Dairy Stewardship Alliance

Sustainability Indicators for Dairy Farms

University of Vermont - Center for Sustainable Agriculture

Sustainable indicators resulting from farmer self assessments completed 2005 through 2009.
A joint project with Center for Sustainable Agriculture at the University of Vermont, St. Alban's Cooperative Creamery, Ben & Jerry's Homemade, Inc., Vermont Farmers, University of Vermont Extension, Vermont Agency of Agriculture, Food and Markets with funding from USDA - Sustainable Agriculture Research and Education.

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1. Abstract

Which sustainable practices contribute to increasing environmental stewardship on dairy farms? The Dairy Stewardship Alliance (Alliance) study has developed and vetted sustainability indicators for dairy farming. To be sustainable, practices guided by the indicators must enhance the natural environment and herd health, support profitability and improve the quality of life for farmers and their communities.

The Alliance's Self-Assessment provides measurable indicators for continuous improvement in farming practices. Assessment of agricultural practices is often a reaction to market demand and administrated by external systems which focus on single products. Many farmers are independently interested is assessing and improving the sustainability for their entire farm.

Working with participant farmers, the Alliance's sustainability indicators include modules with a focus on biodiversity, animal husbandry, community health, on-farm energy, soil health, water quality, pest and nutrient management as well as a farm financial inventory. The Alliance is a collaborative effort between dairy farmers, the University of Vermont, Ben & Jerry's Inc., St. Albans Cooperative Creamery and Vermont's Agency of Agriculture.

For farms that have used these indicators to guide management decisions, there have been significant improvements in stewardship practices which reduce environmental impacts. Support is provided for farmers to develop a better understanding of their production practices, explore alternatives and implement changes to improve the sustainability of their farm operations.

The Alliance has enhanced the self-assessment by coordinating similar efforts with farmers in the EU to develop an on-line self assessment. Researchers are examining measures for continuous improvement that might create financial opportunities for dairy farmers and create product value for their co-ops.

The opportunity of using these indicators to develop baseline measurements for carbon credits has lead to the organization of a Northeast Dairy Sustainability Collaborative of dairy cooperatives, processors, researchers and farmers. As a group, we have become involved in an industry wide effort to identify ways to reduce Green House Gas (GHG) emissions and carbon footprints throughout the dairy production and distribution system (Value Chain). A recent focus has been to develop a "low carbon farming" matrix to measure improvements. Future research is necessary to identify technologies and/or innovative approaches to decrease atmospheric concentrations of GHG by increasing carbon sequestration and/or by reducing GHG emissions from agricultural operations.

2. Needs and Challenges

The Dairy Stewardship Alliance helps farmers to conduct a careful analysis of their production practices as they move toward greater stewardship in the areas of water quality, soil, pest and nutrient management; biodiversity, and animal husbandry. The farms also assess their financial stability, energy efficiency and community interactions.

The Alliance has identified a set of sustainability indicators separated into ten (10) modules. These modules were tested and refined with an original group of 52 farmers who voluntarily agreed to be a part of the research. Prior to a second assessment, these farms identified and implemented changes in their production or management practices. These farms then completed the post-test 2nd assessment which documented the areas where changes were and identified needs for further technical assistance.

The Alliance's sustainability indicators have gained a great deal of interest and momentum. St. Alban's Co-op, Ben & Jerry's and Unilever are now considering the expansion and the availability of the on-line version of the assessment as the "Caring Dairy" program to all 520 members of the co-op.

Originally conceived as a hard copy set of ten modules, the 90 page manual is extremely costly to reproduce and to assess results. With the support of Ben & Jerry's/ Unilever, we are moving forward to develop an on-line version of the sustainability indicators as an electronic on-line self-assessment that can be completed and submitted electronically.

3. Objectives/ Performance Targets

Objective: Of 520 farms in the dairy co-op, 52 will participate in the Dairy Stewardship Self Assessment and 40 (76%) of these will each improve at least two identified sustainable production practices in the areas of animal husbandry, biodiversity, community health, energy efficiency, farm financials, nutrient management, organic practices, pest management, soil health management, and water management.

Result: Over a four year trial, 51 (93%) of the Alliance's farms completed the self assessment and received pre-test summary reports. As of 9/30/09, 37 farmers (72.5%) completed the assessment a second time after having implemented changes to increase stewardship practices on their farms.

Objectives/Outcomes:

1. Farmers complete a self assessment of sustainability indicators for ten modules of sustainable dairy practices, receive summary reports and identify additional sustainable practices to implement.

2. During this research, 76% of participating farms improve sustainable farming practices and utilize the self assessment to guide them in meeting Accepted Agricultural Practices (AAPs) and Concentrated Animal Farm Operation (LFO/ MFO) certification requirements.

3. The Dairy Stewardship Alliance and University Extension will identify future areas for technical assistance as identified through the research summary results.

4. The final edited version of the Dairy Stewardship Sustainability Indicators is published and distributed with recommendations for on-going development and application throughout the Northeast Region.

4. Accomplishments

Milestones

Milestone 1: 520 farmers and dairy specialists receive detailed background information concerning On-Farm Self Assessment for Sustainable Practices.

Initial information on the Dairy Stewardship Alliance (DSA) was distributed to all members of the St. Alban's Co-op through their membership coordinator and Co-op newsletter. While the DSA was originally directed at the 520 members of St. Alban's Co-op, participation expanded to any interested dairy farmers in Vermont. As a result, farmers from two other Co-ops, Agri-Mark and Organic Valley also participated. The Secretary of the Board of St' Alban's Coop participated in the research, as did all farmer advisory board members of the "Young Cooperators" advisory board members. Throughout the project, 5 different farmers served on our DSA advisory task force.

Milestone 2: 52 farms are identified for participation by Extension, NRCS, VT Pasture Network, and Agency of Agriculture. During the Mid-Phase, these farmers complete the Dairy Stewardship Self Assessment and help to refine the tool kit.

During the course of this project, 55 farmers volunteered to participate in the assessment and received their own copies of the Self Assessment Tool Kit. Of these, 51 farmers enrolled and completed the first assessment (Pre-test). The original 12 farms served as a group of advisors who helped to revise and edit the text of the manuals. In addition, as each of the other farmers completed their assessment, their input was gathered by researchers for the final editing of the manual, which was then tested with the final group of farmers.

As of the end of the project period, Ben & Jerry's/Unilever was working to update an on-line version based on the Dairy Stewardship Alliance's self assessment, combined with the format used by "Caring Dairy" project in The Netherlands.

Milestone 3: Self-Assessment Modules are revised and pre- and post-assessments are completed by 40 farms for planning and decision making concerning new practices to implement and technical assistance needs.

Over the full length of this project, we continued to collect edits in order to make the modules more farmer friendly and to be able to standardize results. 72.5% (37)of the farms who completed the assessment a first time (Pre-test) moved forward to identify changes and complete the assessment a second time (Post-test) after their changes had been made.

- The final report for the Dairy Stewardship Alliance (USDA-NESARE LNE06-243) which documents the sustainable indicators and changes implemented for all farms is available at http://www.uvm.edu/sustainableagriculture in their publications section
- The modules and self assessments are available on-line at http://www.benandjerrys.com/activism/inside-the-pint/more-about-milk/dsa/

5. Outcomes/ Impacts

Farmers and advisors involved in the Alliance assessments have made at least 30 educational presentations on the value of this experience to a wide variety of farm and community groups, and many have written numerous articles on the Alliance. (Sample article is attached in Appendix 6.4)

- Over the course of this four year research project, 51 farmers complete baseline pre-test assessments of their "Indicators for Sustainability" for all modules of their dairy farming practices. Within two years, 72.5% (37) of these farms identified additional sustainable practices to implement, and documented their changes by completing the 2nd assessment (Post-test). Farmers identified sustainable farming practices that they could consider implementing and utilized the self-assessment to guide them in meeting the state required Accepted Animal Practices (AAPs) and Large Farm Operations (LFO)/ Medium Farm Operations (MFO) certification requirements.
- Through farmer scores on the assessments, the Dairy Stewardship Alliance identified biodiversity, energy enhancement, water quality and farm safety as the most immediate areas for needed technical assistance.
- The modules were edited and the final edited version of the Dairy Stewardship Self Assessment are accessible through the Internet.
- Our findings were presented to over 1,200 individuals to conferences such as the Northeast Dairy Conference Forum, the VT Grass Farmers Association, and the European Association for Animal Production annual meetings.
- Ben & Jerry's/Unilever continues partnering with representatives of Wageningen University, CONO-Co-op/ Beemester and their "Caring Dairy" project in the Netherlands, to develop and on-line version of the "Sustainability Indicators" for dairy farms. CONO Coop, makers of Beemster Cheese, have already implemented the process with its 500 Dairy Co-op members, and there are expectations that St. Alban's Co-op may be able to implement the process with its 500+ members within the next year.

