	243.036	239.608
HAY	85.609	88.405	94.419	96.591	95.862	95.132	94.402	93.672	92.942	92.212
CONCENTA	110.158	113.174	113.470	100.897	98.437	95.978	93.518	91.059	88.599	86.140
CONCENTP	159.511	159.150	146.000	144.678	143.357	142.036	140.714	139.393	138.072	136.750
TOTAL PURCHASED FEED COST	699.865	732.942	716.619	678.226	673.786	661.706	651.569	635.498	621.633	607.862
DAIRY NON-FEED COSTS										
VET AND MEDICINE COSTS	10687.	10928.	11037.	11258.	11483.	11712.	11947.	12186.	12429.	12678.
BREEDING COSTS	7906.	8083.	8164.	8328.	8494.	8664.	8837.	9014.	9194.	9378.
MILK SUPPLIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DHIA & HERD TESTING	1464.	1497.	1512.	1542.	1573.	1604.	1637.	1669.	1703.	1737.
LIVESTOCK COMMISSIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BEDDING COSTS	2928.	2994.	3024.	3084.	3146.	3209.	3273.	3339.	3405.	3473.
MISCELLANEOUS COSTS	7494.	7663.	7739.	7894.	8052.	8213.	8377.	8545.	8716.	8890.
OTHER COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
COOP RETAINS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROMOTION ASSESSMENTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MILK HAULING	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OTHER COSTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL DAIRY NON-FEED COST	30479.	31165.	31476.	32106.	32748.	33403.	34071.	34753.	35447.	36157.
PURCHASED FEED EXPENSES										
GRASSSILAGE	12740.	12471.	11602.	10754.	10042.	9331.	8619.	7908.	7196.	6485.
CORNSILAAGE	29299.	32939.	32651.	30245.	30966.	30754.	30779.	30080.	29650.	29232.
HAY	10444.	10785.	11519.	11784.	11695.	11606.	11517.	11428.	11339.	11250.
CONCENTA	13439.	13807.	13843.	12309.	12009.	11709.	11409.	11109.	10809.	10509.
CONCENTP	19460.	19416.	17812.	17651.	17490.	17328.	17167.	17006.	16845.	16684.
TOTAL PURCHASED FEED COST	85384.	89419.	87427.	82744.	82202.	80728.	79491.	77531.	75839.	74159.
NO. MILK COWS	122.	122.	122.	122.	122.	122.	122.	122.	122.	122.
MILK PER COW (CWTS.)	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02	181.02
PRICE OF MILK ($/CWT.)	19.79	18.60	17.78	16.98	16.18	15.94	15.94	15.94	15.94	15.94
FEED COST/TOTAL COST	0.3970	0.4097	0.4094	0.4043	0.4056	0.4032	0.4022	0.4008	0.3982	0.3962

```
                               10/15/04   20:32 PAGE  5 AFPC/TAES    Ver2004.03.1(C)
                   NO.100DD122    03-Feb-04      Dutch      Dairy            VE1 08/25/04  □□□□□□□□

 YEARS 2002 -   11             2002      2003      2004      2005      2006      2007      2008      2009      2010      2011

                                          ANNUAL SUMMARY OF QUANTITY AND COST OF DAIRY FEEDS

YEAR   1       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
          TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                     NO. OF HEAD FED        35.      34.      33.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    405.9    369.4    358.4    177.3      0.0    116.3    260.7     45.2   1733.2     326.   39.126   12740.
   CORNSILAAGE TON    225.5    205.3    199.1      0.0      0.0     53.2    143.8     24.2    851.0     851.   34.427   29299.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   88.788   10444.
   CONCENTA    TON     28.2     45.1     13.3      0.0      0.0      5.3      0.0      0.0     91.9      92.  146.174   13439.
   CONCENTP    TON     84.6     23.3      0.0      0.0      0.0      0.0      0.0      0.0    107.8     108.  180.476   19460.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                         85384.
            NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   2       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
          TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                     NO. OF HEAD FED        34.      34.      34.      20.       0.      44.      42.       6.

   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   38.389   12471.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   38.722   32939.

   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   91.687   10785.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  150.849   13807.

   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  184.281   19416.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                         89419.

            NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   3       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
          TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                     NO. OF HEAD FED        34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   35.712   11602.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   38.384   32651.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   97.925   11519.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  151.244   13843.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  169.054   17812.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                         87427.
            NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   4       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
          TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                     NO. OF HEAD FED        34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   33.101   10754.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   35.556   30245.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.  100.178   11784.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  134.485   12309.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  167.524   17651.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                         82744.
            NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   5       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
          TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                     NO. OF HEAD FED        34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   30.911   10042.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   36.403   30966.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   99.421   11695.
```

```
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  131.207   12009.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  165.994   17490.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          82202.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   6       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
           TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                   NO. OF HEAD FED         34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   28.721    9331.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   36.154   30754.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   98.664   11606.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  127.929   11709.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  164.464   17328.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          80728.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   7       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
           TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                   NO. OF HEAD FED         34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   26.531    8619.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   36.183   30779.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   97.907   11517.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  124.651   11409.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  162.934   17167.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          79491.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   8       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
           TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                   NO. OF HEAD FED         34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   24.341    7908.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   35.362   30080.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   97.150   11428.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  121.372   11109.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  161.404   17006.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          77531.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR   9       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
           TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                   NO. OF HEAD FED         34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   22.150    7196.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   34.857   29650.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   96.393   11339.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  118.094   10809.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  159.874   16845.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          75839.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.

YEAR  10       THREE STRINGS OF LACTATING COWS   DRY            BABY    12-24 MO  24+ MO     TOTAL PURCHASED WEIGHTED  PURCHASED
           TOP    MIDDLE  BOTTOM     COWS    BULLS   CALVES  HEIFERS  HEIFERS*    FEED    FEED   AVG PRICES FEED COST
                   NO. OF HEAD FED         34.      34.      34.      20.       0.      44.      42.       6.
   GRASSSILAGE TON    394.1    369.4    369.4    177.3      0.0    116.3    260.7     45.2   1732.5     325.   19.960    6485.
   CORNSILAAGE TON    218.9    205.3    205.3      0.0      0.0     53.2    143.8     24.2    850.6     851.   34.365   29232.
   HAY         TON      0.0      0.0      0.0     64.5      0.0      0.0     42.3     10.9    117.6     118.   95.636   11250.
   CONCENTA    TON     27.4     45.1     13.7      0.0      0.0      5.3      0.0      0.0     91.5      92.  114.816   10509.
   CONCENTP    TON     82.1     23.3      0.0      0.0      0.0      0.0      0.0      0.0    105.4     105.  158.344   16684.
  TOTAL COSTS OF DEFICIT FEEDS                                                                                          74159.
             NOTE: NUMBER OF 24+ HEIFERS FED IS ADJUSTED FOR AGE AT FIRST CALVING AND NUMBER OF REPLACEMENTS CALVED.
```

