

SECTION I

1. Project Number: LNE93-39
Grant Number: USDA Cooperative Agreement 92 COOP-1-7191
Funding Period: September 1, 1993 - March 31, 1997

2. Project Title: A Systems Analysis of Organic and Transitional Dairy Production

3. Project Coordinator: Enid Wonnacott
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4. Type of Report: Final

5. Date of Report: June 28, 1998

6. Reporting Period: September 1, 1993 - March 31, 1997

7. Major Participants: There are no changes from original proposal

8. Cooperators: There are no changes from original proposal

9. Project Status: The project is:

 New: received SARE/ACE funding for the first time.
 Continuation: a previously approved project, following revision and competitive review.

10. Statement of Expenditures: Attached

SECTION II

1. Objectives

1. Assess the farm management system of four certified organic dairy farms and four transitional dairy farms.
2. Facilitate the exchange of information from farmer-to-farmer, and farmer-to-agricultural professional (Extension, Research, Veterinarian).

2. Abstract

This project collected information on the economic, environmental and social costs of organic dairy production and farms in transition to organic. Of the 8 study farms that started the project, 3 were organic, 4 transitional and 1 conventional. The conventional farm was added based on the recommendation by the proposal reviewers. During the course of the study, two of the transitional farms became organic leaving 5 organic, 2 transitional and 1 conventional. Although there were only 3 certified organic dairies in Vermont at the start of the project, by 1997, there were over 40 organic dairy farms in Vermont.

Data was gathered and analyzed both quantitatively and qualitatively. Quantitative information was obtained by collecting detailed records of costs, labor, time, inputs and production of animal and crop components on each farm. In addition, whole farm financial analysis was conducted on each farm.

Each year, the participating farmers chose topics to focus on including large animal homeopathy, organic feed and forage management, milk quality and udder-health, and soil fertility management; and then on-farm technical meetings were organized around each topic. At the meetings, participating farmers had the opportunity to meet with 30-40 other farmers who have recently made or are interested in making the transition to organic dairy production. The farmers used these meetings for several purposes: to show their farm to the other participants and demonstrate a management practice unique to their farm, to discuss their approach to the particular topic and detail their successes and challenges, and to network with the researchers and project advisors on different management practices.

3. Specific Project Results

A. Findings and Accomplishments

Objective 1

The general purpose of this project was to collect and analyze data on organic dairy farms and farms that are making the transition to organic dairy in three areas: Business Management,

Animal Management and Crop Management. The project was generated out of a lack of studies available on a systems analysis of organic dairy, or answers to questions such as "How much does it cost to produce a hundred pounds of milk organically? Is there any connection between feeding a lower energy ration to my cows and a decrease in animal health problems? Will milk production decrease if I feed my cows organically?" By getting baseline data on all of the certified organic farms in the state and a number of farmers who are interested in making the transition to organic farming, we proposed to document the whole management systems of several different farms.

To gather this information, monthly visits were done for each farm through November, 1996. This gave us two full years of cropping data from each farm, two full years of animal management data, (including feeding and nutrition and herd health), and we completed the economic data collection for 1993-1995 on 7 of the 8 farms. The data analysis took place between December, 1996 and March, 1997. Case Study reports are currently being written for each farm and chapters are being written by participating farmers and researchers for an organic dairy publication. Key findings broken into each component study area are as follows:

Business Management: The farmers in the study found that it was economically profitable to produce milk organically. One farm increased their total farm net profit 30% from the first to third year of the study and one farm increased more than 40%. This was due to both an increase in the price of milk per hundredweight, a decrease in production expenses and an increase in non-dairy farm income. Neil Pelsue and Fred Person, the researchers who analyzed the economic data noted that "We approached the analysis as a set of case studies, rather than as a conventional aggregated analysis. While this approach does not yield a single set of numbers to represent organic dairy production, it does provide greater detail of the farms in the study. It may also provide the opportunity to contrast the differing operating structures and methods to learn how each impacts the resulting economic outcomes." Given this reality, it is difficult, and perhaps inaccurate, to present the isolated economic findings without the context of the full case-studies. Nevertheless, the greatest demand for information is from individuals who want to answer whether or not organic dairy farming is economically viable. The analysis of the farms who transitioned to organic dairy production during the course of our study is probably the most helpful information for these inquiries. The farms that seem to have the easiest time transitioning tend to be pasture based herds with production levels that are average, not high. These farms were fertilizing their fields with manure, growing haylage or hay for their forage, relying on pasture for seasonal feed, and rarely had health problems - using antibiotics only a few times a year. Financially, these farmers were doing well conventionally. One farm under conventional management grossed \$125,000 from 70 cows with a total of 908,000 lb.. of milk shipped. The

second year they shipped conventional milk for part of the year and then qualified for organic certification and shipped organic for the second half of the year. By the end of the third year of their transition, they were completely shipping organic milk, receiving \$165,000 from 70 cows with a total of 890,000 lbs of milk shipped. The detailed economic analysis completed by Pelsue and Person is attached.

Animal Management - feeding and nutrition

The predominant questions for the participating farmers regarding feeding were: if you are relying primarily on pasture, how do you best supplement energy? If you don't want to stress cows, but you want enough energy, how much feed should cows be getting?

The assumption among the organic dairy farmers at the start of the project was feeding cows a lower energy feed, will result in cows that are less stressed, will tend to have fewer health problems and will be productive milkers for more years. The majority of the organic farmers in the state, and in this study (6 out of 7) are grass based farmers. While most conventional farmers rely on corn silage for energy, grass based farmers must increase milk through putting up high quality forages (16-18%^{protein}) to maintain condition. One of the farmers in the project said that "you make milk on your forages, you can't afford to rely on purchasing (expensive) organic grains to maintain body condition." This is an obstacle for farmers transitioning to organic dairy who are used to the conventional goal of managing cows for production. If a farmer does not grow his/her own organic corn silage or soybeans, it is difficult to purchase, so they are having to reformulate their ration to rely on organic forages and purchased grain. .

For example, through both the economic analysis and crop record keeping components of the study, Jack Lazor has determined that it is cost effective for him to grow all of his own grains. In a March 1996 technical meeting, he reported on the economics of his grain production, his yields (1800 lb./A of soybean in 1995), and his plans for successive seasons including working with open pollinated varieties. He is finding that they may make more sense for organic farmers since hybrids are bred to perform with high inputs. Jack also recommended that farmers interested in growing their own grains should start with cereals, as they are cheaper to grow than corn when starting out. This knowledge is complementary to information that Stu Gibson, nutritionist and project advisor, has recommend to the farmers. Through his extension work, he has found that in order for farmers to maximize the use of their roughage, they need a readily degradable protein source to balance the pasture, and have found that barley is a good choice. While many of the farmers are getting barley in their purchased feed, the increased demand for organic grain in Vermont is causing many farmers to start growing their own grains.

Animal Management - herd health

Before this grant, few of the farmers were getting their milk quality tested (somatic cell count) and were not identifying the mastitis pathogens. Working with the Quality Milk Research Lab (QMRL) at UVM, the farmers sampled their cows when they dried them off, when they freshened, when they purchased a cow into the herd or when they had a clinical. The QMRL found the following:

- Staphylococcus aureus is the most common mastitis pathogen, and the researchers hypothesize that this is due to the age of the cows, and the fact that most organic farmers keep their cows around for more lactations than conventional farmers. This finding has stirred a debate about whether the organic farmers with cows with Staph. aureus should treat those cows with an antibiotic when they are dried off. If farmers can now identify which cows in their herd have Staph. aureus, and are therefore responsible for elevating the somatic cell count, those cows could be treated individually. The organic certification standards prohibit the routine use of dry treatment and its use may be prohibited in subsequent years. Given this, the farmers are working with the QMRL to determine what other management practices might be contributing to the occurrence of Staph. aureus and how to control it in the herd, i.e. changing pre and post dipping solutions, segregation of cows with Staph. aureus.
- Anecdotal evidence of the success of homeopathic remedies.

All of the participating farmers (with the exception of the conventional farmer) rely primarily on homeopathic remedies for herd health, yet there is only one veterinarian in Vermont who is a homeopathic large animal practitioner. His work with the herds in 1996 led to the interest among farmers to scientifically study the efficacy of homeopathy. The on-farm trials in this project led to the SARE proposal (funded in 1997) entitled, "Efficacy Evaluation of Homeopathic Nosodes for Mastitis and Calf Scours and documentation of Homeopathic Practices in Organic and Conventional Dairy Production." Many of the farmers participating in our study are now participating in the efficacy trials.

- Control of mastitis is paramount to maximize production of high quality milk profitability. Given that organic dairy farmers are prohibited from using antibiotics to treat mastitis, organic dairy farmers must pay more attention to preventing the occurrence of mastitis. Dairy cow hygiene is the single most important management aspect in organic dairy farms. Organic producers should take extra precautions to minimize new intramammary infections during the dry period and among replacement heifers; the two critical points of entry of mastitis. Special attention should be given to rations as well; balance rations for micro-nutrients such as Vitamin E, selenium and copper to enhance the cow's immune system.

Crop Management

The predominant issues for the farmers who are making the transition to organic dairy production is how they can maintain fertility without the use of synthetic chemical fertilizers and how to manage weeds in row crops without the use of herbicides. The farmers in the project used the crop management record keeping system to track amount of fertilizer used, time involved in spreading, and yield information. The findings are as follows:

- Organic dairy farming starts with a healthy, balanced soil. A soil that is well mineralized will contribute to healthy plants and healthy animals.

Although the veteran dairy farmers participating in the grant have long espoused this tenet, the transitioning farmers came to understand the importance of soil management. There was an active discussion among the dairy farmers who transitioned into organic agriculture for predominantly economic reasons, and those dairy farmers who believed a farm could only be successful if managed as a system of connecting parts. This discussion led to the topic for the second annual "Alternatives in Animal Health Conference." Supported by SARE, the conference in 1998 was entitled: The Farm as an Organism: Interconnections from the Soil Up, with workshops on 'Soil Chemistry, Composting and Wholeness', and Holistic Animal Health' among others.

Objective 2:

This project was designed with the assumption that dairy farmers have few opportunities to share information with other farmers, organic farmers make management decisions without the consultation of other farmers or agricultural professionals, and agricultural professionals are doing work that is relevant to organic and sustainable production, but that information is not effectively transferred.

In order to facilitate networking among those groups, on-farm meetings were held. In most circumstances, a meeting was held of the farmers in the project, followed by a shared lunch and meeting of farmers interested in making the transition to organic dairy production, or those who are in the process. The ideas for the meeting were generated from the eight farmers in the research group. Since most of the research information was isolated to individual farms and predominantly benefitted those farms, this second objective of extension and education proved very valuable. Following is a listing of the technical meetings that took place during the project:

- March 10, 1995 A meeting and workshop took place on large animal homeopathy. Consulting veterinarian, Steve Woodard, a homeopathic veterinarian in Waterbury, Vermont presented some background information on homeopathic remedies and then facilitated a networking session among the farmers present on specific health scenarios and what has worked or not worked. The outcomes of that meeting were then summarized and distributed to all of the

farmers and researchers involved in the project, as well as the farmers interested in making the transition to organic management. (23 attendees)

- September 11, 1995 A meeting and workshop took place on forage management in organic production and the use of pastured poultry for parasite management. Peter Young and Nancy Everhart, one of the 8 farm couples participating in the research project hosted the workshop and a total of 30 people, including farmers and researchers attended. The minutes for that meeting were typed up and distributed to all of the participating farmers, as well as the growing network of farmers interested in making the transition to organic dairy production.
- October 18, 1995 A pasture walk took place on Jack Lazor's farm. Jack is one of the farmers participating in the research grant, and also received a SARE farmer grant. Several of the researchers and participating farmers attended the pasture walk which covered Jack's production of his own organic forage and grains, soil fertility management, and economics of being a farmer and processor.
- November 29 and December 12, 1995 Two farmer meetings took place to discuss "what is organic dairy production" and what organic certification standards should accompany the agreed upon production practices. A majority of the farmers participating in the grant, researchers, a veterinarian and many of the transitional farmers participated in these full day discussions. Although not the intended purpose, there was a lot of discussion about the research project, and the lessons the participating farmers have learned about health management and how that would have an impact on the certification standards.
- February 17, 1996 Three workshops on organic dairy production were held at the NOFA-VT annual winter conference (600 attendees). The workshops, featuring the researchers, farmers and consulting veterinarian for this grant include: Formulating Feed for Organic Livestock Production, Large Animal Homeopathy, and the Art and Science of Organic Soil Fertility Management.
- March 11, 1996 A technical meeting took place on Milk Quality and Udder Health. Woody Pankey, of the UVM Quality Milk Research Lab and cooperator in the grant, led the technical meeting based on the results of the milk quality analysis. Before the meeting, all of the participating farmers were visited to identify the primary issues they wanted covered at the meeting, and then Woody designed the presentation to answer these questions. The farmers were also interested in having Dr. Steve Woodard, consulting veterinarian for the project, to speak on homeopathic remedies for udder health. All of the participating farmers in the grant, as well as 26 other farmers interested in organic dairy production attended the meeting.
- September 24, 1996 A meeting and on-farm workshop took place on soil fertility management and stewardship on Jack and Anne Lazor's farm, one of the 8 farm couples participating in the research project. There were 12 farmers that attended the meeting. The goal

of the meeting was to provide the opportunity for Jack and Anne to describe the management system they have developed on their farm. They have not purchased an animal since 1982, they grow all of their own grains, and believe strongly in recycling energy on their farm.

- September 26, 1996 A pasture walk took place on Peter Flint's Maple Lane Farm. Peter is one of the farmers participating in the research grant. Twenty-six people attended the pasture walk, the focus of which was their new greenhouse milking parlor. As with many of the other herds in the study, Peter has decided to transition to seasonal milking, and is evaluating new models of cow housing including the new parlor, wintering dry cows outside using trees as shelter.
- December 12, 1996: A final meeting and gathering was held for all of the participating farmers and researchers to formally close the data collection of the grant. Slides were shown of all of the participating farms, with special practices highlighted from each farm.

B. Dissemination of Findings

A lot of information has been disseminated through the on-farm workshops outlined above, articles in *The Natural Farmer* (the regional newspaper of the Northeast Organic Farming Association), and conference presentations (by farmers, researchers and project coordinators) throughout the Northeast. As a result of those meetings and the realization of the need and interest in more farmer networking, the farmers organized monthly meetings, which rotate from farm to farm, and farmer-farmer mentoring was established (through private funding) to assist the farmers transitioning to organic dairy production. Three of the eight farmers participating in the grant are farmer mentors.