6. Summary

Background

In 2003, Ben & Jerry's joined forces with the University of Vermont's Center for Sustainable Agriculture and the St. Albans Cooperative Creamery, Inc. to form the Dairy Stewardship Alliance. The Alliance's primary goals were:

- To provide an on-farm self-assessment of sustainability indicators designed to help dairy farmers measure & evaluate the environmental, social and economic aspects of their farm operations
- To provide information about sustainable indicators for dairy farming practices
- To provide a foundation for further research and development of programs promoting sustainability in agriculture

To date the group's efforts have focused on testing and evaluation of the on-farm self-assessment formally known as the Dairy Farm Sustainability Toolkit (or "Toolkit" for short). Originally developed for Ben & Jerry's by graduate students from the Corporate Environmental Management Program at the University of Michigan, the Toolkit is a comprehensive set of 10 Educational Modules, each corresponding to one of ten key indicators for sustainable dairy farming in Vermont, against which farmers can self-assess their farm management practices and performance over time.

Purpose

The purposes of this initiative to:

- **Provide an on-farm assessment tool for sustainability indicators for dairy farms**
- **Educate and communicate information on sustainable dairy farming practices**
- **Create a foundation for ongoing work in sustainable agriculture.**

The Dairy Stewardship Alliance's creation of a self-assessment tool helps the farm to assess farm management strategies which include environmental, social and economic goals.

7. Methodology

Strategy

The self-assessment tool has 10 modules encompassing social, environmental and economic indicators:

ANIMAL HUSBANDRY	NUTRIENT MANAGEMENT
BIODIVERSITY	ORGANIC (included only for informational purposes)
COMMUNITY HEALTH	PEST MANAGEMENT
ENERGY	FARM FINANCIALS
SOIL QUALITY	WATER MANAGEMENT

Brief Explanation of Modules:

Animal Husbandry:
Focus on areas such as: herd nutrition, overall health, health of incoming and outgoing animals, milk quality, lactation management and cull rates, housing and handling areas, stalls, pasturing and milking equipment, parlor, and calf raising conditions.

Biodiversity:
This refers to all plants, animals, and microorganisms existing and interacting within an ecosystem. In an agriculture setting, this can be viewed in layers: microorganisms and worms living in the soil; native plants, crops, and trees growing on top of the soil; and insects, birds, and animals inhabiting the plants, crops, and trees.

Community Health:
Community health is defined as the strength of the community in which a farmer operates. Strong community relations and respect for agriculture can lead to a better quality of life for farmers. Research shows that the support received from a community can significantly impact a farmer's job satisfaction. Consequently, this module evaluates a farmer's working environment through two main criteria: community relations and protection of labor supply.

Energy:
There are two main types of energy: renewable and non-renewable described in this module. Non-renewable energy is an energy resource that is not replaced or is replaced only very slowly by natural processes. Primary examples of non-renewable energy resources are the fossil fuels—oil, natural gas, and coal. Renewable energy is any energy resource that is naturally regenerated over a short time scale and derived either directly or indirectly from the sun, or from other natural movements and mechanisms of the environment. Examples of renewable energy are things such as: thermal, photochemical, photoelectric, wind, hydropower, photosynthetic, geothermal and tidal energy. In order to gain maximum farmer participation in adopting best management practices, it is necessary to outline how the dairy farmer benefits from managing their energy use.

Farm Financials:
Farm Financials is a module designed to assess the financial performance of a farm enterprise. Through the use of key ratios, and the quality of life the farmer leads, this section describes the merits of monitoring financial performance of the farms. Monitoring financial performance can help farmers control their costs for managing and perhaps even growing their businesses.

Nutrient Management:
Nutrients are needed to sustain healthy animals and crops. Adopting best practices for nutrient management is important to maintaining ground water that is safe for drinking and surface waters that can support healthy aquatic ecosystems, function as industrial and commercial water supplies, and provide recreational enjoyment.

Organics:
Note: This module is not used in the ranking and provides information and a summary of the regulations rather than certification questions.
Organic farms are those certified under the USDA National Organic Program. The USDA National Organic Program is defined in the United States Federal code and is the only legally recognized standard for organic products in the United States. Because only an accredited organization can certify a farm as organic under the requirements of the USDA National Organic Program.

Pest Management:
Since the 1940's, chemical pesticides such as herbicides, insecticides, fungicides, rodenticides, and plant growth regulators have been the dominant approach to controlling and eliminating pests. There is a growing concern regarding the use of pesticides as they have the potential to cause harm to humans, animals, or the environment because they are designed to kill or otherwise adversely affect living organisms. These concerns led to an alternative approach called Integrated Pest Management (IPM), that is a pest management strategy that focuses on long-term prevention or suppression of pest problems through a combination of techniques such as monitoring for pest presence and establishing treatment threshold levels, using non-chemical practices to make the habitat less conducive to pest development, improving sanitation, and employing mechanical and physical controls. Elements of the IPM are integrated into this module.

Soil Health:
This module focuses on best management practices to maximize soil quality and health in order to maximize production and minimize erosion and pollution to water or air. Recommended areas of management include monitoring overall quality, minimizing erosion, maximizing organic content and preventing soil compaction.

Water Management:
This module will focus on best management practices dairy farmers can use to minimize and prevent water pollution and, to a lesser extent, to promote appropriate water use. General areas to be covered include preventing pollution from livestock yards, storage areas and milk house waste, general land management strategies and management of water use.

Rank Scoring

After completing the first assessment, participating farmers each receive a report with detailed charts showing how they scored in each of the different topic areas of the modules. Their first chart shows their individual farm results and the second chart presents their scores in comparison to the overall averages for all farms for each module area. In this way the farmer can see how they've scored in relation to all the other farms completing the self assessment. (See Appendix)

The scoring is done based on a 'red', 'yellow' and 'green' color coding, in a sort of "traffic light" system where 'green' indicates that sustainable practices are being used. 'Yellow', indicates that some level of sustainable practices are being used, however additional attention could be added to improve them. Finally, a 'red' score shows areas within an evaluation which are in need of improvements to be corrected in order to be more sustainable overall. The organic module is included for informational purposes and there are no specific questions for this area.

Table 7-1 Scoring System for Module Total Scores

Module	Green			Yellow		Red	
	Maximum	High	Low	High	Low	High	Low
Animal Husbandry	41	41	35	34	25	24	9
Biodiversity	26	26	21	20	16	16	6
Community Health	28	28	23	22	19	18	12
Energy	20	20	16	15	13	12	6
Farm Financials	33	33	28	27	20	19	6
Nutrient Management	25	25	21	20	16	15	7
Pest Management	30	30	26	25	18	17	5
Soil Health	24	24	21	20	15	14	6
Water Management	32	32	27	26	20	19	7

Modules and Individual Indicators

Animal Husbandry	
1	Herd Nutrition
2	Overall Health
3	Health Incoming/Outgoing Animals
4	Milk Quality
5	Lactations
6	Housing/Handling Areas
7	Stalls
8	Pasturing
9	Milk Equipment
10	Calf Raising Conditions

Biodiversity	
1	Genetic Diversity of Crops
2	Natural Area Conservation
3	Management of Riparian Areas
4	Pasture Management
5	Crop Field Management
6	Adjacent Area Management
7	GMO's

Community Health	
1	Community Relations
2	Documented Labor
3	Child Labor
4	Base Wage
5	Worker Sanitation
6	General Safety

Energy	
1	Percentage of Income
2	Lighting
3	Variable speed pumps
4	Ventilation
5	Milk Cooling
6	Renewable Energy

Modules and Individual Indicators (Continued)

Farm Financials

1	Current Ratio
2	Equity of Asset Ratio
3	Rate of Return on Farm Assets
4	Term Debt& Capital Ratio
5	Operating Expense Ratio
6	Farm Income
7	Work/Life Balance
8	Attitude To Adopt New Practices

Nutrient Management

1	Nutrient Management & Records
2	Manure Rates
3	Commercial Fertilizer Rates
4	Manure & Phosphorus Application
5	Nitrogen Fertilizer Application
6	Fertilizer Equipment
7	Phosphorus Supplements

Pest Management

1	Pest ID
2	Pesticide Selection
3	Timing of Application
4	Weather Conditions
5	Record Keeping
6	Fly Management
7	Weed Management

Soil Health

1	Soil Organic Matter
2	Use of Cover Crops and Vegetative Areas
3	Crop Rotation
4	Tillage Practices
5	Soil Conservation/Erosion Prevention
6	Soil Quality Monitoring

WaterManagement

1	Livestock Yard Management
2	Manure Storage System
3	Fertilizer Storage System
4	Silage Storage System
5	Milk House Waste
6	Protecting On-farm Water Sources
7	Water Use Plan

Design and Process

From July 2005 until June 2009 assessments gauging a variety of indicator criteria related to sustainability were conducted on dairy farms throughout the state of Vermont. During this time, fifty-five (55) farms volunteered to become involved in the research being conducted by the Dairy Stewardship Alliance. Fifty-one (51) farms successfully completed a ten module self assessment inventory composed of 67 ranked questions on sustainability of their farming practices. Farmers then received a report ranking their results, identifying and providing a comparison of their results against all other farms completing the assessment. Seventy-two percent (72%) or 37 of those farms identified changes or improvements in their farming practices. These farms then documented the changes made by completing the self assessment a second time. Farmers were provided a final report identifying the results of their first assessment versus their second assessment for all modules, as well as a report of their ranked scores and changes compared to all other farms completing the final assessment.