10/15/04 20:32 PAGE 2 AFPC/TAES Ver2004.03.1(C)
ADDITIONAL INFORMATION TO EXPLAIN VALUES IN THE INCOME STATEMENT 2002 - 2011
NO.100DD122 03-Feb-04 Dutch Dairy VE1 08/25/04

YEARS 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CALCULATIONS NECESSRY TO SIMULATE CROP RECEIPTS										
ACRES HARVESTED CROP(I,100+K)										
CROP NO. DOUBLE										
GRASSSILAGE 1 0.	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00
TOTAL HARVSTED ACRES	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00	126.00
CROP YIELDS CROP(I,40+K)										
GRASSSILAGE	11.17	11.17	11.17	11.17	11.17	11.17	11.17	11.17	11.17	11.17
TOTAL CROP PRODUCTION CROP(I,820+)										
GRASSSILAGE	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.
NET PRODUCTION AVAILABLE TO OWNER/OPERATOR CROP(I,540+K)										
GRASSSILAGE	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.
PRODUCTION PLUS CARRY-IN STOCKS CROP(I,200+K)										
GRASSSILAGE	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.	1408.
QUANTITY OF FEED DEMANDED BY LIVESTOCK ON THE FARM CROP(I,340+K)										
GRASSSILAGE	1733.	1732.	1732.	1732.	1732.	1732.	1732.	1732.	1732.	1732.
CORNSILAAGE	851.	851.	851.	851.	851.	851.	851.	851.	851.	851.
HAY	118.	118.	118.	118.	118.	118.	118.	118.	118.	118.
CONCENTA	92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
CONCENTP	108.	105.	105.	105.	105.	105.	105.	105.	105.	105.
PRICES CROP(I,60+)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
GRASSSILAGE	39.1400	38.0128	34.5614	32.3712	30.1810	27.9908	25.8005	23.6103	21.4201	19.2299
SUMARIZE CASH RECEIPTS FOR LIVESTOCK ENTERPRISES										
CASH RECEIPTS FOR DAIRY ENTERPRISE										
MILK SALES D(I,121)	437095.	410704.	392573.	375038.	357282.	351982.	351982.	351982.	351982.	351982.
BABY CALVES D(I,119)	17280.	18631.	18845.	18105.	18338.	18125.	18224.	18457.	18724.	18994.
CULLED HEIFERS D(I,120)	2039.	2114.	2126.	2085.	2098.	2086.	2092.	2105.	2120.	2135.
SURPLUS HEIFERS D(I,118)	5069.	5255.	5285.	5183.	5215.	5185.	5199.	5231.	5268.	5306.
CULLED COWS D(I,123)	19439.	20961.	21204.	20369.	20631.	20393.	20504.	20766.	21064.	21370.
CULLED BULLS D(I,125)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL D(I,58)	480922.	457666.	440033.	420779.	403564.	397771.	398001.	398542.	399159.	399786.
TOTAL CASH RECEIPTS FROM LIVESTOCK										
CATTLE B(I,32)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
HOGS HS(I,32)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DAIRY D(I,58)	480922.	457666.	440033.	420779.	403564.	397771.	398001.	398542.	399159.	399786.
FINISH HOGS FP(I,1085)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
STOCKERS S(I,1085)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHEEP SH(I,32)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ANGORAS GT(I,32)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MEAT GOATS GTM(I,32)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

VITA

Anthony Ray Duncan was born in Fremont, California on January 16, 1981. He grew up in Pleasanton, California where his family operated a small registered Angus cattle ranch. He graduated from Foothill High School in May 1999.

In the fall of 1999, Anthony entered California State University, Fresno. While at CSU Fresno, his many organizational involvements included the Sigma Chi Fraternity, the AgBusiness Club, and the Young Farmers and Ranchers Program of the California Farm Bureau Federation. Anthony was the first non-business major to be accepted into the Craig School of Business Honors Program and the first student to be accepted twice into the Kenneth L. Maddy Institute of Public Affairs, where he served internships for California State Senators Jim Costa and Charles Poochigian. He graduated Summa Cum Laude with his B.S. in Agricultural Business in May 2003.

Upon completion of his B.S., he went to work for the Agricultural and Food Policy Center (AFPC) at Texas A&M University in College Station, Texas as a graduate student in agricultural economics. During the course of his studies as a master's student, he was able to present materials the American Agricultural Economics Association 2004 Annual Meeting in Denver, CO. He also served as an Agricultural and Natural Resources Policy Intern in Washington, D.C. for Congressman Ciro D. Rodriguez. He graduated in December 2004 with a M.S. in Agricultural Economics.

All future inquiries may be directed through the Agricultural and Food Policy Center at the Department of Agricultural Economics, Texas A&M University, College Station, TX, 77843-2124.