Currently, we are writing a detailed publication on organic dairy farming (extended funding LNE 97-97), including comprehensive case studies for each participating farm, technical chapters by the participating researchers and articles by the participating farmers. These will be made available through extension publications, the publications of the Northeast Organic Farming Association and professional journals.

C. Site Information

All of the farms in the study are in Vermont, but the soil type and cropping systems of the farms differ. The soil types vary from Vergennes clay (Leicester) to Tunbridge (Chelsea). While 6 of the 8 farms are pasture based and purchase their grain, two farms grow the majority of their own feed, including corn, barley, and oats. Seven of the eight farms are family run, while one is managed by a solo operator. The size of the farms varies from milking 13 - 115 cows, with 3 milking Holsteins and 5 milking Jerseys or mixed breeds. The topography of the farms varies from the lowland farms of the Champlain Valley in the west of Vermont to hill

farms in Plainfield and Chelsea, and one farm on a high, northern plateau near the Canadian border.

D. Economic Analysis

The economic analysis completed by researchers Neil Pelsue and Alfred Person is attached.

4. Potential Contributions and Practical Applications

A. Impacts of project work

This project has the potential to contribute significantly to the dairy industry in Vermont, and with a transfer of information, to other states. Conventional dairy production is threatened by low milk prices, environmental regulation and liability, and consumer acceptance. Due to these factors, many commercial dairy farmers are interested in organic dairy farming, and want concrete numbers and information about making a transition. The potential environmental benefits of organic dairy production include: a reduction in herbicide use as crops are cultivated; a decrease in surface and ground water contamination by synthetic fertilizers, herbicides and pesticides; and improved soil tilth as crops are rotated with soil conserving crops and/or leguminous crops.

With the current consumer interest in organic milk, organic dairy farmers are being paid \$18/cwt. (hundred pounds of milk) plus a protein premium, versus \$12/cwt. for non-organic milk. While organic grain costs are higher than conventional grain, and some farmers experience a decrease in milk production, farmers estimate that there is a net economic benefit. Due to their increased milk check, the organic farmers are meeting their cost of production and are able to be better all around managers, including upkeep of facilities, and affording new manure management systems to divert primarily liquid run-off from existing storage.

B. Pesticide reduction

Not applicable

C. New Hypotheses

Not applicable.

5. Farmer adoption and direct impact

A. Changes in Practice

There have been changes that the participating farmers have made, as well as changes that have taken place among the farmers that are transitioning to organic and using the project

farmers as mentors. Some specific examples of the adoption of new technologies or production methods during the project are as follows:

- a farmer transitioning to organic production started cultivating his corn, instead of using a synthetic herbicide, and relying on organic fertilizers and crop rotations instead of synthetic fertilizers. For organic corn production, the farmer now plows in 20T/A of manure in the spring, uses an organic granulated whey fertilizer (5-9-1) at 420#/A as a corn starter, cultivates the corn three times with an s-tine cultivator, six days apart, and spinner spreads on allis sweet annual red clover at 10#/A as a green manure crop. Corn is planted for 2 years, followed by 6 years of alfalfa and orchard grass. Jack Lazor (farmer participant) is acting as a mentor to this transitioning farm.
- All of the farmers in the project and the transitioning farmers have increased their knowledge of and use of alternatives to antibiotics, mostly by using more homeopathic remedies. Most of the farmers have the greatest problem with reproductive and udder health. In conventional animal practices, farmers treat reproductive problems with hormones, which are prohibited in organic practice. Mastitis, the most common udder malady is conventionally treated with antibiotics. For example, farmers have had success using the homeopathic remedies Belladonna and Aconite when the quarter is swollen and cow has a high fever.

Especially noteworthy is the fact that the one conventional farm in the study started using homeopathic nosodes in a controlled procedure directed by the consulting veterinarian. They were so shocked by their success rate that they have transitioned from conventional remedies to homeopathic remedies, specifically for hairy heel wart and calf scours.

- One of the project farmers and two of the transitioning farmers have adopted intensive pasture management, as a result of this project. Through cooperation with the UVM Pasture Management Outreach Program, all of the participating farmers have on-farm consultation in pasture management. Whereas many of the farmers had already been rotating pastures prior to the start of this project, one farmer had not been utilizing his forage well and has seen a tremendous economic benefit from doing so. With organic grain being considerably higher priced than non-organic grain, the farmers have found it economically beneficial to feed as much high quality forage as possible.
- One farm that has made the transition to organic production in the past year, has had to find alternatives to synthetic insecticides for fly control. They experimented with a) fly parasites, a beneficial wasp that they release once a month to feed on fly eggs, b) fly ribbons, c) a cone trap with yeast bait, d) a spray of witch hazel, cedar, citronella and eucalyptus, and e) hens in barnyard to eat fly parasites in manure.
- Woody Pankey of the UVM Quality Milk Research Lab, worked with farmers in 1996 to establish a protocol for evaluating milking equipment washing and sanitizing procedures. Used

milk quality testing to analyze effectiveness of Basic H soap as a pipeline cleaner and citric acid as an acid rinse. If enough data can be generated, farmers may be granted permission to use less caustic soaps and acids. This experiment is still taking place.

- Peter Young and Nancy Everhart are raising all of their calves on nurse cows to improve health of the cow and improve milk quality. Their theory was that problem cows with high Somatic Cell Count might actually get better if they are being nursed regularly. They have found that both the nurse cows improve and can be a productive part of their milking string and the calves thrive. Other farms in the study have since started using high count cows for nurse cows with good success.

B. Operational Recommendations

Based on the study, there are general observations and trends that we can recommend for organic dairy production, as follows:

- Maximize the use of high quality forage through soil fertility management, and intensive pasture management.
- Establish a relationship with a veterinarian who can work with farmers on herd health alternatives. Conventional animal remedies are often more expensive per treatment, and have a withholding time for the milk. According to the vet we are working with, the cost of treating a cow for mastitis homeopathically is \$1-2/cow which is far less expensive than a conventional treatment, especially when considering that there is no withholding time for the milk.
- Farmers can maintain and improve their soil fertility through the annual spreading of manure (10-12T/A) and natural soil amendments and through crop rotation, instead of having to rely on the use of chemical fertilizers. For example, one farmer is growing corn for 2 years, then following corn with soybeans for 1 year and then growing 2 years of small grains before going into a mixed hay seeding. There is enough residual fertility from the soybeans for the small grains.

C. Farmer Evaluations

At our final meeting/celebration on December 12, 1996, many of the farmers commented on how much they gained from being a part of the project, and how long it took to learn that. But as with anything, the participating farmers just started to take advantage of this project at the end - trusting that the researchers were really there for them to get information from and share information with. Jack Lazor's 1995 quote sums up what many of the farmers think with his comment, "I am just starting to have fun with this project. For a long time, I thought it was one of those typical projects where the researchers dictate the information they want to get. Now I see that I can set the agenda and use the researchers to help me find the answers I want."

6. Producer Involvement

Number of grower/producers at attendance at workshops, conferences, etc. are detailed under "Specific Project Results: Objective 2."

7. Areas needing additional study

a) There was a lot of interest among participating farmers to study the efficacy of homeopathy and other alternative remedies. Due to this, we applied for and received a SARE grant in 1997 entitled, " Efficacy Evaluation of Homeopathic Nosodes for Mastitis and Calf Scours, and documentaion of Homeopathic Practices in Organic and Conventional Dairy Production." (97LNE97-86)

b) With the realization that many of the organic herds have Staph. aureus present, they would like to follow up with research on the impacts of different dry cow therapies to treat Staph. aureus, and the connection between high somatic cell count and milk quality.

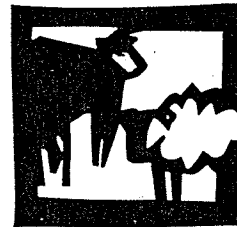
c) One identified problem for some of the organic dairy farms in the project concerns low soil fertility pastures. The major concern is whether there would be enough improvement in pasture prodction and quality to offset the high cost of organic fertilizers. To address this issue, two farms initiated a research project in 1996 as described below. Because these are long term studies, we were not able to get the results for this project; however it would be an ideal follow-up study.

- Annie Claghorn and Catlin Fox questioned whether manure can sustain the fertility of their farm. They determined that they have enough manure to spread 10 tons/acre on 12 acres a year. They estimated that 50% of the total manure gets spread by the cows during the grazing season. They then identified three pastures as being very unproductive. A soil test taken in June 1996 showed that all three were very low in phosphorus. They have two treated areas and two untreated areas, applying 100# of P2O5/A, based on soil test recommendations. They are particularly interested in evaluating whether the expense of spreading expensive organic fertilizers will be recovered in increased value or quantity from their pastures.

- After reviewing several years of animal/pasture records, Peter Young learned that he was getting 2 tons of dry matter per year off his pastures and felt that pasture production could be better. A soil test taken in June of 1996 on one of the bigger pastures showed a low soil test for potassium. A trial was undertaken to supplement a portion of the pasture with Sul-po-mag (22% K2O) to satisfy the soil test recommendation (100 lbs. per acre). Two sections of the pasture system was treated and two sections were not. Data being gathered in order to compare treatments include: grazing days per animal unit, soil tests, tissue analysis and pasture yield.

8. Photographs

I previously attached photographs with the 1995 and 1996 annual reports, please let me know if you would like any additional ones.



A Systems Analysis of Organic & Transitional Dairy Production

Summary

This project collected information on the economic, environmental and social costs of organic dairy production and farms in transition to organic. Three areas were analyzed: business management, animal management, and crop management.

Objectives

- ◆ Assess the farm management systems of three certified organic dairy farms, four transitional dairy farms, and one conventional dairy farm.
- ◆ Facilitate the exchange of information from farmer-to-farmer and farmer-to-agricultural professional, particularly Cooperative Extension staff, researchers, and veterinarians.

Key Findings

The farmers in the study found that it was economically profitable to produce milk organically. Farmers can maintain and improve their soil fertility through the annual spreading of manure and natural soil amendments and through crop rotation instead of having to rely on the use of chemical fertilizers.

Homeopathic treatments show great promise as an alternative to antibiotics and other conventional medicines currently used to maintain herd health.

The farms that seem to have the easiest time making the transition to organic production tend to have pasture-based herds with production levels that are average, not high.

Staphylococcus aureus is the most common mastitis pathogen for organic herds, perhaps due to the tendency of cows in organic herds to live longer.

Dairy cow hygiene is the most important management item in organic dairy farms. Organic producers should take extra precautions to minimize new intramammary infections during the dry period and among replacement heifers, the two critical points of entry of mastitis. Special attention should be given to balancing rations for micronutrients such as Vitamin E, selenium, and copper to enhance the cow's immune system.

Due to their increased milk check, the organic farmers are meeting their cost of production and are able to be better all-around managers. This management includes upkeep of facilities and affording new manure-management systems to divert primarily liquid runoff from existing storage.

Methods and Findings

Of the eight study farms that started the project, three were organic, four transitional, and one conventional. During the course of the study, two of the transitional farms became organic, leaving five organic, two transitional, and one conventional. Quantitative information was obtained by collecting detailed records of costs, labor, time, inputs, and production of animal and crop components on each farm. In addition, whole-farm financial analysis was conducted on each farm.

Each year, the participating farmers chose topics to focus on. These topics included large-animal homeopathy, organic feed and forage management, milk quality and udder health, and

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SARE Grant

\$165,000

Match

\$131,108

Duration

1993 to 1998

Project Number

LNE93-39

VT

soil fertility management. On-farm technical meetings were organized around each subject, and farmers had the opportunity to meet with 30 to 40 peers who had recently made or were interested in making the transition to organic dairy production. The farmers used these meetings to show their farm and demonstrate a management practice unique to their farm, to discuss their approach to the particular topic, to detail their successes and challenges, and to network with the researchers and project advisors on different management practices.

Topics included large animal homeopathy, forage management in organic production, the use of pastured poultry for parasite management, organic dairy production, milk quality and udder health, soil fertility and stewardship, and new models of cow housing for seasonal milking programs.

This project was generated out of a lack of answers to questions such as: "How much does it cost to produce 100 pounds of milk organically? Is there any connection between feeding a lower energy ration to my cows and a decrease in animal health problems? Will milk production decrease if I feed my cows organically?" To gather this information, monthly visits were done through November of 1996 to each farm. This gave us two full years of data on cropping and animal management, including information on feeding, nutrition, and herd health. During this time, we also completed the economic data collection for 1993 through 1995 on seven of the eight farms. Key findings are:

Business Management: The farmers in the study found that it was profitable to produce milk organically. One farm increased their net profit by 30% from the first to third year of the study; another farm increased by more than 40%. This was due to an increase in the price of milk per hundredweight, a decrease in production expenses, and an increase in non-dairy-farm income.

It is difficult, and perhaps inaccurate, to present the isolated economic findings without the context of the full case studies. Nevertheless, the greatest demand for information is from individuals who want to know whether organic dairy farming is economically viable. The analysis of the farms that made the transition to organic dairy production during the course of our study is probably the most helpful. The farms that seemed to have the easiest time making this transition tended to have pasture-based herds with production levels that were average, not high. These farms were fertilizing their

fields with manure, growing haylage or hay for their forage, relying on pasture for seasonal feed, and rarely had health problems, using antibiotics only a few times a year.

Financially, these farmers were doing well conventionally. One farm under conventional management grossed \$125,000 from 70 cows with a total of 908,000 pounds of milk shipped. The second year they shipped conventional milk for part of the year and then qualified for organic certification and shipped organic for the second half of the year. By the end of the third year, they were shipping only organic milk, receiving \$165,000 from 70 cows with a total of 890,000 pounds of milk shipped.

All of the farms in the study are in Vermont, but their soil type and cropping systems differ. The soil types vary from Vergennes clay (Leicester) to Tunbridge (Chelsea). While six of the eight farms are pasture-based and purchase their grain, two grow the majority of their own feed, including corn, barley, and oats. Seven of the eight farms are family run, while one is managed by a solo operator. The farms vary from 13 to 115 milking cows, with three herds of Holsteins and five of either Jerseys or mixed breeds. The topography ranges from the lowlands of the Champlain Valley to the hill farms of Plainfield and Chelsea to a farm on a high, northern plateau near the Canadian border.