The initial time a farm filled out the assessment it was referred to by researchers as 'assessment one' or the 'Pre assessment' and correspondingly, the second time a farm fill out the assessment, the document was referred to by researchers as 'assessment two' or 'Post-assessment'. With a time gap of 12-24 months between the first and second assessment, researchers were able to document a number of changed conditions/practices being reported on these farms. When taken in sum, an analysis of these findings indicates an increase in sustainability related practices/indicators has occurred during the project period. Data from these assessments tell an interesting story about practices on dairy farms and selected findings are presented below.

The assessment tool contained nine distinct modules (or categories) to be ranked as indicators, plus a tenth information module on organic farming practices to consider. The indicator modules were Animal Husbandry, Biodiversity, Community Health, Energy, Farm Financials, Nutrient Management, Pest Management, Soil Healn.th, and Water Management. Each module contained a series of 6-9 questions related to the module theme. Some of these questions were quantitative in nature and others more qualitative. When assessments were collected from farms, answers to each of the 67 questions were ranked and assigned a quantitative value then weighted. When added together the values of these answers helped to create Module Index Scores (MIS) for each farm. A more comprehensive indicator score, Total Index Score (TIS) was created for each farm which consisted of the sum of a farm's nine individual MIS scores.

Database Methodology

Scalability and Inferential Integrity

Initially, all data was entered into an EXCEL spreadsheet. Reproducing the reports for farmers, and accessing information details proved to be difficult and time consuming. During 2007 all data collected from the Dairy Stewardship Alliance has been migrated into Microsoft Access 2007. This system established a structured data base structure that provided relationships and inferential integrity between different tables (see figure 4.1). This system ensures scalability while maintaining flexibility in the development to meet future growth and complexity requirements.

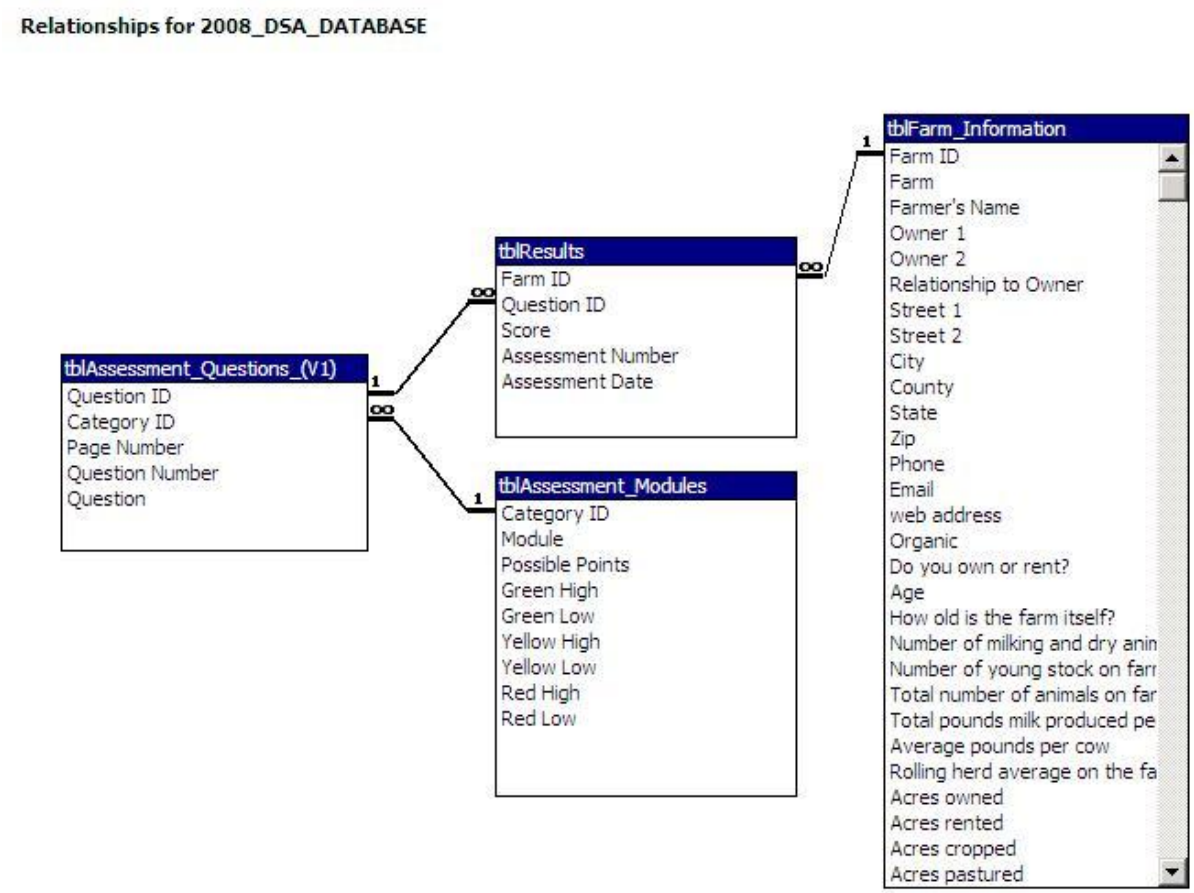


Figure 7-2 Inferential Integrity in the DSA Database

Prior to 2007 all of the data existed in Microsoft Excel. While Excel provides strong presentation and shorter development time, benefits of migration to Microsoft Access include increased performance as the data storage of Access is faster than Excel. In addition data extraction is streamlined through Access reports, integration with Microsoft Excel, or third-party applications such as Crystal Reports. Finally, the migration to Access will give the researchers the ability to upscale to SQL Server for web based data entry, collection and reports.

Transparency of Analytical Processes

Users can audit the database to see named ranges, formulas, and macros that are creating the interlocking system of calculations, linked cells, and formatted summaries that work together as an intricate system to create a final analysis. This ensures there are no hidden steps in the analysis.

Separation of Data and Presentation

ACCESS separates the analytical data into components: tables, queries, and reports. These components are less sensitive to changes and create an environment where changes to the database can easily be implemented and custom analysis can be created at request without destroying previous analyses.

8. Findings/Results

Post-test Results: Interpreting the values from the 2nd Assessments

When added together the value of the scores from each question within an individual DSA Module determines the module score. The value of these answers helped to create Module Index Scores (MIS) for each farm, which was shared with each farmer so they could see how they ranked themselves. As a more comprehensive indicator score, the Total Index Score (TIS) was created for each farm which consisted of the sum of a farm's nine individual MIS scores, allowing them to compare their overall results with those of all other farms involved.

Across the farms making changes and completing the second assessment, researchers saw a 12.2 average increase/improvement in TIS between the first assessment and second assessment (186.5 and 198.7 respectively). The average total MIS for all farms increased by 1.35, however the level of change did deviate between different farms and across different modules. When looking at the average MIS, all of the modules except the Farm Financial module showed an increase in sustainability related indicators. Farmers were more reluctant to share the specifics of their farm financial information. Therefore, the final edit of assessment changed the format of the Financial module to include a series of positive or negative responses to their record-keeping and financial analysis, rather than asking for specific financial indicators.

The most significant changes in conditions/practices were all quantitatively positive and were seen in the Animal Husbandry (+2.59), Water Management (+1.86), Soil Health (+1.81) , and Community Health (+1.71) modules.

Chart 1 below outlines the average MIS for each assessment and the observed change between assessments for all farms. Chart 2 plots the average change between the MIS recorded during the first and second assessment for all farms. Chart 3 graphs the MIS average scores recorded during the first(pre-test) and second (post-test) assessments for all farms making changes and completing the assessment twice.

Module	1st Assessment Average	2nd Assessment Average	Average Change
Animal Husbandry	31.13	33.72	2.59
Water Management	23.28	25.14	1.86
Soil Health	17.26	19.07	1.81
Community Health	18.61	20.32	1.71
Pest Management	20.93	22.41	1.48
Biodiversity	17.17	18.59	1.41
Nutrient Management	20.25	21.43	1.18
Energy	13.57	13.89	0.32
Farm Financials	24.38	24.15	-0.23

Chart 1: Comparison of Average Module Index Scores across all Farms

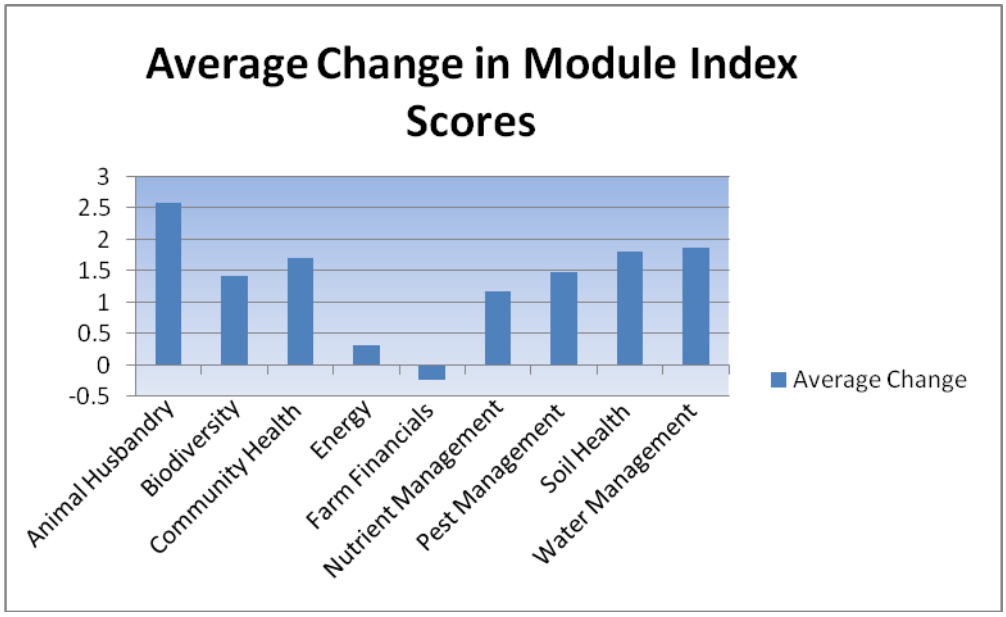


Chart 2: Average Change in Module Index Scores for all Farms

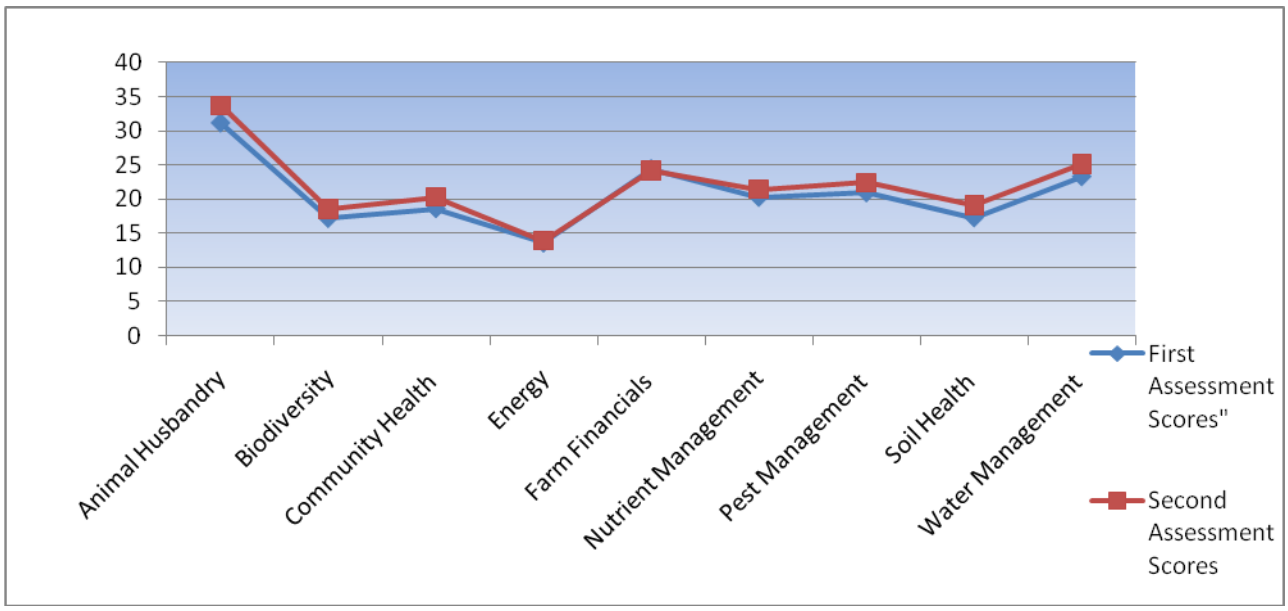


Chart 3: Average Module Index Scores for first and second assessments.

Although the TIS and MIS do help convey a great deal of information, in and of themselves these scores do not shed light on specific on farm practices/indicators identified within each module. In order to glean detailed information regarding specific indicators for changes in farming practices, an analysis of the data which of the specifically ranked indicators within the MIS and TIS scores was conducted. This process included the development of an average score for each of the 67 questions answered by farmers on both the first and second assessments. Fifty-eight of these average scores were then placed on a spectrum ranking level-of-change (because of the changes made in the final version, the questions related to Farm Financials were not included). This ranking ordered scores from those that changed the most to those that changed the least.

The greatest change in practice observed was found within the Soil Health Module, specifically an increase use of cover crops on farms. The second greatest change observed was part of the Animal Husbandry module. Particularly, a greater number of farms have been working to improve the health status of incoming and outgoing animals by the use of practices such as examining animals, washing animals, and/or requiring visitors to wear booties before entering barns. The third greatest change in practices observed was within the Nutrient Management module. Researchers detected an increased use of, adherence to, and documentation of nutrient management plans.

Looking further at this data, we see the five greatest specific changes in practices/indicators occurred across five different modules. The top ten changes in practices/conditions were distributed between seven of the nine modules. This may indicates farmers are receptive to making changes related to sustainability rankings across multiple facets of their operations. The graph below (Chart 4) outlines the top ten changes in practices which were observed.

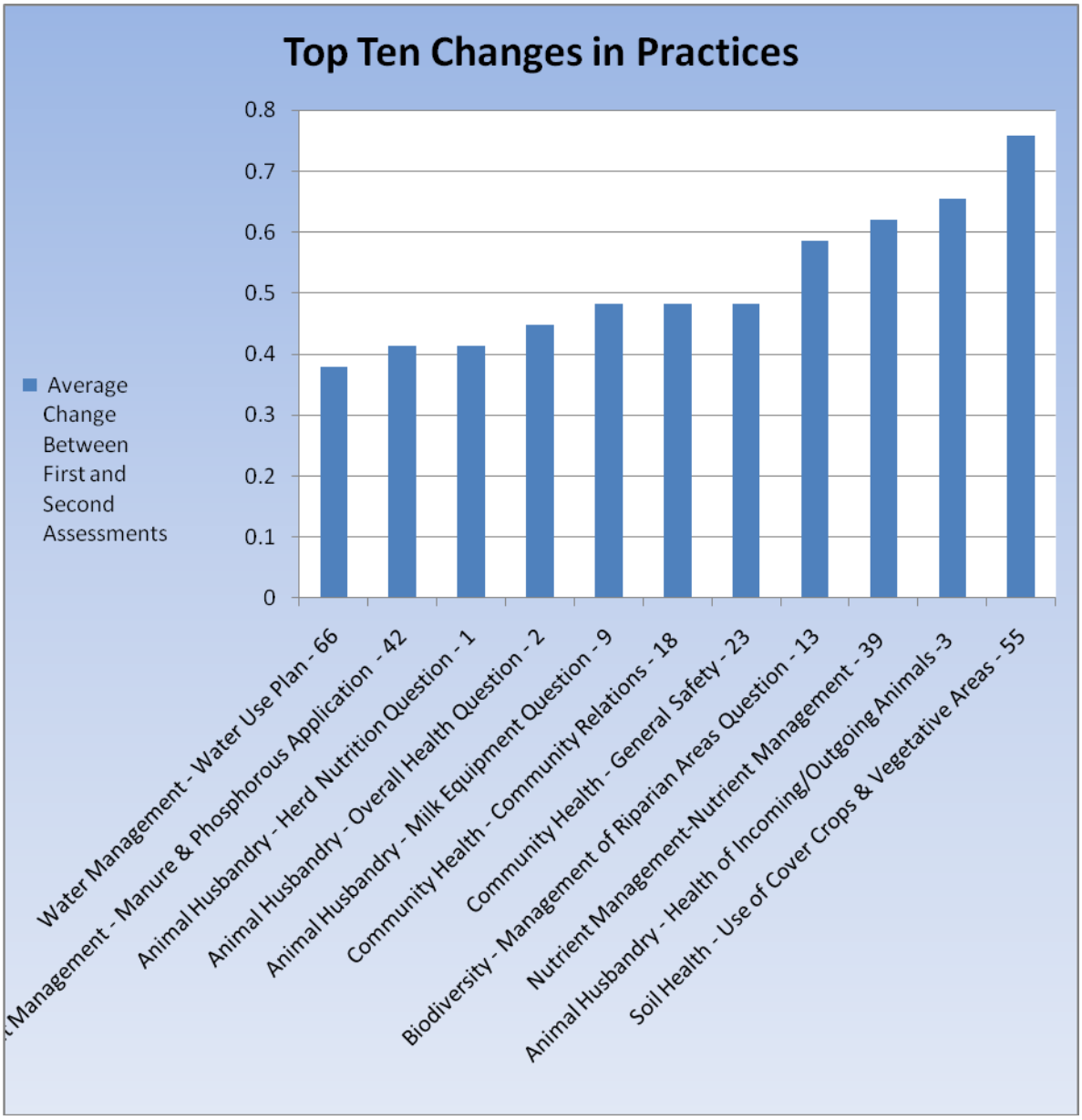
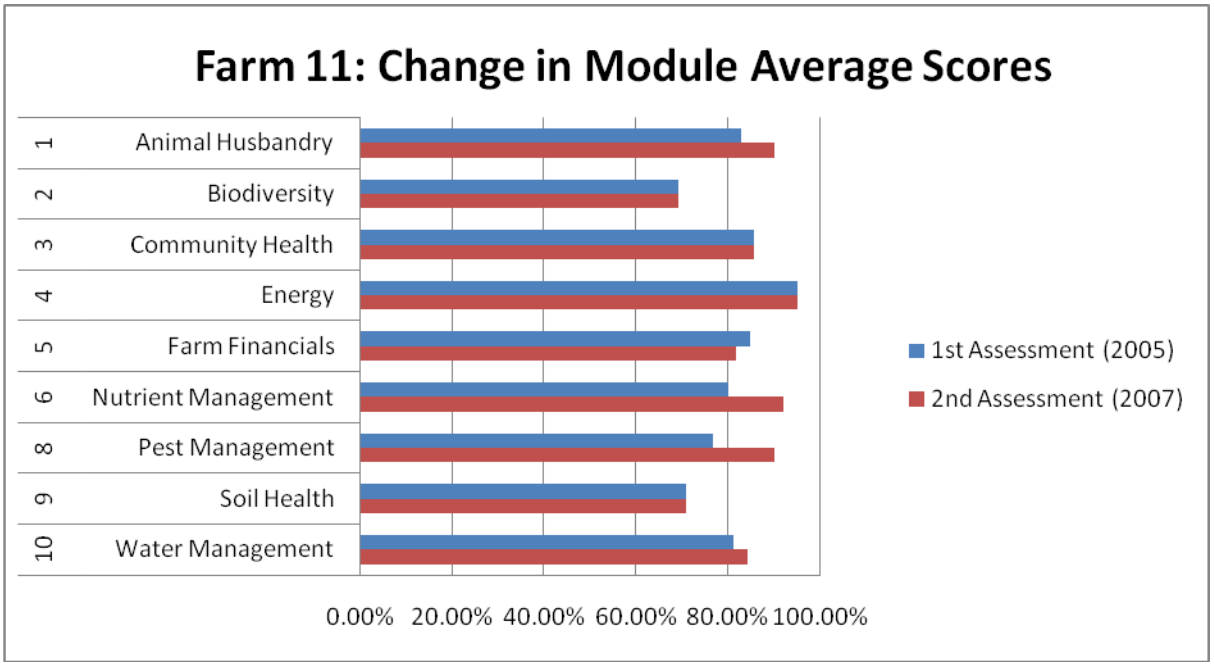