Animal management and herd health: Before this grant, few of the farmers were getting their milk quality tested for somatic cell count, and were not identifying the mastitis pathogens. Working with the Quality Milk Research Lab (Q.M.R.L.) at UVM, the farmers sampled their cows when they dried them off, when they freshened, when they purchased a cow, or when they had a clinical.

The Q.M.R.L. found that *Staphylococcus aureus* is the most common mastitis pathogen, and the researchers hypothesize that this is due to the age of the cows and due to the fact that most organic farmers keep their cows around for more lactations than conventional farmers. This finding has stirred a debate about whether the organic farmers with cows with *Staph. aureus* should treat those cows with an antibiotic when they are dried off. The organic certification standards prohibit the routine use of dry treatment and its use may be prohibited in subsequent years. The farmers are working with the Q.M.R.L. to determine what other management practices might be contributing to the occurrence of *Staph. aureus* and how to control it in the herd,

perhaps by changing pre- and post-dipping solutions, or segregating cows with *Staph. aureus*. Control of mastitis is paramount to maximizing the production and profitability of high-quality milk. Given that organic dairy farmers are prohibited from using antibiotics to treat mastitis, organic dairy farmers must pay more attention to preventing mastitis.

Animal management and feeding and nutrition: The predominant questions for the participating farmers regarding feeding were whether, if you are relying primarily on pasture, how to best supplement energy. If you don't want to stress cows, but you want enough energy, how much feed should cows be getting?

The majority of the organic farmers in the state, and in this study, are grass-based farmers. While most conventional farmers rely on corn silage for energy, grass-based farmers must increase milk production by putting up high quality forages to maintain condition. This is an obstacle for farmers making the transition to organic dairy who are used to the conventional goal of managing cows for production. If a farmer does not grow organic corn silage or soybeans, these feeds are difficult to purchase; farmers must reformulate their ration in order to rely on organic forages and purchased grain.

Crop Management: The predominant issues for the farmers who are making the transition to organic dairy production is how they can maintain fertility without the use of synthetic chemical fertilizers and how to manage weeds in row crops without the use of herbicides. There was an active discussion among the dairy farmers who transitioned into organic agriculture for predominantly economic reasons, and those dairy farmers who believed a farm could only be successful if managed as a system of connecting parts. This discussion led to the topic for the second annual "Alternatives in Animal Health" conference. Supported by SARE, the 1998 conference was called "The Farm as an Organism: Interconnections from the Soil Up."

Impacts

We are writing a detailed publication on organic dairy farming, including comprehensive case studies for each participating farm, technical chapters by the participating researchers, and articles by the participating farmers.

This project has the potential to contribute significantly to the dairy industry in Vermont, and with a transfer of information, to other states. Conven-

tional dairy production is threatened by low milk prices, environmental regulation and liability, and consumer acceptance. While organic grain costs are higher than conventional grain, and while some farmers see a decrease in milk production, farmers estimate that there is a net economic benefit due to higher organic milk prices.

There have been changes the participating farmers have made, as well as changes that have taken place among the farmers that are transitioning to organic and using the project farmers as mentors. For example, one farmer transitioning to organic production started cultivating his corn instead of using a herbicide, and began relying on organic fertilizers and crop rotations instead of synthetic fertilizers. For organic corn production, the farmer now plows in 20 tons per acre of manure in the spring, uses an organic granulated whey fertilizer (5-9-1) at 420 pounds per acres as a corn starter, cultivates the corn three times with a s-tine cultivator, six days apart, and spinner spreads on allis sweet annual red clover at 10 pounds per acre as a green manure crop. Corn is planted for two years, followed by six years of alfalfa and orchard grass.

All of the farmers have increased their knowledge of and use of alternatives to antibiotics, mostly by using more homeopathic remedies. Most of the farmers have the greatest problem with reproductive and udder health. In conventional animal practices, farmers treat reproductive problems with hormones, which are prohibited in organic practice. Mastitis, the most common udder malady, is conventionally treated with antibiotics. Farmers have had success using the homeopathic remedies belladonna and aconite when the quarter is swollen and cow has a high fever.

Especially noteworthy is the fact that the one conventional farm in the study started using homeopathic nosodes in a controlled procedure directed by the consulting veterinarian. They were so shocked by their success rate that they have transitioned from conventional to homeopathic remedies, specifically for hairy heel wart and calf scours.

Other effects of this project include pasture-management consults and an increase in intensive pasture management, experiments with non-synthetic fly-control strategies, new protocols for sanitizing milking equipment, and using calf nursing to improve cow health and improve milk quality.

Reported June 1998

SYSTEMS ANALYSIS OF ORGANIC AND TRANSITIONAL DAIRY PRODUCTION
Report of Economics Component
Neil H. Pelsue, Jr. and Alfred S. Person

Overview

"How much does it cost to produce milk?" This may be one of the most frequently asked questions with respect to the economics of dairy farming. Yet, at the same time, it may well be one of the most challenging and elusive questions to answer. No two farms are exactly alike. Each farm has a unique set of characteristics and factors that influence the way it operates, which in turn influence the economic aspects of that farm operation.

On the other hand, {recall Harry Truman's reference to 'two-handed economists'} farms do have many similar characteristics. The more similar they are, the more accurately an economic analysis can represent those farms. To have any degree of reliability in such studies, there must be a sufficient number of farms or a group of farms analyzed over a sufficient number of years. Unfortunately, neither is the case in this study.

At the time this study was developed, proposed, approved, and funded, there were four certified organic dairy farms in Vermont. All four farms were originally included in the project. Part way through the study one of the farms discontinued operation and was dropped from the analysis.

The researchers on this project were not able to commit long periods of time to the study. Recognizing the time span and population constraints, we approached the analysis as a set of case studies, rather than as a conventional aggregated analysis. While this approach does not yield a single set of numbers to represent organic dairy production, it does provide greater detail of the farms in the study. It may also provide the opportunity to contrast the differing operating structures and methods to learn how each impacts the resulting economic outcomes.

Data Collection and Analysis

The data was collected by personal interviews with each of the participating farm families. The data was obtained from a combination of personal farm records and Federal income tax forms. The study period began in 1993 and covered the three year period through 1995.

The data was analyzed in several different ways. It was first put into a standard income and expense format, which provided the detail necessary to determine the individual sources of income and the production and marketing expenses associated with the dairy enterprise. Non-dairy income and expenses were included for the whole farm summaries. Secondly, an annual balance sheet was developed for each farm.

The income and expense data were tabulated and presented in three formats. First, the data was compiled and reported in total aggregate form. These data were then recalculated to

present the receipts and expenses, for the appropriate items, in terms of income and expense on a per cow and per hundredweight of milk basis. The balance sheet tables are presented in aggregate form, with the single exception of the debt/cow entry at the bottom of the table.

We also itemized the annual expense items associated with the livestock, manure, and forage crop activities for each farm. These analyses were developed to enhance the evaluation of the agronomic aspects of the study. This information will be included and reported in the section in which Bosworth discusses the crop production and harvesting activities for the study farms.

Organic Dairy Farms: Economic Analysis

Hill Farm [Tables 1 - 4]

The Hill Farm increased in size from 11 to 18 milking cows during the three year course of the study. In this same time period, they also switched from year-round milking to a seasonal milk production system. During at least three months of the year, milk production was zero. In the last year of the study, they isolated two or three mature milking cows and fed some of their calves with these cows. The decline in milk production per cow over the study period was predominantly influenced by these two production practices. The associated impacts on income from the sale of milk are obvious. Crop and pasture acreage remained unchanged at a little over 100 acres throughout the three year study period.

This farm was a vertically integrated production, processing, and marketing operation. The owners packaged and sold their own milk, increasing total income from the integrated dairy operation through both wholesale and retail value-added sales. Total farm income was also supplemented by other agricultural enterprises. This latter characteristic permits the owners to spread their operating costs, especially the fixed costs, over the several enterprises. We have tried to identify and isolate those economic variables associated with the milk production operation. Variable expenses attributable to other operations are identified in separate entries.

Total farm Net Profit increased nearly 30% from the first to third year of the study. However, this gain did not come from greater milk sales, which in fact decreased. Rather, the improved Net Profit was due primarily to a substantial increase in non-dairy farm income. Tables 2 and 3 point out the financial precariousness of the dairy farm. Looking just at the milk production operation, the net losses are rather substantial. Dairy farmers, individually and collectively, must aggressively pursue ways to capture larger portions of the value added to milk beyond the farm gate.

Looking at the farm expense side of the operation, we see quite a different picture. Deducting the costs of items associated with the non-dairy operation, indicates that milk production costs actually decreased by nearly \$5,000 over the three year study period. Much of that decline was attributable to lower expenses for hauling, hired labor, and bedding, and were

**Table 1: Hill Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis**

Item:	Units			
	Year	1993	1994	1995
Farm Workers (total)	No.	1.5	1.5	1.5
Total Cows Milking	No.	11	13	18
Total Dairy Livestock	No.	18	24	45
Average Milk / Cow / Year	lbs	10,061	9,556	6,676
Total Milk Sold	lbs.	110,671	124,223	120,172
Value of Milk Sold	\$	40,306	38,944	33,276
Crop Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Pasture Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Income:				
Value of Milk Sold	\$	40,306	38,944	33,276
Value of Livestock Sold	\$	810	20	0
Value of Crops Sold	\$	0	80	0
Non-dairy Farm Income	\$	18,300	20,263	29,041
Total Income	\$	59,416	59,307	62,317
Expenses:				
Hauling	\$	4,690	8,296	1,435
Coop Dues	\$	0	0	0
Advertising	\$	0	0	0
CCC Deductions	\$	0	719	572
Labor (paid)	\$	2,776	2,134	590
Purchased Forage	\$	0	84	1,034
Purchased Grain	\$	4,387	4,158	6,837
Veterinary Services	\$	354	472	332
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	0	0	0
Breeding	\$	0	112	86
DHI / Records / Tax Prep.	\$	728	264	0
Fencing	\$	300	289	815
Water System	\$	250	575	129
Lanes	\$	0	0	0
Propane	\$	1,404	1,070	891
Fuel (Desel)	\$	250	250	225
Bedding	\$	2,405	1,522	693
Milking Supplies	\$	1,114	4,711	1,198
Other Supplies	\$	4,173	0	2,430
Custom / Machine Hire	\$	0	175	0
Fertilizer / Lime	\$	1,182	0	0
Seed	\$	0	0	266
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	594	5,007	3,732
Building Repairs	\$	0	0	0
Electric / Telephone	\$	2,900	1,675	1,700
Rent	\$	600	523	500
Taxes (property)	\$	1,503	1,229	1,615
Farm Insurance	\$	374	280	357
Interest	\$	0	0	0
Other Expenses	\$	1,919	0	1,500
Non-Dairy Farm Expenses	\$	6,183	7,038	9,775
Total Costs	\$	38,086	40,583	36,712
Net Income				
Net Income	\$	21,330	18,724	25,605
Depreciation	\$	4,500	5,650	3,971
Net Profit / Loss	\$	16,830	13,074	21,634

Table 2: Hill Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit	1993	1994	1995
Farm Workers (total)	No.	1.5	1.5	1.5
Total Cows Milking	No.	11	13	18
Total Dairy Livestock	No.	18	24	45
Average Milk / Cow / Year	lbs	10,061	9,556	6,676
Total Milk Sold	lbs.	110,671	124,223	120,172
Value of Milk Sold	\$ / cow	40,306	38,944	33,267
Crop Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Pasture Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Income:				
Value of Milk Sold	\$ / cow	3,664	2,996	1,848
Value of Livestock Sold	\$ / cow	74	2	0
Value of Crops Sold	\$ / cow	0	80	0
Total Income	\$ / cow	3,738	3,077	1,848
Expenses:				
Hauling	\$ / cow	426	638	80
Coop Dues	\$ / cow	0	0	0
Advertising	\$ / cow	0	0	0
CCC Deductions	\$ / cow	0	55	32
Labor (paid)	\$ / cow	252	164	33
Purchased Forage	\$ / cow	0	84	57
Purchased Grain	\$ / cow	399	320	380
Veterinary Services	\$ / cow	32	36	332
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	0	0	0
Breeding	\$ / cow	0	9	5
DHI / Records / Tax Prep.	\$ / cow	66	20	0
Fencing	\$ / cow	27	22	45
Water System	\$ / cow	23	44	7
Lanes	\$ / cow	0	0	0
Propane	\$ / cow	128	82	50
Fuel	\$ / cow	23	19	13
Bedding	\$ / cow	219	117	39
Milking Supplies	\$ / cow	101	362	67
Other Supplies	\$ / cow	379	0	135
Custom / Machine Hire	\$ / cow	0	13	0
Fertilizer / Lime	\$ / cow	107	0	0
Seed	\$ / cow	0	0	15
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	54	385	207
Building Repairs	\$ / cow	0	0	0
Electric / Telephone	\$ / cow	264	129	94
Rent	\$ / cow	55	40	28
Taxes (property)	\$ / cow	137	95	90
Farm Insurance	\$ / cow	34	22	20
Interest	\$ / cow	0	0	0
Other Expenses	\$ / cow	174	0	83
Total Expenses	\$ / cow	2,900	2,658	1,810
Net Income	\$ / cow	838	419	38
Depreciation	\$ / cow	409	435	221
Net Profit / Loss	\$ / cow	429	-15	-183

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**Table 3: Hill Farm, Income and Expenses, 1993-1995.
Milk Production Operation**

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	1.5	1.5	1.5
Total Cows Milking	No.	11	13	18
Total Dairy Livestock	No.	18	24	45
Average Milk / Cow / Year	lbs	10,061	9,556	6,676
Total Milk Sold	lbs.	110,671	124,223	120,172
Value of Milk Sold	\$ / cwt.	40,306	38,994	33,276
Crop Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Pasture Land: Owned / Rented	Acres	51 / 0	51 / 0	51 / 0
Income:				
Value of Milk Sold	\$ / cwt.	36.44	31.40	27.71
Value of Livestock Sold	\$ / cwt.	0.73	0.02	0.00
Value of Crops Sold	\$ / cwt.	0.00	0.06	0.00
Total Income	\$ / cwt.	37.18	31.48	27.71
Expenses:				
Hauling	\$ / cwt.	4.24	6.68	1.19
Coop Dues	\$ / cwt.	0.00	0.00	0.00
Advertising	\$ / cwt.	0.00	0.00	0.00
CCC Deductions	\$ / cwt.	0.00	0.58	0.48
Labor (paid)	\$ / cwt.	2.51	1.72	0.49
Purchased Forage	\$ / cwt.	0.00	0.07	0.86
Purchased Grain	\$ / cwt.	3.96	3.35	5.69
Veterinary Services	\$ / cwt.	0.32	0.38	0.28
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.00	0.00	0.00
Breeding	\$ / cwt.	0.00	0.09	0.07
DHI/Records/Tax Prep.	\$ / cwt.	0.66	0.21	0.00
Fencing	\$ / cwt.	0.27	0.23	0.68
Water System	\$ / cwt.	0.23	0.46	0.11
Lanes	\$ / cwt.	0.00	0.00	0.00
Propane	\$ / cwt.	1.27	0.86	0.74
Fuel	\$ / cwt.	0.23	0.20	0.19
Bedding	\$ / cwt.	2.17	1.23	0.58
Milking Supplies	\$ / cwt.	1.01	3.79	1.00
Other Supplies	\$ / cwt.	3.77	0.00	2.02
Custom/Machine Hire	\$ / cwt.	0.00	0.14	0.00
Fertilizer/Lime	\$ / cwt.	1.07	0.00	0.00
Seed	\$ / cwt.	0.00	0.00	0.22
Chemicals/Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	0.54	4.03	3.11
Building Repairs	\$ / cwt.	0.00	0.00	0.00
Electric/Telephone	\$ / cwt.	2.62	1.35	1.41
Rent	\$ / cwt.	0.54	0.42	0.42
Taxes (property)	\$ / cwt.	1.36	0.99	1.34
Farm Insurance	\$ / cwt.	0.34	0.23	0.30
Interest	\$ / cwt.	0.00	0.00	0.00
Other Expenses	\$ / cwt.	1.73	0.00	1.25
Total Expenses	\$ / cwt.	28.83	27.00	22.42
Net Income	\$ / cwt.	8.35	4.47	5.29
Depreciation	\$ / cwt.	4.07	4.55	3.30
Net Profit/Loss	\$ / cwt.	4.28	-0.08	1.99

Table 4: Hill Farm, Balance Sheet, 1993-1995.

Item:	Unit			
	Year	1993	1994	1995
Farm Assets				
Cash and Checking Balance	\$	1,150	1,850	1,850
Prepaid Expenses and Supplies	\$	0	0	0
Accounts Receivable	\$	0	1,500	0
Crops on Hand or Growing Crops	\$	2,763	3,125	3,000
Barrels	\$	9,000	12,000	14,000
Livestock Held for Sale	\$	0	0	0
Dairy Livestock	\$	10,300	12,400	21,000
Machinery	\$	30,800	30,800	30,800
Farm Land and Buildings	\$	162,500	170,000	176,500
Total Farm Assets	\$	216,513	231,675	247,150
Liabilities				
Accounts Payable	\$	0	500	0
Current Loans	\$	0	0	0
Dairy Livestock Loans	\$	0	0	0
Machinery Loans	\$	0	0	0
Farm Land and Building Loans		0	0	0
Total Liabilities	\$	0	500	0
Net Worth	\$	216,513	231,175	247,150
Debt / Cow	\$	0	38	0

presumably associated with the alternative milk production operating system employed on the Hill Farm.

Hauling costs in each of the first two study years included the cost of distributing the packaged products which they processed on the farm. In the third year, the operators substantially reduced the volume of milk processed on the farm and began selling milk to another processor. The lower hired labor expenses were directly associated with the reductions in on-farm processing and wholesale/retail deliveries. The decline in bedding costs on the farm reflect the change in bedding materials used. They began using larger portions of farm produced hay and less purchased sawdust for bedding. The increase in machine repairs resulted in large part from breakdowns in their delivery truck and tractor.

From 1993 to 1995, the Hill Farm's Net Worth climbed nearly 15%. This gain was attributable entirely to increases in the value of the farm's assets.

Taconic End Farm [Tables 5 - 8]

The number of milking cows held very steady at 26-28 for each of the three years in the study period. Milk production per cow rose nearly 1,000 pounds in the first two years. Production per cow then declined in 1995, but this reflected a change from milking 12 months to 10 months of the year. Average pounds of milk produced per month actually rose from 1,203 in 1994 to 1,367 in 1995. The total crop land used on this farm remained steady at 70 - 75 acres annually. Pasture land rose by about 20 acres.

Net farm profit increased a little more than 40% over the three-year study period. Three factors are of interest here. First, both the value of milk sold and non-dairy farm income increased. Secondly, farm production expenses dropped by nearly 25% and thirdly, depreciation expense more than tripled in the third year. At the same time, the farm owners reported that the focus of this study on farm production methods and milking practices helped them improve their management and operating efficiencies, resulting in better overall economic performance.

The decline in farm production expenses resulted primarily from improvements in operating methods and the switch from year-round milking to seasonal milking. Expense items of note include hired labor, purchased forage, purchased grain, veterinary services, milking supplies, machine repairs, and utilities. The reduction achieved in these items alone from year one to year three totaled over \$11,500.

Elimination of outstanding loans on their machinery in 1995, combined with annual increases in the value of assets held, caused net worth to rise \$4,800 from 1993 - 1995.

Table 5: Taconic End Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	26	28	26
Total Dairy Livestock	No.			42
Average Milk / Cow / Year	lbs.	13,468	14,440	13,671
Total Milk Sold	lbs.	350,178	404,331	355,450
Value of Milk Sold	\$	50,525	60,989	51,600
Crop Land: Owned / Rented	Acres	70 / 0	75 / 0	70 / 0
Pasture Land: Owned / Rented	Acres	55 / 0	75 / 0	75 / 0
Income:				
Value of Milk Sold	\$	50,525	60,989	51,600
Value of Livestock Sold	\$	3,911	3,809	2,360
Value of Crops Sold	\$	806	0	1,950
Non-Dairy Farm Income	\$	267	881	2,400
Total Income	\$	55,509	65,679	58,310
Expenses:				
Hauling	\$	2,174	2,354	2,130
Coop Dues	\$	336	121	106
Advertising	\$	614	605	530
CCC Deductions	\$	519	650	596
Labor (paid)	\$	756	905	0
Purchased Forage	\$	987	597	0
Purchased Grain	\$	16,469	16,373	12,570
Veterinary Services	\$	2,480	1,930	1,350
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	0	0	260
Breeding	\$	1,117	1,286	1,220
DHI / Records / Tax Prep.	\$	1,226	1,389	1,320
Fencing	\$	333	0	50
Water System	\$	0	40	0
Lanes	\$	0	0	0
Irrigation	\$	0		0
Fuel	\$	274	433	250
Bedding	\$	450	588	545
Milking Supplies	\$	2,849	2,605	1,525
Other Supplies	\$	0	0	0
Custom / Machine Hire	\$	0	0	707
Fertilizer / Lime	\$	0	908	0
Seed	\$	0	560	0
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	5,201	4,573	2,370
Building Repairs	\$	0	0	410
Electric / Telephone	\$	2,223	1,948	1,523
Rent	\$	0	0	0
Taxes (property)	\$	1,600	1,600	2,000
Farm Insurance	\$	1,290	1,239	1,125
Interest	\$	0	0	0
Other Expenses	\$	0	0	480
Non-Dairy Farm Expenses	\$	0	0	0
Total Expenses	\$	40,898	40,704	31,067
Net Income	\$	14,611	24,975	27,243
Depreciation	\$	2,927	3,000	10,750
Net Profit / Loss	\$	11,684	21,975	16,493

Table 6: Taconic End, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	26	28	26
Total Dairy Livestock	No.			42
Average Milk / Cow / Year	lbs.	13,468	14,440	13,671
Total Milk Sold	lbs.	350,178	404,331	355,450
Value of Milk Sold	\$	50,525	60,989	51,600
Crop Land: Owned / Rented	Acres	70 / 0	75 / 0	70 / 0
Pasture Land: Owned / Rented	Acres	55 / 0	75 / 0	75 / 0
Income:				
Value of Milk Sold	\$ / cow	1,943	2,178	1,985
Value of Livestock Sold	\$ / cow	150	136	91
Value of Crops sold	\$ / cow	31	0	75
Total Income	\$ / cow	2,125	2,314	2,150
Expenses:				
Hauling	\$ / cow	84	84	82
Coop Dues	\$ / cow	13	4	4
Advertising	\$ / cow	24	22	20
CCC Deductions	\$ / cow	20	23	23
Labor (paid)	\$ / cow	29	32	0
Purchased Forage	\$ / cow	38	21	0
Purchased Grain	\$ / cow	633	585	483
Veterinary Services	\$ / cow	95	69	52
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	0	0	10
Breeding	\$ / cow	43	46	47
DHI / Records / Tax Prep.	\$ / cow	47	50	51
Fencing	\$ / cow	13	0	2
Water System	\$ / cow	0	1	0
Lanes	\$ / cow	0	0	0
Irrigation	\$ / cow	0		0
Fuel	\$ / cow	11	15	10
Bedding	\$ / cow	17	21	21
Milking Supplies	\$ / cow	110	93	59
Other Supplies	\$ / cow	0	0	0
Custom / Machine Hire	\$ / cow	0	0	27
Fertilizer / Lime	\$ / cow	0	32	0
Seed	\$ / cow	0	20	0
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	200	163	91
Building Repairs	\$ / cow	0	0	16
Electric / Telephone	\$ / cow	86	70	59
Rent	\$ / cow	0	0	0
Taxes (property)	\$ / cow	62	57	77
Farm Insurance	\$ / cow	50	44	43
Interest	\$ / cow	0	0	0
Other Expenses	\$ / cow	0	0	18
Total Expenses	\$ / cow	1,573	1,454	1,195
Net Income	\$ / cow	552	861	956
Depreciation	\$ / cow	113	107	413
Net Profit / Loss	\$ / cow	439	753	542

**Table 7: Taconic End, Income and Expenses, 1993-1995.
Milk Production Operation**

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	26	28	26
Total Dairy Livestock	No.			42
Average Milk / Cow / Year	lbs.	13,468	14,440	13,671
Total Milk Sold	lbs.	350,178	404,331	355,450
Value of Milk Sold	\$	50,525	60,989	51,600
Crop Land: Owned / Rented	Acres	70 / 0	75 / 0	70 / 0
Pasture Land: Owned / Rented	Acres	55 / 0	75 / 0	75 / 0
Income:				
Value of Milk Sold	\$ / cwt.	14.43	15.09	14.52
Value of Livestock Sold	\$ / cwt.	1.12	0.94	0.66
Value of Crops Sold	\$ / cwt.	0.23	0.00	0.55
Total Income	\$ / cwt.	15.78	16.03	15.73
Expenses:				
Hauling	\$ / cwt.	0.62	0.58	0.60
Coop Dues	\$ / cwt.	0.08	0.03	0.03
Advertising	\$ / cwt.	0.18	0.15	0.15
CCC Deductions	\$ / cwt.	0.15	0.16	0.17
Labor (paid)	\$ / cwt.	0.22	0.22	0.00
Purchased Forage	\$ / cwt.	0.28	0.15	0.00
Purchased Grain	\$ / cwt.	4.70	4.05	3.54
Veterinary Services	\$ / cwt.	0.71	0.48	0.38
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.00	0.00	0.07
Breeding	\$ / cwt.	0.32	0.32	0.34
DHI / Records / Tax Prep.	\$ / cwt.	0.35	0.34	0.37
Fencing	\$ / cwt.	0.10	0.00	0.01
Water System	\$ / cwt.	0.00	0.01	0.00
Lanes	\$ / cwt.	0.00	0.00	0.00
Irrigation	\$ / cwt.	0.00	0.00	0.00
Fuel	\$ / cwt.	0.08	0.11	0.07
Bedding	\$ / cwt.	0.13	0.15	0.15
Milking Supplies	\$ / cwt.	0.81	0.64	0.43
Other Supplies	\$ / cwt.	0.00	0.00	0.00
Custom / Machine Hire	\$ / cwt.	0.00	0.00	0.20
Fertilizer / Lime	\$ / cwt.	0.00	0.22	0.00
Seed	\$ / cwt.	0.00	0.14	0.00
Chemicals / Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	1.49	1.13	0.67
Building Repairs	\$ / cwt.	0.00	0.00	0.12
Electric / Telephone	\$ / cwt.	0.63	0.48	0.43
Rent	\$ / cwt.	0.00	0.00	0.00
Taxes (property)	\$ / cwt.	0.46	0.40	0.56
Farm Insurance	\$ / cwt.	0.37	0.31	0.32
Interest	\$ / cwt.	0.00	0.00	0.00
Other Expenses	\$ / cwt.	0.00	0.00	0.14
Total Expenses	\$ / cwt.	11.67	10.07	8.74
Net Income	\$ / cwt.	4.11	5.96	6.99
Depreciation	\$ / cwt.	0.84	0.74	3.02
Net Profit / Loss	\$ / cwt.	3.28	5.22	3.97

Table 8: Taconic End, Balance Sheet, 1993-1995.

Item:	Unit			
	Year	1993	1994	1995
Assets				
Cash and Checking Balance	\$	1,000	1,000	1,000
Prepaid Expenses and Supplies	\$	0	0	0
Accounts Receivable	\$	4,000	4,000	4,000
Crops on Hand or Growing Crops	\$	7,000	7,000	7,000
Livestock Held for Sale	\$	0	1,500	800
Dairy Livestock	\$	31,700	31,700	31,700
Machinery	\$	16,000	16,500	18,000
Farm Land and Buildings	\$	140,000	140,000	140,000
Total Assets	\$	199,700	201,700	202,500
Liabilities				
Accounts Payable	\$	0	0	0
Current Loans	\$	0	0	0
Dairy Livestock Loans	\$	0	0	0
Machinery Loans	\$	2,000	4,000	0
Farm Land and Building Loans	\$	0	0	0
Total Liabilities	\$	2,000	4,000	0
Net Worth	\$	197,700	197,700	202,500
Debt / Cow	\$	77	143	0

Lazor Farm [Tables 9 - 12]

The Lazors increased the number of milking cows from 22 in 1993 to 28 in 1995. Production per cow also rose, resulting in total milk production increasing by nearly 30%. Their operation is a vertically integrated milk production - processing - distribution system. The milk produced on the farm, plus additional purchased milk, is used to produce a variety of yogurt products.