CHART 4: Top Ten Changes in Practices

Individual Farm Results: Charts and Summary

EXAMPLE FARM # 11:

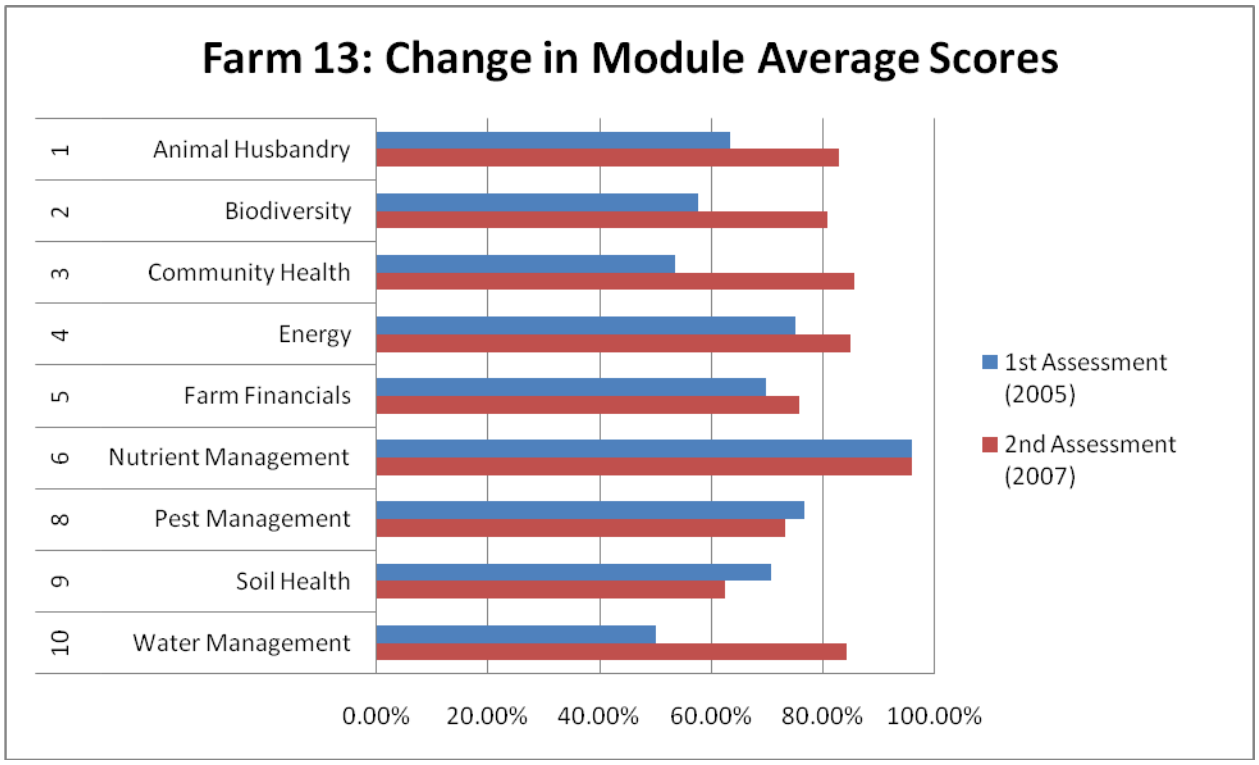
To protect their confidentiality, all participating farms received an identifying code number. The chart below indicates that "Farm #11" showed marked improvement between the first and second assessments in several key areas, and has remained constant in others. Areas of improvement include animal husbandry, as well as nutrient, pest, and water management. Significant strides were made in nutrient and pest management. Their results show a focus on trying to improve crop management. While making improvements in several areas, the farm was able to maintain the same level of sustainability in other areas, which indicates that the new management practices that employed have smoothly integrated into the whole farm practices and are not so labor intensive that they detract from other areas of the farm. Farm financials was the one area in which this farm scored a lower percentile on the second assessment as compared to the first. There are many possible reasons for this including the drastic drop in milk prices in 2006 and again in 2009. Financial indicators are affected by farm management and by the variable economy, and farmers can expect the financial module scores to fluctuate more than some of the other modules.