Whole farm net income, before deductions for depreciation, was negative for each of the three study years, ranging from \$-158,051 to \$-236,550. The relatively high depreciation costs were attributable mostly to upgrading and modifying the equipment and facilities for the milk production system.

Total farm expenses rose \$142,000 from 1993 to 1995. The largest, single item increase was in building repairs. It should be noted that this resulted from the fact that all the building materials used for the milk production and heifer raising facilities were expensed as one time cash expenses, rather than amortized over several years. Most of the increase for other items resulted from higher outlays for the larger milking herd and the expanded grain cropping operation to support the modified milk production operation. Non-dairy farm expenses accounted for 60 - 67 percent of the total farm expenses. By 1995, non-dairy farm income represented more than 40 percent of the total farm income.

Tables 10 and 11 attempt to look at just the milk production operation. Net dairy farm profit remains negative, even with the elimination of the non-dairy entries. Amortizing the building modification costs would have lessened the annual net income loss, but one-year expensing does not wholly explain the loss in net income.

Despite the efforts to separate milk production and milk processing costs, we most likely were not successful in all instances. We suspect that hired labor included labor expenses for both milk production and processing activities. The depreciation entry may also include at least some of the depreciation costs that rightfully pertain only to the milk processing operation. These would tend to overstate the costs for the milk production operation.

Even with the extensive upgrades and expansion to the milk producing facility, total liabilities actually declined over the three-year study period. At the same time, the value of the farm assets rose 15%, resulting in a 20% gain in net worth. Outstanding liabilities declined by nearly one-quarter, and coupled with a larger milking herd resulted in a debt/cow dropping almost 40%.

**Table 9: Lazor Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis**

Item:	Units			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	3	3
Total Cows Milking	No.	22	24	28
Total Dairy Livestock	No.	43	50	60
Average Milk / Cow / Year	lbs.	12,965	13,823	13,141
Total Milk Sold	lbs.	285,226	331,754	367,953
Value of Milk Sold	\$	56,075	63,066	73,591
Crop Land: Owned / Rented	Acres	/	/	250 / 0
Pasture Land: Owned / Rented	Acres	/	/	25 / 0
Income:				
Value of Milk Sold	\$	56,075	63,066	73,591
Value of Livestock Sold	\$	490	0	1,226
Value of Crops sold	\$	0	0	719
Non-Dairy Farm Income	\$	13,384	35,535	57,936
Total Income	\$	69,949	98,601	133,472
Expenses:				
Hauling	\$	0	0	0
Coop Dues	\$	0	0	0
Advertising	\$	452	0	0
CCC Deductions	\$	434	613	0
Labor (paid)	\$	20,534	32,919	30,426
Purchased Forage	\$	4,003	7,108	0
Purchased Grain	\$	0	0	335
Veterinary Services	\$	3,164	1,530	1,510
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	0	0	0
Breeding	\$	11	2,074	1,277
DHI / Records / Tax Prep.	\$	125	125	0
Fencing	\$	0	0	0
Water System	\$	0	0	0
Lanes	\$	0	0	0
Fuel	\$	2,583	3,983	3,239
Bedding	\$	0	0	0
Milking Supplies	\$	4,019	5,197	4,776
Other Supplies	\$	0	0	0
Custom / Machine Hire	\$	6,565	10,739	12,188
Fertilizer / Lime	\$	14,146	5,309	10,980
Seed	\$	3,041	3,987	6,220
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	5,473	12,254	18,395
Building Repairs	\$	0	3,767	28,716
Electric / Telephone	\$	1,661	4,430	5,590
Rent	\$	668	1,126	6,068
Taxes (property)	\$	2,979	3,183	3,194
Farm Insurance	\$	3,020	4,431	5,977
Interest	\$	1,604	800	375
Other Expenses	\$	0	0	1,443
Non-Dairy Farm Expenses	\$	153,518	181,625	229,313
Total Expenses	\$	228,000	285,200	370,022
Net Income	\$	-158,051	-186,599	-236,550
Depreciation	\$	52,718	39,423	52,767
Net Profit / Loss	\$	-210,769	-226,022	-289,317

Table 10: Lazor Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Units	Year		
		1993	1994	1995
Farm Workers (total)	No.	2	3	3
Total Cows Milking	No.	22	24	28
Total Dairy Livestock	No.	43	50	60
Average Milk / Cow / Year	lbs.	12,965	13,823	13,141
Total Milk Sold	lbs.	285,226	331,754	367,953
Value of Milk Sold	\$ / cow	56,075	63,066	73,591
Crop Land: Owned / Rented	Acres	/	/	250 / 0
Pasture Land: Owned / Rented	Acres	/	/	25 / 0
Income:				
Value of Milk Sold	\$ / cow	2,549	2,628	2,628
Value of Livestock Sold	\$ / cow	22	0	44
Value of Crops Sold	\$ / cow	0	0	26
Total Income	\$ / cow	2,571	2,628	2,698
Expenses:				
Hauling	\$ / cow	0	0	0
Coop Dues	\$ / cow	0	0	0
Advertising	\$ / cow	21	0	0
CCC Deductions	\$ / cow	20	26	0
Labor (paid)	\$ / cow	933	1,372	1,087
Purchased Forage	\$ / cow	182	296	0
Purchased Grain	\$ / cow	0	0	12
Veterinary Services	\$ / cow	144	64	54
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	0	0	0
Breeding	\$ / cow	1	86	46
DHI / Records / Tax Prep.	\$ / cow	6	5	0
Fencing	\$ / cow	0	0	0
Water System	\$ / cow	0	0	0
Lanes	\$ / cow	0	0	0
Fuel	\$ / cow	117	166	116
Bedding	\$ / cow	0	0	0
Milking Supplies	\$ / cow	183	217	171
Other Supplies	\$ / cow	0	0	0
Custom / Machine Hire	\$ / cow	298	447	435
Fertilizer / Lime	\$ / cow	643	221	392
Seed	\$ / cow	138	166	222
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	249	511	657
Building Repairs	\$ / cow	0	157	1,026
Electric / Telephone	\$ / cow	76	185	200
Rent	\$ / cow	30	47	217
Taxes (property)	\$ / cow	135	133	114
Farm Insurance	\$ / cow	137	185	213
Interest	\$ / cow	73	33	13
Other Expenses	\$ / cow	0	0	52
Total Expenses	\$ / cow	3,386	4,316	5,025
Net Income	\$ / cow	-814	-1,688	-2,328
Depreciation	\$ / cow	1,150	1,002	1,131
Net Profit / Loss	\$ / cow	-1,965	-2,690	-3,458

**Table 11: Lazor Farm, Income and Expenses, 1993-1995.
Milk Production Operation**

Item:	Units			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	3	3
Total Cows Milking	No.	22	24	28
Total Dairy Livestock	No.	43	50	60
Average Milk / Cow / Year	lbs.	12,965	13,823	13,141
Total Milk Sold	lbs.	285,226	331,754	367,953
Value of Milk Sold	\$	56,075	63,066	73,591
Crop Land: Owned / Rented	Acres	/	/	250 / 0
Pasture Land: Owned / Rented	Acres	/	/	25 / 0
Income:				
Value of Milk Sold	\$ / cwt.	19.66	19.01	20.00
Value of Livestock Sold	\$ / cwt.	0.17	0.00	0.33
Value of Crops Sold	\$ / cwt.	0.00	0.00	0.20
Total Income	\$ / cwt.	19.83	19.01	20.53
Expenses:				
Hauling	\$ / cwt.	0.00	0.00	0.00
Coop Dues	\$ / cwt.	0.00	0.00	0.00
Advertising	\$ / cwt.	0.16	0.00	0.00
CCC Deductions	\$ / cwt.	0.15	0.18	0.00
Labor (paid)	\$ / cwt.	7.20	9.92	8.27
Purchased Forage	\$ / cwt.	1.40	2.14	0.00
Purchased Grain	\$ / cwt.	0.00	0.00	0.09
Veterinary Services	\$ / cwt.	1.11	0.46	0.41
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.00	0.00	0.00
Breeding	\$ / cwt.	0.00	0.63	0.35
DHI / Records / Tax Prep.	\$ / cwt.	0.04	0.04	0.00
Fencing	\$ / cwt.	0.00	0.00	0.00
Water System	\$ / cwt.	0.00	0.00	0.00
Lanes	\$ / cwt.	0.00	0.00	0.00
Fuel	\$ / cwt.	0.91	1.20	0.88
Bedding	\$ / cwt.	0.00	0.00	0.00
Milking Supplies	\$ / cwt.	1.41	1.57	1.30
Other Supplies	\$ / cwt.	0.00	0.00	0.00
Custom / Machine Hire	\$ / cwt.	2.30	3.24	3.31
Fertilizer / Lime	\$ / cwt.	4.96	1.60	2.98
Seed	\$ / cwt.	1.07	1.20	1.69
Chemicals / Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	1.92	3.69	5.00
Building Repairs	\$ / cwt.	0.00	1.14	7.80
Electric / Telephone	\$ / cwt.	0.58	1.34	1.52
Rent	\$ / cwt.	0.23	0.34	1.65
Taxes (property)	\$ / cwt.	1.04	0.96	0.87
Farm Insurance	\$ / cwt.	1.06	1.34	1.62
Interest	\$ / cwt.	0.56	0.24	0.10
Other Expenses	\$ / cwt.	0.00	0.00	0.39
Total Expenses	\$ / cwt.	26.11	31.22	38.24
Net Income	\$ / cwt.	-6.28	-12.21	-17.71
Depreciation	\$ / cwt.	8.87	7.25	8.60
Net Profit / Loss	\$ / cwt.	-15.15	-19.46	-26.31

Table 12: Lazor Farm, Balance Sheet, 1993-1995.

Item:	Unit			
	Year	1993	1994	1995
Assets				
Cash and Checking Balance	\$	20,000	21,700	22,000
Prepaid Expenses and Supplies	\$	0	0	0
Accounts Receivable	\$	22,000	22,000	22,000
Crops on Hand or Growing Crops	\$	25,000	25,800	25,000
Livestock Held for Sale	\$	0	0	0
Dairy Livestock	\$	19,000	21,000	23,000
Machinery	\$	183,150	185,000	195,000
Farm Land and Buildings	\$	200,000	215,000	230,000
Total Assets	\$	469,150	490,500	517,000
Liabilities				
Accounts Payable	\$	0	0	0
Current Loans	\$	0	0	0
Dairy Livestock Loans	\$	0	0	0
Machinery Loans	\$	28,210	16,550	11,900
Farm Land and Building Loans	\$	75,250	71,650	68,050
Total Liabilities	\$	103,460	88,200	79,950
Net Worth	\$	365,690	402,300	437,050
Debt / Cow	\$	4,703	3,675	2,855

*Transitional Dairy Farms: Economic Analysis***Eastman Farm** [Tables 13 - 16]

The number of cows milked on the Eastman farm increased from 70 to 77 to 82 over the three year study period. The average volume of milk produced per cow, however, declined from 22,213 pounds to 18,708 pounds during the same time period due to a lower culling rate and initial attempts to switch to a seasonal milking herd. Total milk production, on the other hand, remained nearly constant at 1.5 million pounds per year. The total crop and pasture land used declined from 515 acres to 330 acres. Much of this decline was attributed to a change from a conventional grain and forage based confined feeding system to a managed pasture feeding system. The owner also made the decision to grow and harvest less feed and purchase more.

The economic impact of the change in the milk production system is reflected in a substantial drop in both net income and net profit in the third year. Part of the lower net income is attributable to the owner hiring additional labor to provide more off-farm time for himself. The total value of milk sold actually increased, despite the substantial decline in production per cow, which was more than offset by the increase in the number of cows in the milking herd and higher prices received for milk sold. Even though milk production was highest in 1993, the relatively low milk price that year lowered the value of the milk sold compared to the following two years. The value of livestock sold dropped sharply from \$31,640 to \$6,397, apparently reflecting the decision to increase the herd size rather than selling the livestock.

The increase in hired labor costs accounts for nearly the entire increase in total farm expenses from 1993 to 1995. Increases and decreases in other items tended to pretty much cancel each other out.

The absence of liabilities, combined with increased asset values, provided a 14% increase in total farm net worth over the three year period.

Kaiser Farm [Tables 17 - 19]

The number of cows milked on the Kaiser farm dropped slightly from 33 to 30 during the three year study period. Milk production per cow exhibited healthy gains each year. Combining these two events resulted in total annual milk production dropping about 2%. Offsetting changes in the milk price caused income from the sale of milk to remain about steady at \$75,000. The amount of land used for cropping and pasture dropped nearly a third, from 126 acres to 86 acres, as the owners discontinued their use of a substantial portion of the rented land.

The increase in non-dairy farm income more than offset the drop in income from milk sales, resulting in total farm income rising about \$3,000. Nearly one-third of this increase was erased by larger total farm operating expenses. A substantial decline in depreciation costs permitted farm profit to rise from less than \$750 in 1993 to just over \$11,000 two years later.

**Table 13: Eastman Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis**

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	3.5	2.5	2.7
Total Cows Milking	No.	70	77	82
Total Dairy Livestock	No.			
Average Milk \ Cow \ Year	lbs	22,213	19,909	18,708
Total Milk Sold	lbs	1,554,913	1,532,998	1,534,078
Value of Milk Sold	\$	199,733	211,812	207,070
Crop Land: Owned / Rented	Acres	215 / 85	215 / 0	215 / 0
Pasture Land: Owned / Rented	Acres	115 / 100	115 / 0	115 / 0
Income:				
Value of Milk Sold	\$	199,733	211,812	207,070
Value of Livestock Sold	\$	31,640	14,377	6,397
Value of Crops Sold	\$	0	0	0
Non-Dairy Farm Income	\$	0	0	0
Total Income	\$	231,373	226,189	213,467
Expenses:				
Hauling	\$	6,089	6,505	5,369
Coop Dues	\$	2,400	1,892	1,963
Advertising	\$	2,000	2,379	2,336
CCC Deductions	\$	2,166	2,485	2,500
Labor (paid)	\$	36,165	38,946	45,670
Purchased Forage	\$	4,600	0	4,200
Purchased Grain	\$	45,000	43,873	47,400
Veterinary Services	\$	3,900	4,521	2,800
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	0	0	0
Breeding	\$	2,700	1,992	1,030
DH I /Records / Tax Prep.	\$	1,867	2,199	1,700
Fencing	\$	675	1,939	1,400
Water System	\$	0	0	2,000
Lanes	\$	0	564	250
Fuel	\$	5,400	5,686	5,700
Beddings	\$	1,956	1,938	922
Milking Supplies	\$	7,300	7,834	7,000
Other Supplies	\$	0	0	0
Custom / Machine Hire	\$	3,867	2,400	2,500
Fertilizer / Lime	\$	0	354	4,870
Seed	\$	0	0	0
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	13,925	9,954	11,000
Building Repairs	\$	0	0	0
Electric / Telephone	\$	6,759	6,429	7,260
Rent	\$	18,560	16,150	16,150
Taxes (property)	\$	0	0	0
Farm Insurance	\$	2,000	2,318	3,100
Interest	\$	0	0	0
Other Expenses	\$	0	0	0
Non-Dairy farm expenses	\$	0	0	0
Total Expenses	\$	167,329	160,358	177,120
Net Income				
Net Income	\$	64,044	65,831	36,347
Depreciation	\$	16,067	12,700	11,329
Net Profit \ Loss	\$	47,977	53,131	25,018

Table 14: Eastman Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit	1993	1994	1995
Farm Workers (total)	No.	3.5	2.5	2.7
Total Cows Milking	No.	70	77	82
Total Dairy Livestock	No.			
Average Milk \ Cow \ Year	lbs	22,213	19,909	18,708
Total Milk Sold	lbs	1,554,913	1,532,998	1,534,078
Value of Milk Sold	\$	199,733	211,812	207,070
Crop Land: Owned / Rented	Acres	215 / 85	215 / 0	215 / 0
Pasture Land: Owned / Rented	Acres	115 / 100	115 / 0	115 / 0
Income:				
Value of Milk Sold	\$ / cow	2,853	2,751	2,525
Value of Livestock Sold	\$ / cow	452	187	78
Value of Crops Sold	\$ / cow	0	0	0
Total Income	\$ / cow	3,305	2,938	2,603
Expenses:				
Hauling	\$ / cow	87	84	65
Coop Dues	\$ / cow	34	25	24
Advertising	\$ / cow	29	31	28
CCC Deductions	\$ / cow	31	32	30
Labor (paid)	\$ / cow	517	506	557
Purchased Forage	\$ / cow	66	0	51
Purchased Grain	\$ / cow	643	570	578
Veterinary Services	\$ / cow	56	59	34
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	0	0	0
Breeding	\$ / cow	39	26	13
DH I / Records / Tax Prep.	\$ / cow	27	29	21
Fencing	\$ / cow	10	25	17
Water System	\$ / cow	0	0	24
Lanes	\$ / cow	0	7	3
Fuel	\$ / cow	77	74	70
Beddings	\$ / cow	28	25	11
Milking Supplies	\$ / cow	104	102	85
Other Supplies	\$ / cow	0	0	0
Custom / Machine Hire	\$ / cow	55	31	30
Fertilizer / Lime	\$ / cow	0	5	59
Seed	\$ / cow	0	0	0
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	199	129	134
Building Repairs	\$ / cow	0	0	0
Electric / Telephone	\$ / cow	97	83	89
Rent	\$ / cow	265	210	197
Taxes (property)	\$ / cow	0	0	0
Farm Insurance	\$ / cow	29	30	38
Interest	\$ / cow	0	0	0
Other Expenses	\$ / cow	0	0	0
Total Expenses	\$ / cow	2,390	2,083	2,160
Net Income	\$ / cow	915	855	443
Depreciation	\$ / cow	230	165	138
Net Profit \ Loss	\$ / cow	685	690	305

Table 15: Eastman Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	3.5	2.5	2.7
Total Cows Milking	No.	70	77	82
Total Dairy Livestock	No.			
Average Milk / Cow / Year	lbs	22,213	19,909	18,708
Total Milk Sold	lbs	1,554,913	1,532,998	1,534,078
Value of Milk Sold	\$	199,733	211,812	207,070
Crop Land: Owned / Rented	Acres	215 / 85	215 / 0	215 / 0
Pasture Land: Owned / Rented	Acres	115 / 100	115 / 0	115 / 0
Income:				
Value of Milk Sold	\$ / cwt.	12.85	13.82	13.50
Value of Livestock Sold	\$ / cwt.	2.03	0.94	0.42
Value of Crops Sold	\$ / cwt.	0.00	0.00	0.00
Total Income	\$ / cwt.	14.88	14.76	13.92
Expenses:				
Hauling	\$ / cwt.	0.39	0.42	0.35
Coop Dues	\$ / cwt.	0.15	0.12	0.13
Advertising	\$ / cwt.	0.13	0.16	0.15
CCC Deductions	\$ / cwt.	0.14	0.16	0.16
Labor (paid)	\$ / cwt.	2.33	2.54	2.98
Purchased Forage	\$ / cwt.	0.30	0.00	0.27
Purchased Grain	\$ / cwt.	2.89	2.86	3.09
Veterinary Services	\$ / cwt.	0.25	0.29	0.18
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.00	0.00	0.00
Breeding	\$ / cwt.	0.17	0.13	0.07
DH I /Records / Tax Prep.	\$ / cwt.	0.12	0.14	0.11
Fencing	\$ / cwt.	0.04	0.13	0.09
Water System	\$ / cwt.	0.00	0.00	0.13
Lanes	\$ / cwt.	0.00	0.04	0.02
Fuel	\$ / cwt.	0.35	0.37	0.37
Beddings	\$ / cwt.	0.13	0.13	0.06
Milking Supplies	\$ / cwt.	0.47	0.51	0.46
Other Supplies	\$ / cwt.	0.00	0.00	0.00
Custom / Machine Hire	\$ / cwt.	0.25	0.16	0.16
Fertilizer / Lime	\$ / cwt.	0.00	0.02	0.32
Seed	\$ / cwt.	0.00	0.00	0.00
Chemicals / Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	0.90	0.65	0.72
Building Repairs	\$ / cwt.	0.00	0.00	0.00
Electric / Telephone	\$ / cwt.	0.43	0.42	0.47
Rent	\$ / cwt.	1.19	1.05	1.05
Taxes (property)	\$ / cwt.	0.00	0.00	0.00
Farm Insurance	\$ / cwt.	0.13	0.15	0.20
Interest	\$ / cwt.	0.00	0.00	0.00
Other Expenses	\$ / cwt.	0.00	0.00	0.00
Total Expenses	\$ / cwt.	10.76	10.46	11.55
Net Income	\$ / cwt.	4.12	4.30	2.37
Depreciation	\$ / cwt.	1.03	0.83	0.74
Net Profit \ Loss	\$ / cwt.	3.09	3.47	1.63

Table 16: Eastman Farm, Balance Sheet, 1993-1995.

Items:	Unit			
	Year	1993	1994	1995
Farm Assets				
Cash and Checking Balance	\$	30,000	30,000	55,000
Prepaid Expenses and Supplies	\$	0	0	0
Accounts Receivable	\$	0	0	
Crops on Hand or Growing Crops	\$	18,000	18,000	18,000
Livestock Held for Sale	\$	0	0	0
Dairy Livestock	\$	121,000	133,000	130,000
Machinery	\$	70,000	70,000	70,000
Farm Land and Buildings	\$	0	0	0
Total Farm Assets	\$	239,000	251,000	273,000
Liabilities				
Accounts Payable	\$	0	0	0
Current Loans	\$	0	0	0
Dairy Livestock Loans	\$	0	0	0
Machinery Loans	\$	0	0	0
Farm Land and Building Loans	\$	0	0	0
Total Liabilities	\$	0	0	0
Net Worth	\$	239,000	251,000	273,000
Debt / Cow	\$	0	0	0

Table 17: Kaiser Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	33	31	30
Total Dairy Livestock	No.	48	53	48
Average Milk / Cow / Year	lbs	16,816	17,327	18,161
Total Milk Sold	lbs	554,931	537,130	544,816
Value of Milk Sold	\$	75,100	75,278	73,821
Crop Land: Owned / Rented	Acres	47 \ 53	47 \ 17	47 \ 18
Pasture Land: Owned / Rented	Acres	13 \ 9	12 \ 9	12 \ 9
Income:				
Value of Milk Sold	\$	75,100	75,278	73,821
Value of Livestock Sold	\$	3,730	6,000	4,684
Value of Crops Sold	\$	0	0	0
Non-dairy Farm Income	\$	7,722	4,530	11,000
Total Income	\$	86,552	85,808	89,505
Expenses:				
Hauling	\$	6,761	6,197	6,425
Coop Dues	\$	694	695	642
Advertising	\$	832	806	833
CCC Deductions	\$	814	886	866
Labor (paid)	\$	0	0	0
Purchased Forage	\$	0	315	1,340
Purchased Grain	\$	19,207	19,836	17,940
Veterinary Services	\$	1,214	1,402	945
Conventional Medicines	\$	0	0	150
Natural Medicines	\$	0	0	150
Hoof Trimming	\$	0	0	0
Breeding	\$	623	954	1,090
DHI / Records / Tax Prep.	\$	1,296	1,486	1,872
Fencing	\$	720	0	125
Water System	\$	0	0	0
Lanes	\$	0	0	0
Irrigation	\$	0	0	0
Fuel	\$	1,448	1,664	1,525
Beddings	\$	432	316	350
Milking Supplies	\$	3,422	2,251	2,000
Other Supplies	\$	0	0	474
Custom / Machine Hire	\$	0	0	0
Fertilizer / Lime	\$	656	1,019	1,000
Seed	\$	0	20	0
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	5,884	3,767	1,140
Building Repairs	\$	0	0	209
Electric / Telephone	\$	2,809	3,401	2,966
Rent	\$	11,099	9,459	11,760
Taxes (property)	\$	2,154	2,405	2,307
Farm Insurance	\$	1,933	1,944	2,087
Interest	\$	8,809	9,278	13,548
Other Expenses	\$	0	0	0
Non-Dairy farm expenses	\$	0	0	0
Total Expenses	\$	70,807	68,101	71,744
Net Income	\$	15,745	17,707	17,761
Depreciation	\$	15,000	12,000	6,728
Net Profit \ Loss	\$	745	5,707	11,033

Table 18: Kaiser Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
		Year	1993	1994
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	33	31	30
Total Dairy Livestock	No.	48	53	48
Average Milk / Cow / Year	lbs	16,816	17,327	18,161
Total Milk Sold	lbs	554,931	537,130	544,816
Total Value of Milk Sold	\$ / cow	75,100	75,278	73,821
Crop Land: Owned / Rented	Acres	47 \ 53	47 \ 17	47 \ 18
Pasture Land: Owned / Rented	Acres	13 \ 9	12 \ 9	12 \ 9
Income:				
Total Value of Milk Sold	\$ / cow	2,276	2,428	2,461
Total Value of Livestock Sold	\$ / cow	113	194	156
Total Value of Crops Sold	\$ / cow	0	0	0
Total Income	\$ / cow	2,389	2,622	2,617
Expenses:				
Hauling	\$ / cow	205	200	214
Coop Dues	\$ / cow	21	22	21
Advertising	\$ / cow	25	26	28
CCC Deductions	\$ / cow	25	29	29
Labor (paid)	\$ / cow	0	0	0
Purchased Forage	\$ / cow	0	10	45
Purchased Grain	\$ / cow	582	640	598
Veterinary Services	\$ / cow	37	45	32
Conventional Medicines	\$ / cow	0	0	5
Natural Medicines	\$ / cow	0	0	5
Hoof Trimming	\$ / cow	0	0	0
Breeding	\$ / cow	19	31	36
DHI / Records / Tax Prep.	\$ / cow	39	48	62
Fencing	\$ / cow	22	0	4
Water System	\$ / cow	0	0	0
Lanes	\$ / cow	0	0	0
Irrigation	\$ / cow	0	0	0
Fuel	\$ / cow	44	54	51
Beddings	\$ / cow	13	10	12
Milking Supplies	\$ / cow	104	73	67
Other Supplies	\$ / cow	0	0	16
Custom / Machine Hire	\$ / cow	0	0	0
Fertilizer / Lime	\$ / cow	20	33	33
Seed	\$ / cow	0	1	0
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	178	122	38
Building Repairs	\$ / cow	0	0	7
Electric / Telephone	\$ / cow	85	110	99
Rent	\$ / cow	336	305	392
Taxes (property)	\$ / cow	65	78	77
Farm Insurance	\$ / cow	59	63	70
Interest	\$ / cow	267	299	452
Other Expenses	\$ / cow	0	0	0
Total Expenses	\$ / cow	2,146	2,197	2,391
Net Income	\$ / cow	243	425	225
Depreciation	\$ / cow	455	387	224
Net Profit \ Loss	\$ / cow	-211	38	1

Table 19: Kaiser Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit:	1993	1994	1995
	Year			
Farm Workers (total)	No.	2	2	2
Total Cows Milking	No.	33	31	30
Total Dairy Livestock	No.	48	53	48
Average Milk / Cow / Year	lbs	16,816	17,327	18,161
Total Milk Sold	lbs	554,931	537,130	544,816
Value of Milk Sold	\$ / cwt.	75,100	75,278	73,821
Crop Land: Owned / Rented	Acres	47 \ 53	47 \ 17	47 \ 18
Pasture Land: Owned / Rented	Acres	13 \ 9	12 \ 9	12 \ 9
Income:				
Value of Milk Sold	\$ / cwt.	13.53	14.02	13.55
Value of Livestock Sold	\$ / cwt.	0.67	1.12	0.86
Value of Crops Sold	\$ / cwt.	0.00	0.00	0.00
Total Income	\$ / cwt.	14.21	15.13	14.41
Expenses:				
Hauling	\$ / cwt.	1.22	1.15	1.18
Coop Dues	\$ / cwt.	0.13	0.13	0.12
Advertising	\$ / cwt.	0.15	0.15	0.15
CCC Deductions	\$ / cwt.	0.15	0.16	0.16
Labor (paid)	\$ / cwt.	0.00	0.00	0.00
Purchased Forage	\$ / cwt.	0.00	0.06	0.25
Purchased Grain	\$ / cwt.	3.46	3.69	3.29
Veterinary Services	\$ / cwt.	0.22	0.26	0.17
Conventional Medicines	\$ / cwt.	0.00	0.00	0.03
Natural Medicines	\$ / cwt.	0.00	0.00	0.03
Hoof Trimming	\$ / cwt.	0.00	0.00	0.00
Breeding	\$ / cwt.	0.11	0.18	0.20
DHI / Records / Tax Prep.	\$ / cwt.	0.23	0.28	0.34
Fencing	\$ / cwt.	0.13	0.00	0.02
Water System	\$ / cwt.	0.00	0.00	0.00
Lanes	\$ / cwt.	0.00	0.00	0.00
Irrigation	\$ / cwt.	0.00	0.00	0.00
Fuel	\$ / cwt.	0.26	0.31	0.28
Beddings	\$ / cwt.	0.08	0.06	0.06
Milking Supplies	\$ / cwt.	0.62	0.42	0.37
Other Supplies	\$ / cwt.	0.00	0.00	0.09
Custom / Machine Hire	\$ / cwt.	0.00	0.00	0.00
Fertilizer / Lime	\$ / cwt.	0.12	0.19	0.18
Seed	\$ / cwt.	0.00	0.00	0.00
Chemicals / Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	1.06	0.70	0.21
Building Repairs	\$ / cwt.	0.00	0.00	0.04
Electric / Telephone	\$ / cwt.	0.51	0.63	0.54
Rent	\$ / cwt.	2.00	1.76	2.16
Taxes (property)	\$ / cwt.	0.39	0.45	0.42
Farm Insurance	\$ / cwt.	0.35	0.36	0.38
Interest	\$ / cwt.	1.59	1.73	2.49
Other Expenses	\$ / cwt.	0.00	0.00	0.00
Total Expenses	\$ / cwt.	12.76	12.68	13.17
Net Income	\$ / cwt.	1.45	2.45	1.24
Depreciation	\$ / cwt.	2.70	2.23	1.23
Net Profit \ Loss	\$ / cwt.	-1.26	0.22	0.01

Taking non-dairy farm income out of the calculations, and the net income picture is substantially different (Tables 18 & 19).