Comparison of Results of Pre- vs. Post Assessments for Farm #11

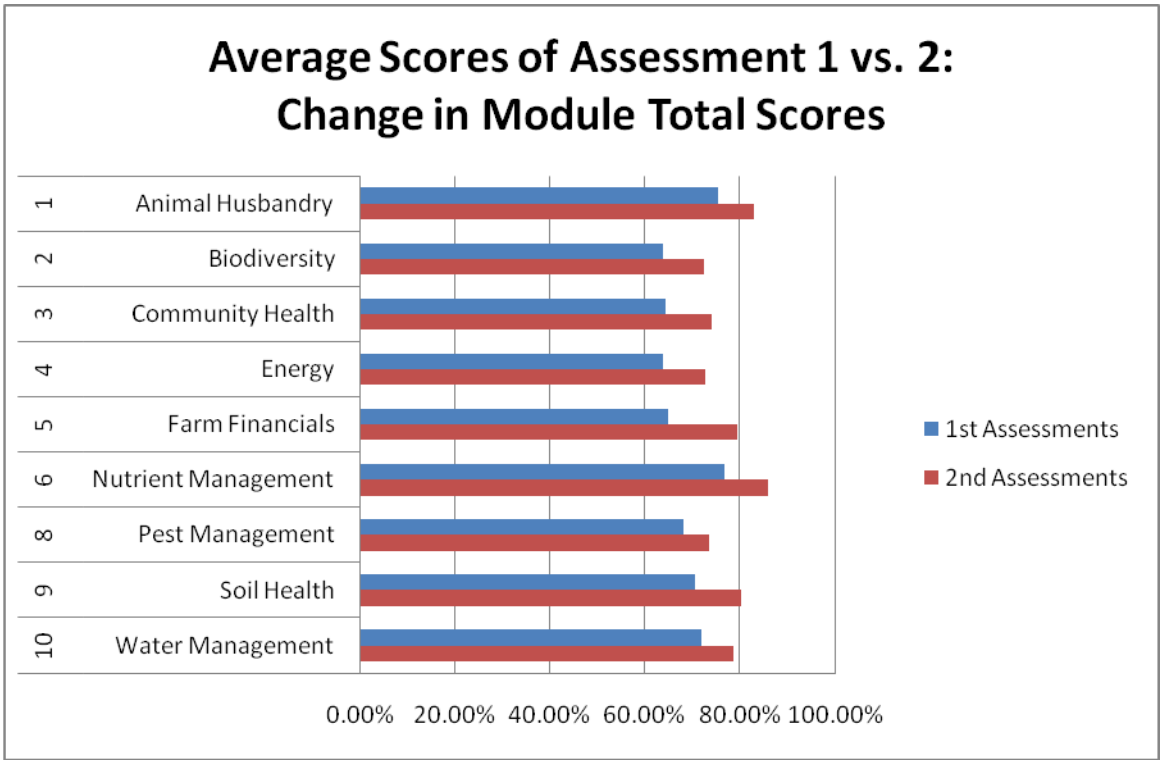
Example Farm #13: Charts and Summary

Farm 13 really focused and made great progress in many of the areas including scoring 34% higher in water management, 32% higher in community health, and 23% higher in biodiversity. This intense honing of management practices in certain areas took a small toll on other aspects on the farm with both soil health and pest management going down by 3.3% and 8.3% respectively. This may mean that the new practices adopted by the farm are too time consuming, or that implementing them at first proved to be a challenge so that other areas of the farm were not as closely managed as usual. However, the two modules that did go down did not go down that much, so hopefully farm 13 will become more adept at executing a more sustainable management plan. Eventually, it is expected that they will be able to bring up the other modules to the original level of sustainability, if not higher. Another possibility is that the questions in those modules were unclear so the farmer systematically marked the practice with a lower score when unsure exactly where the farmer's practices fell under. Not having a technical assistant available for guidance or consultation, was a problem observed in these earlier self assessments. Over time, as the modules were edited, using famer input, each module section gained clarity, and the result was less confusion by the farmers involved.



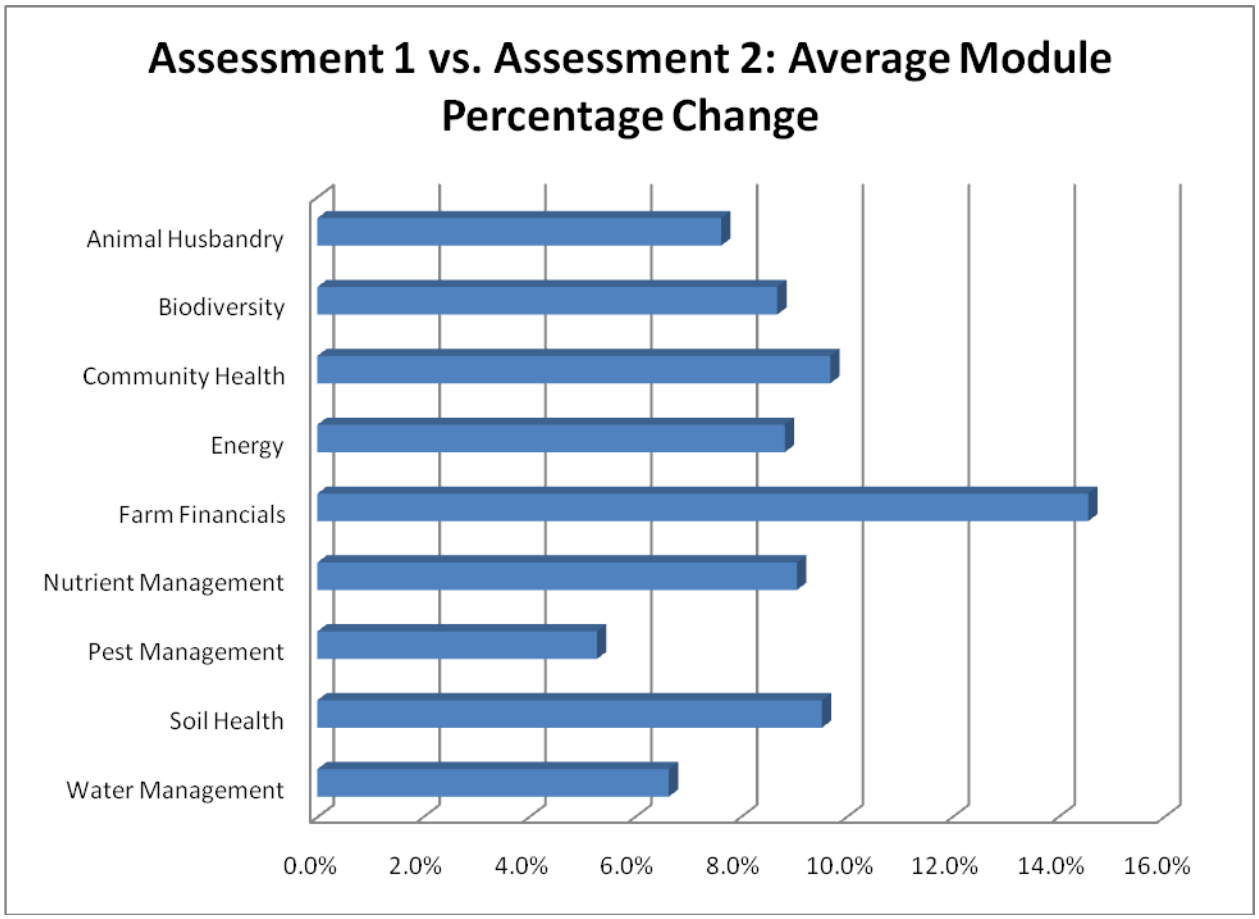
Comparison of Results of Pre- vs. Post Assessments for Farm 13

Comparison of 1st and 2nd Assessments across all Farms



	Module	Avg 1st	Avg 2nd	Possible Points	AvgOf1 as %	AvgOf2 as %	% change
1	Animal Husbandry	30.87	34.00	41.00	75.30%	82.93%	7.6%
2	Biodiversity	16.56	18.82	26.00	63.71%	72.40%	8.7%
3	Community Health	18.05	20.76	28.00	64.47%	74.16%	9.7%
4	Energy	12.76	14.53	20.00	63.82%	72.65%	8.8%
5	Farm Financials	21.46	26.27	33.00	65.03%	79.60%	14.6%
6	Nutrient Management	19.21	21.47	25.00	76.82%	85.88%	9.1%
7	Pest Management	20.47	22.06	30.00	68.25%	73.53%	5.3%
8	Soil Health	16.95	19.24	24.00	70.61%	80.15%	9.5%
9	Water Management	23.05	25.18	32.00	72.04%	78.68%	6.6%

Overall Increase in Sustainability Rankings across all Farms



Overall, there were measureable positive changes in the scores for all modules between the pre and post-tests. Providing up to date information and education on sustainable practices for dairy farms was a secondary, underlining objective when designing the Diary Stewardship Self Assessment. It was extremely encouraging to see positive change over time in all areas of the assessment.

Sustainability Indicators - Interpretation of Results

Our initial experience after interviewing the first 12 famers involved, indicated that that we needed to make a few changes in the phrasing of the individual questions being scored and to use terminology that the farmers they themselves suggested. For example, a confinement operation, not growing their own crops, may not respond accurately to the questions in that section, because some of the questions did not seem applicable to their farm. Or, an organic farm, not using chemical pesticides, may leave some of the questions blank, based on their interpretation of the questions. This meant that the assessment, or particular modules in the assessment had to be revised for a second printing before proceeding with Phase II farms after the first year of research.

Overall, the farms that participated were able to implement new sustainable measures in certain areas without neglecting other parts of the farm. This is very important because this assessment is only pertinent if it can help farmers not only identify parts of their farms that could become more sustainable but also suggest solutions that are able to be integrated into their overall management. Individual farms seem to be implementing a focused approach to tackling improved sustainability.

The areas within a module which received the lowest rankings, were identified in a report to the farmer. Farmers were encouraged to implement whichever changes seem the most feasible to them, while continuing to manage farm in a similar way as before the assessment. This seemed to be a very effective method because farmers were able to make significant steps toward sustainability without completely overhauling their farming practices or becoming burnt out.

Both the Caring Dairy and the Dairy Stewardship Alliance models encourage a farm focus on two or three modules a year, and to make changes at a reasonable pace. Eventually, they will be able to obtain additional technical assistance and education in each of the Sustainability Indicators. This makes implementing changes toward sustainability a systematic and successful ongoing process.

9. Appendix

Sample 1st Assessment Report

July 14th, 2008

DAIRY FARM SUSTAINABILITY:

Sustainability Indicators: AN ON-FARM ASSESSMENT TOOL

Dear _____,

We thank you for your participation in the Dairy Stewardship Alliance's on-farm self assessment. Your input about sustainable farming practices will help guide further programs to promote sustainable agriculture. We appreciate your effort!

We are providing you with a detailed analysis of your individual farm's results and a comparison with overall performance of the other farms involved in your group. You will find a table that reflects your color-coded total scores of each module. The average scores for other farms are provided in similar color coded charts. We hope that this information will assist you in an ongoing process to evaluate the sustainability of your farm as it relates to social, environmental and economic aspects of farming. We'll be back in touch to assist you in completing the toolkit again to compare your scores to the baseline after you've made at least two identified changes to your farming practices.

As you identify areas for making changes in your operation please consult the back section of each module in the toolkit manual for a list of potential resources for assistance. In addition, keep an eye out for upcoming discussion groups and evening sessions on various educational topics to assist you in understanding possible on farm improvements.