Aside from the decline in depreciation costs, noted earlier, the only other substantial downward changes in operating costs occurred in machine repair. Interest charges rose because they invested more in machinery, both purchased and rental. The increase in purchased forage expense was nearly completely offset by the drop in purchased grain costs.

Information was not available to prepare a balance sheet and determine changes in net worth.

Seiler Farm [Tables 20 - 23]

The number of milking cows on this farm increased from 50 to 56 the first two years and remained at this level the next year. Milk production per cow rose slightly, and the higher level of milk production resulted primarily from the greater number of cows in the milking herd. Combined crop and pasture acreage remained steady throughout the study period.

Both net income and farm profit rose during the study period. Increased farm income resulted from higher milk sales, greater livestock sales, and higher non-dairy farm income. Farm income rose substantially more than did farm expenses in the same time period. Higher milk production and milk prices in 1994, coupled with markedly lower operating expenses, resulted in a substantial improvement in both net income and net profit that year.

The higher feed grain expenditure in 1995 resulted from the owners paying off a pre-existing grain bill in addition to the feed purchased in that year. The higher machine repair bill reflects extensive work needed on the farm tractors. The hired labor category was lower because they decided to use less hired labor and do more of the work themselves.

Access to personal resources permitted the owners to pay off the existing mortgage. An associated benefit of this action was the elimination of interest charges in the farm expense ledger. The slight dip in farm asset values occurred from a devaluation of their livestock and the sale of several pieces of farm machinery. Consequently, debt per cow in 1995 dropped to one-tenth the level just two years earlier. Net worth more than doubled in the same time period.

Conventional Farm: Economic Analysis

Clifford Farm [Tables 24 - 27]

The number of milk cows on this farm held nearly steady at 120 - 125 cows. Production per cow showed substantial gains in each year, rising 2,000 pounds in 1994 and nearly 2,100

**Table 20: Seiler Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis**

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	1.3	1.3	1.3
Total Cows Milking	No.	50	56	55
Total Dairy Livestock	No.	102	99	100
Average Milk / Cow / Year	lbs	10,000	10,839	10,737
Total Milk Sold	lbs	500,000	607,000	590,556
Value of Milk Sold	\$	70,500	90,000	84,213
Crop Land: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Pasture Land: Owned / Rented	Acres	87/40	87/40	87/40
Income:				
Value of Milk Sold	\$	70,500	90,000	84,213
Value of Livestock Sold	\$	5,800	3,600	8,799
Value of Crops sold	\$	0	0	0
Non-dairy Farm Income	\$	0	0	4,394
Total Income	\$	76,300	93,600	97,406
Expenses:				
Hauling	\$	4,700	4,700	3,439
Coop Dues	\$	0	0	301
Advertising	\$	0	0	885
CCC Deductions	\$	0	0	999
Labor (paid)	\$	4,000	1,700	1,600
Purchased Forage	\$	11,400	10,750	10,928
Purchased Grain	\$	12,000	12,000	26,575
Veterinary Services	\$	3,100	1,200	1,985
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	0	0	420
Breeding	\$	1,260	330	1,013
DHI / Records / Tax Prep.	\$	150	150	1,015
Fencing	\$	400	500	600
Water System	\$	100	100	100
Lanes	\$	0	0	0
Irrigation	\$	0	0	0
Fuel	\$	800	800	1,800
Bedding	\$	0	0	0
Milking Supplies	\$	0	0	0
Other Supplies	\$	3,720	3,860	4,750
Custom / Machine Hire	\$	1,100	2,100	2,020
Fertilizer / Lime	\$	0	0	0
Seed	\$	200	0	0
Chemicals / Spraying	\$	0	0	0
Machine Repair	\$	3,200	5,000	7,515
Building Repairs	\$	660	4,200	1,800
Electric / Telephone	\$	1,560	1,500	1,800
Rent	\$	2,600	2,150	2,250
Taxes (property)	\$	3,400	3,740	3,995
Farm Insurance	\$	3,200	2,700	1,782
Interest	\$	9,600	5,950	0
Other Expenses	\$	500	500	2,260
Non-Dairy farm expenses	\$	0	0	0
Total Expenses	\$	67,650	63,930	79,832
Net Income	\$	8,650	29,670	17,574
Depreciation	\$	15,300	13,200	9,952
Net Profit / Loss	\$	-6,650	16,470	7,622

Table 21: Seiler Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	1.3	1.3	1.3
Total Cows Milking	No.	50	56	55
Total Dairy Livestock	No.	102	99	100
Average Milk / Cow / Year	lbs	10,000	10,839	10,737
Total Milk Sold	lbs	500,000	607,000	590,556
Value of Milk Sold	\$ / cow	70,500	90,000	84,213
Crop Land: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Pasture Land: Owned / Rented	Acres	87 / 40	87 / 40	87 / 40
Income:				
Value of Milk Sold	\$ / cow	1,410	1,607	1,531
Value of Livestock Sold	\$ / cow	116	64	160
Value of Crops Sold	\$ / cow	0	0	0
Total Income	\$ / cow	1,526	1,671	1,691
Expenses:				
Hauling	\$ / cow	94	84	63
Coop Dues	\$ / cow	0	0	5
Advertising	\$ / cow	0	0	16
CCC Deductions	\$ / cow	0	0	18
Labor (paid)	\$ / cow	80	30	29
Purchased Forage	\$ / cow	228	192	199
Purchased Grain	\$ / cow	240	214	483
Veterinary Services	\$ / cow	62	21	36
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	0	0	8
Breeding	\$ / cow	25	6	18
DHI / Records / Tax Prep.	\$ / cow	3	3	18
Fencing	\$ / cow	8	9	11
Water System	\$ / cow	2	2	2
Lanes	\$ / cow	0	0	0
Irrigation	\$ / cow	0	0	0
Fuel	\$ / cow	16	14	33
Bedding	\$ / cow	0	0	0
Milking Supplies	\$ / cow	0	0	0
Other Supplies	\$ / cow	74	69	86
Custom / Machine Hire	\$ / cow	22	38	37
Fertilizer / Lime	\$ / cow	0	0	0
Seed	\$ / cow	4	0	0
Chemicals / Spraying	\$ / cow	0	0	0
Machine Repair	\$ / cow	64	89	137
Building Repairs	\$ / cow	13	75	33
Electric / Telephone	\$ / cow	31	27	33
Rent	\$ / cow	52	38	41
Taxes (property)	\$ / cow	68	67	73
Farm Insurance	\$ / cow	64	48	32
Interest	\$ / cow	192	106	0
Other Expenses	\$ / cow	10	9	41
Total Expenses	\$ / cow	1,353	1,142	1,451
Net Income	\$ / cow	173	530	240
Depreciation	\$ / cow	306	236	181
Net Profit / Loss	\$ / cow	-133	294	59

**Table 22: Seiler Farm, Income and Expenses, 1993-1995.
Milk Production Operation**

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	1.3	1.3	1.3
Total Cows Milking	No.	50	56	55
Total Dairy Livestock	No.	102	99	100
Average Milk / Cow / Year	lbs	10,000	10,839	10,737
Total Milk Sold	lbs	500,000	607,000	590,556
Value of Milk Sold	\$	70,500	90,000	84,213
Crop Acres: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Pasture Acres: Owned / Rented	Acres	87/40	87/40	87/40
Income:				
Value of Milk Sold	\$ / cwt.	14.10	14.83	14.26
Value of Livestock Sold	\$ / cwt.	1.16	0.59	1.49
Value of Crops Sold	\$ / cwt.	0.00	0.00	0.00
Total Income	\$ / cwt.	15.26	15.42	15.75
Expenses:				
Hauling	\$ / cwt.	0.94	0.77	0.58
Coop Dues	\$ / cwt.	0.00	0.00	0.05
Advertising	\$ / cwt.	0.00	0.00	0.15
CCC Deductions	\$ / cwt.	0.00	0.00	0.17
Labor (paid)	\$ / cwt.	0.80	0.28	0.27
Purchased Forage	\$ / cwt.	2.28	1.77	1.85
Purchased Grain	\$ / cwt.	2.40	1.98	4.50
Veterinary Services	\$ / cwt.	0.62	0.20	0.34
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.00	0.00	0.07
Breeding	\$ / cwt.	0.25	0.05	0.17
DHI / Records / Tax Prep.	\$ / cwt.	0.03	0.02	0.17
Fencing	\$ / cwt.	0.08	0.08	0.10
Water System	\$ / cwt.	0.02	0.02	0.02
Lanes	\$ / cwt.	0.00	0.00	0.00
Irrigation	\$ / cwt.	0.00	0.00	0.00
Fuel	\$ / cwt.	0.16	0.13	0.30
Bedding	\$ / cwt.	0.00	0.00	0.00
Milking Supplies	\$ / cwt.	0.00	0.00	0.00
Other Supplies	\$ / cwt.	0.74	0.64	0.80
Custom / Machine Hire	\$ / cwt.	0.22	0.35	0.34
Fertilizer / Lime	\$ / cwt.	0.00	0.00	0.00
Seed	\$ / cwt.	0.04	0.00	0.00
Chemicals / Spraying	\$ / cwt.	0.00	0.00	0.00
Machine Repair	\$ / cwt.	0.64	0.82	1.27
Building Repairs	\$ / cwt.	0.13	0.69	0.30
Electric / Telephone	\$ / cwt.	0.31	0.25	0.30
Rent	\$ / cwt.	0.52	0.35	0.38
Taxes (property)	\$ / cwt.	0.68	0.62	0.68
Farm Insurance	\$ / cwt.	0.64	0.44	0.30
Interest	\$ / cwt.	1.92	0.98	0.00
Other Expenses	\$ / cwt.	0.10	0.08	0.38
Total Expenses	\$ / cwt.	13.53	10.53	13.52
Net Income	\$ / cwt.	1.73	4.89	2.23
Depreciation	\$ / cwt.	3.06	2.17	1.69
Net Profit / Loss	\$ / cwt.	-1.33	2.71	0.55

Table 23: Seiler Farm, Balance Sheet, 1993-1995.

Item:	Unit			
	Year	1993	1994	1995
Assets				
Cash and Checking Balance	\$	1,000	1,000	1,000
Prepaid Expenses and Supplies	\$	0	0	0
Accounts Receivable	\$	5,900	7,500	7,000
Crops on Hand or Growing Crops	\$	13,000	13,000	13,000
Livestock Held for Sale	\$	530	3,600	0
Dairy Livestock	\$	59,600	60,750	57,000
Machinery	\$	27,500	27,500	25,000
Farm Land and Buildings	\$	240,000	240,000	240,000
Total Assets	\$	347,530	353,350	343,000
Liabilities				
Accounts Payable	\$	0	0	0
Current Loans	\$	0	0	0
Dairy Livestock Loans	\$	0	0	23,000
Machinery Loans	\$	0	0	0
Farm Land and Building Loans	\$	204,000	15,000	0
Total Liabilities	\$	204,000	15,000	23,000
Net Worth	\$	143,530	338,350	320,000
Debt / Cow	\$	4080	268	418

**Table 24: Clifford Farm, Income and Expenses, 1993-1995.
Whole Farm Analysis**

Item:	Unit	1993	1994	1995
	Year			
Farm Workers (total)	No.	3.1	3.1	3.1
Total Cows Milking	No.	125	125	120
Total Dairy Livestock	No.	205	205	210
Average Milk / Cow / Year	lbs	21,202	23,215	25,307
Total Milk Sold	lbs	2,650,217	2,901,912	3,036,893
Value of Milk Sold	\$	347,338	392,968	392,652
Crop Land: Owned / Rented	Acres	200 / 75	200 / 75	200 / 75
Pasture Land: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Income:				
Value of Milk Sold	\$	347,338	392,968	392,652
Value of Livestock Sold	\$	27,617	28,623	26,843
Value of Crops Sold	\$	0	0	0
Non-dairy Farm Income	\$	3,297	13,894	8,626
Total Income	\$	378,252	435,485	428,121
Expenses:				
Hauling	\$	7,983	5,415	7,563
Coop Dues	\$	6,629	6,288	3,725
Advertising	\$	4,096	4,463	4,664
CCC Deductions	\$	5,752	5,577	5,604
Labor (paid)	\$	19,696	25,892	30,836
Purchased Forage	\$	191	1,254	623
Purchased Grain	\$	114,593	120,502	135,467
Veterinary Services	\$	5,902	5,892	7,940
Conventional Medicines	\$	0	0	0
Natural Medicines	\$	0	0	0
Hoof Trimming	\$	1,668	2,329	2,517
Breeding	\$	5,943	6,379	6,390
DHI / Records / Tax Prep.	\$	0	0	0
Fencing	\$	135	338	135
Water System	\$	0	0	0
Lanes	\$	0	0	0
Irrigation	\$	0	0	0
Fuel	\$	6,007	7,539	11,241
Bedding	\$	2,822	3,490	3,290
Milking Supplies	\$	9,953	11,873	7,079
Other Supplies	\$	932	1,789	5,007
Custom / Machine Hire	\$	0	0	6,894
Fertilizer / Lime	\$	2,584	7,283	8,177
Seed	\$	4,008	4,996	4,381
Chemicals / Spraying	\$	7,384	5,880	4,449
Machine Repair	\$	16,327	17,184	10,004
Buiding and Real Estate Repair	\$	12,968	9,447	15,661
Electric / Telephone	\$	9,884	10,243	11,675
Rent	\$	2,575	5,775	2,820
Taxes (property)	\$	10,908	9,400	11,629
Farm Insurance	\$	6,991	7,084	6,771
Interest	\$	9,238	21,624	21,730
Other Expenses	\$	16,848	31,483	11,590
Non-Dairy Farm Expenses	\$	0	0	0
Total Expenses	\$	292,017	339,419	347,862
Net Income	\$	86,235	96,066	80,259
Depreciation	\$	31,750	35,000	38,000
Net Profit / Loss	\$	54,485	61,066	42,259

Table 25: Clifford Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	3.1	3.1	3.1
Total Cows Milking	No.	125	125	120
Total Dairy Livestock	No.	205	205	210
Average Milk / Cow / Year	lbs	21,202	23,215	25,307
Total Milk Sold	lbs	2,650,217	2,901,912	3,036,893
Value of Milk Sold	\$ / cow	347,338	392,968	392,652
Crop Land: Owned / Rented	Acres	200 / 75	200 / 75	200 / 75
Pasture Land: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Income:				
Value of Milk Sold	\$ / cow	2,779	3,144	3,272
Value of Livestock Sold	\$ / cow	221	229	224
Value of Crops sold	\$ / cow	0	0	0
Total Income	\$ / cow	3,000	3,373	3,496
Expenses:				
Hauling	\$ / cow	64	43	63
Coop Dues	\$ / cow	53	50	31
Advertising	\$ / cow	33	36	39
CCC Deductions	\$ / cow	46	45	47
Labor (paid)	\$ / cow	158	207	257
Purchased Forage	\$ / cow	2	10	5
Purchased Grain	\$ / cow	917	964	1,129
Veterinary Services	\$ / cow	47	47	66
Conventional Medicines	\$ / cow	0	0	0
Natural Medicines	\$ / cow	0	0	0
Hoof Trimming	\$ / cow	13	19	21
Breeding	\$ / cow	48	51	53
DHI / Records / Tax Prep.	\$ / cow	0	0	0
Fencing	\$ / cow	1	3	1
Water System	\$ / cow	0	0	0
Lanes	\$ / cow	0	0	0
Irrigation	\$ / cow	0	0	0
Fuel	\$ / cow	48	60	94
Bedding	\$ / cow	23	28	27
Milking Supplies	\$ / cow	80	95	59
Other Supplies	\$ / cow	7	14	42
Custom / Machine Hire	\$ / cow	0	0	57
Fertilizer / Lime	\$ / cow	21	58	68
Seed	\$ / cow	32	40	37
Chemicals / Spraying	\$ / cow	59	47	37
Machine Repair	\$ / cow	131	137	83
Building and Real Estate Repair	\$ / cow	104	76	131
Electric / Telephone	\$ / cow	79	82	97
Rent	\$ / cow	21	46	24
Taxes (property)	\$ / cow	87	75	97
Farm Insurance	\$ / cow	56	57	56
Interest	\$ / cow	74	173	181
Other Expenses	\$ / cow	135	252	97
Total Expenses	\$ / cow	2,336	2,715	2,899
Net Income				
Net Income	\$ / cow	664	657	597
Depreciation	\$ / cow	254	280	317
Net Profit / Loss	\$ / cow	410	377	280

Table 26. Clifford Farm, Income and Expenses, 1993-1995.
Milk Production Operation

Item:	Unit			
	Year	1993	1994	1995
Farm Workers (total)	No.	3.1	3.1	3.1
Total Cows Milking	No.	125	125	120
Total Dairy Livestock	No.	205	205	210
Average Milk / Cow / Year	lbs	21,202	23,215	25,307
Total Milk Sold	lbs	2,650,217	2,901,912	3,036,893
Value of Milk Sold	\$	347,338	392,968	392,652
Crop Land: Owned / Rented	Acres	200 / 75	200 / 75	200 / 75
Pasture Land: Owned / Rented	Acres	0 / 0	0 / 0	0 / 0
Income:				
Value of Milk Sold	\$ / cwt.	13.11	13.54	12.93
Value of Livestock Sold	\$ / cwt.	1.04	0.99	0.88
Value of Crops Sold	\$ / cwt.	0.00	0.00	0.00
Total Income	\$ / cwt.	14.15	14.53	13.81
Expenses:				
Hauling	\$ / cwt.	0.30	0.19	0.25
Coop Dues	\$ / cwt.	0.25	0.22	0.12
Advertising	\$ / cwt.	0.15	0.15	0.15
CCC Deductions	\$ / cwt.	0.22	0.19	0.18
Labor (paid)	\$ / cwt.	0.74	0.89	1.02
Purchased Forage	\$ / cwt.	0.01	0.04	0.02
Purchased Grain	\$ / cwt.	4.32	4.15	4.46
Veterinary Services	\$ / cwt.	0.22	0.20	0.26
Conventional Medicines	\$ / cwt.	0.00	0.00	0.00
Natural Medicines	\$ / cwt.	0.00	0.00	0.00
Hoof Trimming	\$ / cwt.	0.06	0.08	0.08
Breeding	\$ / cwt.	0.22	0.22	0.21
DHI / Records / Tax Prep.	\$ / cwt.	0.00	0.00	0.00
Fencing	\$ / cwt.	0.01	0.01	0.00
Water System	\$ / cwt.	0.00	0.00	0.00
Lanes	\$ / cwt.	0.00	0.00	0.00
Irrigation	\$ / cwt.	0.00	0.00	0.00
Fuel	\$ / cwt.	0.23	0.26	0.37
Bedding	\$ / cwt.	0.11	0.12	0.11
Milking Supplies	\$ / cwt.	0.38	0.41	0.23
Other Supplies	\$ / cwt.	0.04	0.06	0.16
Custom / Machine Hire	\$ / cwt.	0.00	0.00	0.23
Fertilizer / Lime	\$ / cwt.	0.10	0.25	0.27
Seed	\$ / cwt.	0.15	0.17	0.14
Chemicals / Spraying	\$ / cwt.	0.28	0.20	0.15
Machine Repair	\$ / cwt.	0.62	0.59	0.33
Buiding and Real Estate Repair	\$ / cwt.	0.49	0.33	0.52
Electric / Telephone	\$ / cwt.	0.37	0.35	0.38
Rent	\$ / cwt.	0.10	0.20	0.09
Taxes (property)	\$ / cwt.	0.41	0.32	0.38
Farm Insurance	\$ / cwt.	0.26	0.24	0.22
Interest	\$ / cwt.	0.35	0.75	0.72
Other Expenses	\$ / cwt.	0.64	1.08	0.38
Total Expenses	\$ / cwt.	11.02	11.70	11.45
Net Income	\$ / cwt.	3.13	2.83	2.36
Depreciation	\$ / cwt.	1.20	1.21	1.25
Net Profit / Loss	\$ / cwt.	1.93	1.63	1.11

Table 27: Clifford Farm, Balance Sheet, 1993-1995.

Item:	Unit			
	Year	1993	1994	1995
Assets				
Cash and Checking Balance	\$	0	0	0
Prepaid Expenses and Supplies	\$	7,000	7,000	7,000
Accounts Receivable	\$	23,000	23,000	23,000
Crops on Hand or Growing	\$	60,000	60,000	60,000
Livestock Held for Sale	\$	0	0	0
Dairy Livestock	\$	224,000	230,000	239,200
Machinery	\$	130,500	144,180	144,000
Farm Land and Buildings	\$	712,000	712,000	712,000
Total Assets	\$	1,156,500	1,176,180	1,185,200
Liabilities				
Accounts Payable	\$	11,000	1,323	0
Current Loans	\$	0	15,000	10,000
Dairy Livestock Loans	\$	0	0	0
Machinery Loans	\$	58,000	50,000	42,500
Farm Land and Building Loans	\$	274,000	264,000	258,000
Total Liabilities	\$	343,000	330,323	310,500
Net Worth	\$	813,500	845,857	874,700
Debt / Cow	\$	2744	2643	2588

pounds the following year. The gains in productivity resulted in total milk production increasing nearly 15% over the three year study period.

Total farm operating expenses increased more than farm income during the study period, causing net income and profit to fall from 1993 to 1995. Interestingly, the value of milk sold in 1995 was about unchanged from the prior year, as the lower milk price offset the greater milk production.

The move to hiring custom field work was an effort to get crops harvested in a more timely fashion and to improve the quality of the feed going into storage. They also hired the removal and spreading of manure, rather than doing it all themselves. Higher costs associated with these decisions include increases in hired labor and fuel expenditures. On the other hand, outlays for machinery repair dropped more than a third. The greater number of milking cows in the herd, plus feeding at higher levels, caused the purchased feed bill to rise nearly one-fifth over the three year study period.

Non-dairy farm income rose markedly from the first to second and third years of the study. However, farm expenses were not distinguishable to separate them between milk production and other farm enterprises. Accordingly, milk production expenses in Tables 25 and 26 may be a bit overstated.

Gradual and continuous increases in the value of the farm's assets, coupled with continually declining farm liabilities, resulted in a healthy and steady growth in the farm's net worth. Debt per cow improved {dropped} over the study period.

Summary and Conclusions

Dairy farming is one of the oldest forms of entrepreneurship in the world. Successful entrepreneurs, as are the farmers who participated in this study, need economic analysis of their operations to adjust to and prepare for change in these rapidly changing times.

This study provided the participants an opportunity to assess different segments of their enterprises and to view the total economic picture of their dairy farm operation based upon their particular set of management decisions. All farms, organic, transitional, and conventional, were able to see their income, expenses, and net profits. Production expenses were broken down into three separate enterprises, livestock, manure handling and utilization, and crop expenses. The livestock, manure, and crop analyses are incorporated in another part of the report. The balance sheet shows the movement of assets, liabilities, and changes in net worth from year to year.

The case study approach allows each farm owner to look more closely at each segment in detail. It also permits each farmer to determine how their management decisions impacted upon the overall financial position of the farm. This provides useful information for future decision making. The farm owners are then better able to formulate strategies appropriate to their

respective enterprises. The ultimate goal is to enhance their economic position within the total context of their economic, environmental, and personal goals.

A common economic goal is to increase net profit from one period to the next. Dairy farms have a wide range of factors, controllable and uncontrollable, that impact the final outcome of this goal. Changes in these factors will affect financial outcomes on the same farm from one year to the next, as well as between farms in the same year. It is important then to ascertain the cause of a change in net profit. That change may be a result of a purposeful change in operational strategies, or it may result from a change in a factor over which the operator had little or no control, e.g., weather, market price. The case study approach permits just such analysis.

Four of the seven farms in this study experienced increases in net profit over the three year study period. These changes resulted from rising farm income, lower farm expenses, or a combination of both. Analysis of each individual farm reveals the underlying reasons for the gains in profitability. Similarly, analysis of the farms exhibiting declines in income during the study period indicates why these farms experienced lower profits. Table 28 presents some of the key economic variables taken from the individual analyses. This may help to illustrate how changes in crop and pasture strategies may impact on purchased feed costs, or how increased pasturing may affect machine repair costs. Of course, one needs the complete budgets to get the best picture of how operational and management strategies may impact on the bottom line.

Falling farm profits do not necessarily mean that the farm is operating less efficiently. In fact, efficiency could increase, but a reduction in scale (fewer cows, milk fewer months) may result in lower income, expenses, and profit. Such a reduction may have resulted from a conscious choice to switch resources to another form of income generation or a personal lifestyle change.

We must also caution that rising farm profits do not automatically signal improved decision making or management. Rising milk prices, generally beyond the control of an individual farmer, may lead to increased income and profit, as well as a particularly favorable growing season for crops, or falling grain prices.

One must look at both the economic result and the factors that led to that result to ascertain the nature, extent, and expected stability of a particular farm's profitability. One must also look at the economic decisions in context with the farm owners'/operators' personal goals. Finally, one must take into consideration the effect of laws and regulations under which that farm must operate.

Table 28: Selected Key Economic Indicators

Milk Production Operation							
Farm /year	Milk sales	Purchased feed	Crp&Pst costs*	Hired labor	Machine repair	Profit /loss	Net worth
----- Dollars/Hundredweight -----							\$/Farm
Hill Farm							
1993	36.44	3.96	1.57	2.51	0.54	4.28	216,513
1994	31.40	3.42	0.83	1.72	4.03	- 0.08	231,175
1995	27.71	6.55	1.01	0.49	3.11	1.99	247,150
Taconic							
1993	14.43	4.98	0.10	0.22	1.49	3.28	197,700
1994	15.09	4.20	0.37	0.22	1.13	5.22	197,700
1995	14.52	3.54	0.23	0.00	0.67	3.97	202,500
Lazor							
1993	19.66	1.40	8.33	7.20	1.92	-15.15	365,690
1994	19.01	2.14	6.04	9.92	3.69	-19.46	402,300
1995	20.00	0.09	7.98	8.27	5.00	-26.31	437,050
Eastman							
1993	12.85	3.19	0.29	2.33	0.90	3.09	239,000
1994	13.82	2.86	0.35	2.54	0.65	3.47	251,000
1995	13.50	3.36	0.71	2.98	0.72	1.63	273,000
Kaiser							
1993	13.53	3.46	0.25	0.00	1.06	- 1.26	n.a.
1994	14.02	3.75	0.19	0.00	0.70	0.22	n.a.
1995	13.55	3.54	0.20	0.00	0.21	0.01	n.a.
Seiler							
1993	14.10	4.68	0.36	0.80	0.64	- 1.33	143,530
1994	14.83	3.75	0.45	0.28	0.82	2.71	338,350
1995	14.26	6.35	0.46	0.27	1.27	0.55	320,000
Clifford							
1993	13.11	4.33	0.54	0.74	0.62	1.93	813,500
1994	13.54	4.19	0.63	0.89	0.59	1.63	845,857
1995	12.93	4.48	0.79	1.02	0.33	1.11	874,700

* Field crop and pasture costs

n.a. - not available