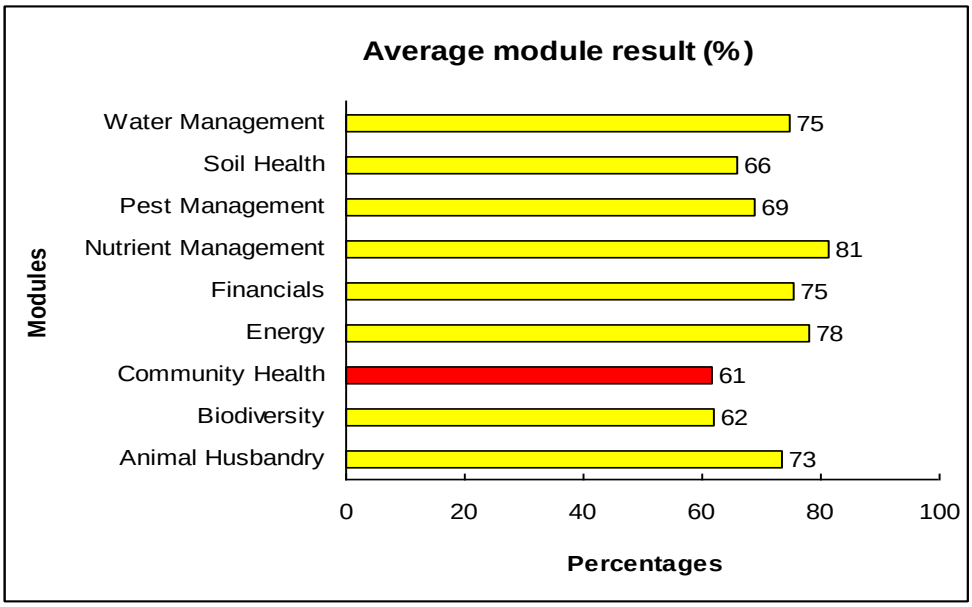
We all want to thank you for your time, effort and interest in the project.

Sincerely,

Allen Matthews, UVM Center for Sustainable Agriculture

Andrea Asch, Ben & Jerry's Homemade, Inc

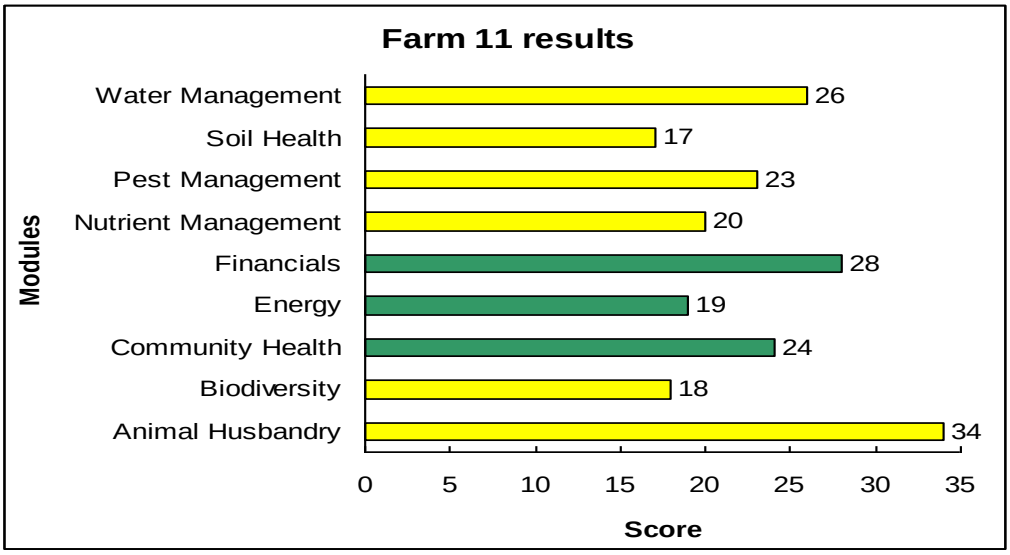
Diane Bothfield, VT Agency of Agriculture



Overall average Percentage scores of each module for all farms

Because of the different number of questions in each module, it provides a clearer comparison when we view the scores for each module by percentage.

For example, the Nutrient Management module, with an average of 81% was the module with the highest overall average score across all farms. However, it is still in the "Yellow" range. To be in the "green Range" the average scores would need to be at least 84% overall.



Participating farmers each receive reports with detailed charts showing how they scored in each of the different topic areas of the modules. The first chart shows their individual farm results and the second one presents the overall-farms average for each topic area. In this way the farmer can see how they've scored in relation to all the other farms completing the self assessment.

Sample 2nd Assessment Report

September 30th, 2009

DAIRY FARM SUSTAINABILITY:

Sustainability Indicators: AN ON-FARM ASSESSMENT TOOL

Dear «Famers_Name»,

We thank you for your participation in the Dairy Stewardship Alliance's on-farm pre- and post self assessments. Your input about sustainable farming practices will help guide further programs to promote sustainable agriculture. We appreciate your effort!

We are providing you with a detailed analysis comparing your 1st and 2nd assessments in which the tables reflect the color-coded total scores of each module. The first analysis in the report is focused on the your ranking score changes between your 1st and 2nd assessments. The second chart compares the overall average of all the farms against your scores for their first assessment. This analysis includes a comparison to all the farms having only completed their first assessment. The second analysis is of your farm's 2nd assessment results against the scores of all farms completing the 2nd assessment. This analysis includes a comparison of your second assessment result as it relates to your first assessment results.

We hope this information will assist you in your ongoing process to evaluate the social, environmental, and economic sustainability of your farming operation.

As you identify areas for making changes in your operation please consult the back section of each module in the toolkit manual for a list of potential resources for assistance. In addition, keep an eye out for upcoming discussion groups and evening sessions on various educational topics to assist you in understanding possible on farm improvements.

We all want to thank you for your time, effort and interest in the project.

Sincerely,

Allen Matthews, UVM Center for Sustainable Agriculture

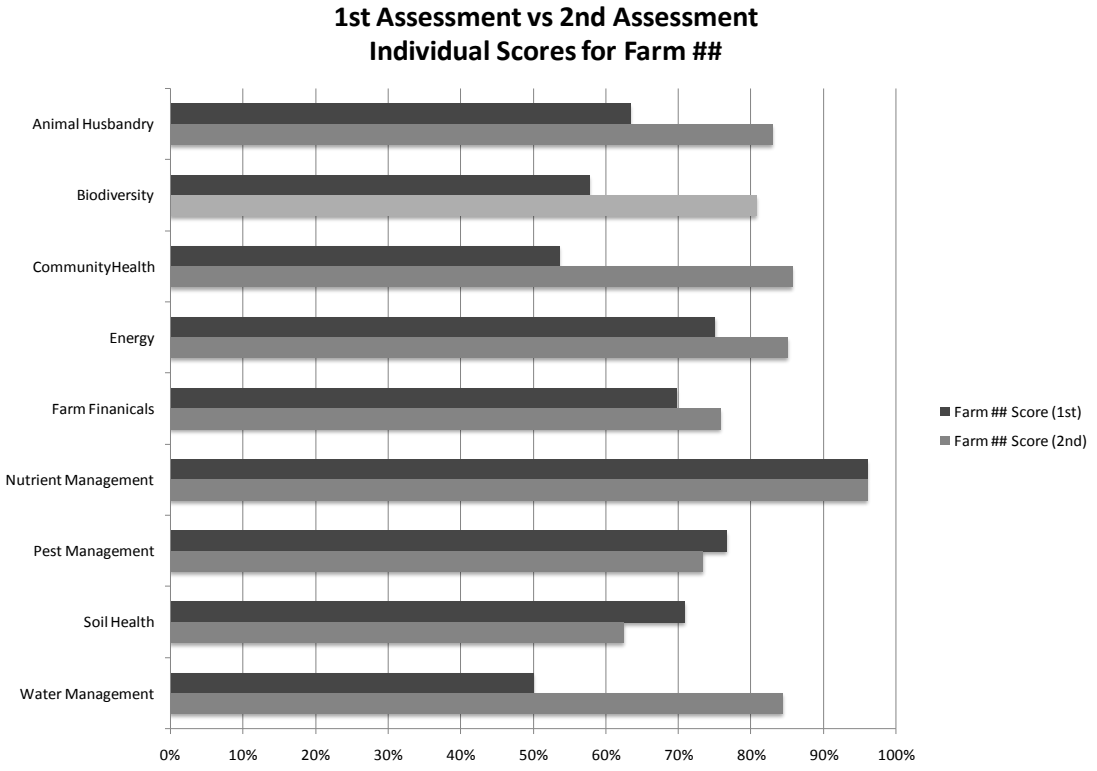
Andrea Asch, Ben & Jerry's Homemade, Inc.

Diane Bothfield, VT Agency of Agriculture

Tom Gates, St. Albans Co-op

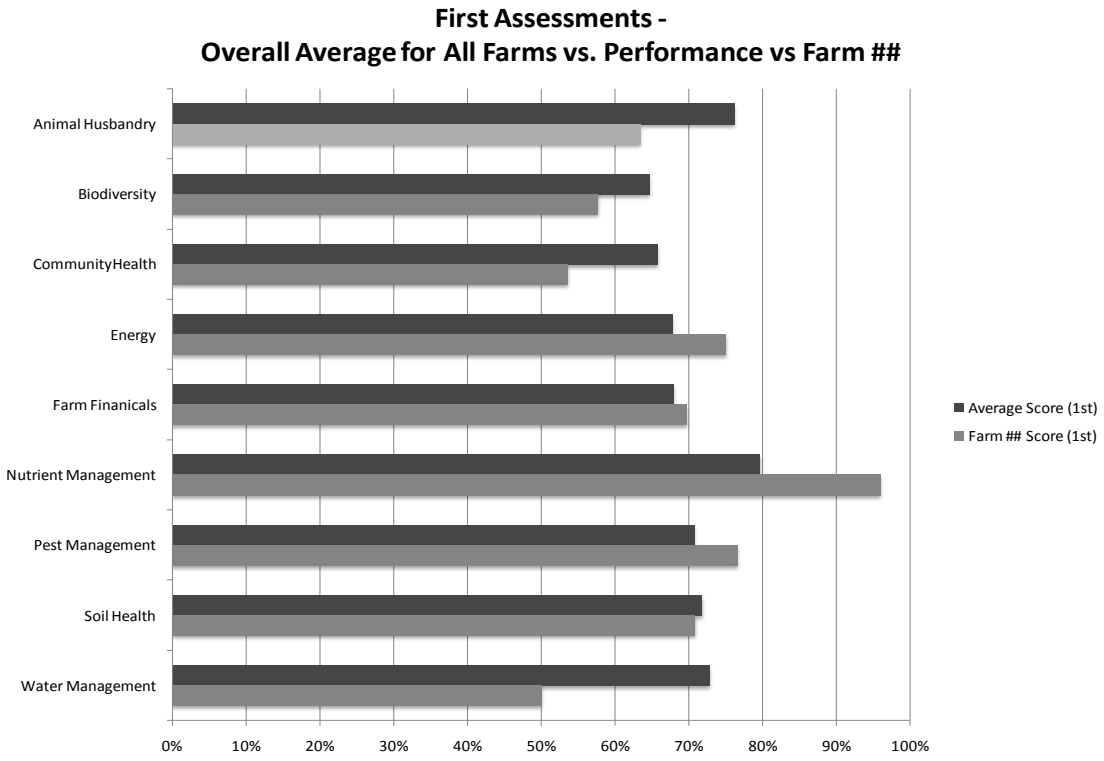
Sample of Results:

Each farm receives a report that compares their sustainability indicator scores between the first and second assessments. Farmer Graph 2.1 allows the farm to compare their own individual scores between the two assessments. Farmer Graph 2.2 and Farmer graph 2.3 will allow the farmer to compare their individual scores to the overall averages of all participating farms.



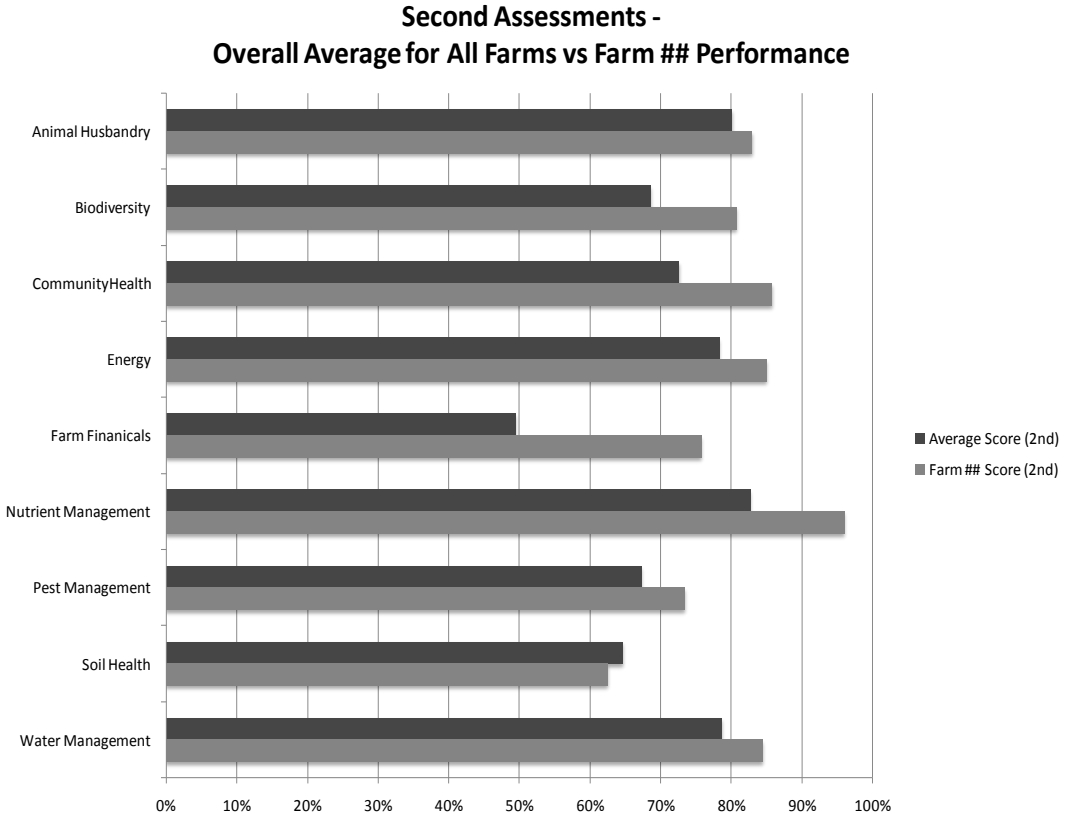
Farmer Graph 2.1

Farmer Graph 2.1 allows the farm to compare their own individual scores between the two assessments, and to recognize where the stewardship practices implemented have increased their sustainability indicators in the various modules. By identifying areas where Farm ## scored the lowest in the first assessment, the farm operation was able to identify modules where they might make improvements in their stewardship practices. In addition to the graph above, each farm receives a report recognizing the indicators where they have made improvement, and identifying areas for continued changes in stewardship practices in order to increase their scores on Sustainability self assessments in the future.



Farmer Graph 2.2

This graph represents the overall average indicator scores from all farms participating in the research and compares them to the individual scores from an individual Farm. For example, in the On-farm Energy, Farm Financials, Nutrient Management and Pest Management indicators Farm ## scored well above the average score for all other farms involved. However, Farm ## scored lower than the overall average for sustainability indicators for Animal Husbandry, Biodiversity, Community Health, and Water Management. It is in the areas where the farm scored lower than the averages for all farms that they have the most opportunity for changes.



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Farmer Graph 2.3

After certain changes were made in his stewardship practices, this graph represents the results of the second self assessment. The farmer can compare overall average indicator scores from all farms participating in the research to Farm ##'s individual. For example, Farm ## drastically increased the sustainability indicator scores in Animal Husbandry, Biodiversity, and Community Health, and Water Management. All these areas were scored lower than the total average for all farms in Farm ##'s first assessment. His indicator scores remained higher than the average for On-farm energy, Farm Financials, Nutrient Management and Pest Management modules.

Having made significant changes, Farm ## was recognized as having made the greatest improvement in stewardship practices out of all farms involved.

Overall percentage change within each module

between Pre- and Post- Assessments

Mod ID	Module	Question	Assessment 1	Assessment 2	Max Score	Avg Of 1 as %	Avg Of 2 as %	% change
1	Animal Husbandry	Herd Nutrition	3.49	3.82	4	87.18%	95.59%	8.4%
1	Animal Husbandry	Overall Health	3.31	3.88	4	82.69%	97.06%	14.4%
1	Animal Husbandry	Health of Incoming/Outgoing Animals	2.49	3.18	4	62.18%	79.41%	17.2%
1	Animal Husbandry	Milk Quality	3.15	3.24	4	78.85%	80.88%	2.0%
1	Animal Husbandry	Lactation Management	3.26	3.53	4	81.41%	88.24%	6.8%
1	Animal Husbandry	Housing/Handling Areas	2.97	3.12	4	74.36%	77.94%	3.6%
1	Animal Husbandry	Stalls	2.74	3.06	4	68.59%	76.47%	7.9%
1	Animal Husbandry	Pasturing	1.97	2.12	4	49.36%	52.94%	3.6%
1	Animal Husbandry	Milk Equipment	3.18	3.76	4	79.49%	94.12%	14.6%
1	Animal Husbandry	Calf Raising Conditions	4.31	4.29	5	86.15%	85.88%	-0.3%
2	Biodiversity	Genetic Diversity of Crops	2.54	3.00	4	63.46%	75.00%	11.5%
2	Biodiversity	Natural Area Conservation	2.38	2.76	4	59.62%	69.12%	9.5%
2	Biodiversity	Management of Riparian Areas	2.51	2.71	4	62.82%	67.65%	4.8%
2	Biodiversity	Pasture Management	2.51	2.88	4	62.82%	72.06%	9.2%
2	Biodiversity	Crop Field Management	2.77	3.12	4	69.23%	77.94%	8.7%
2	Biodiversity	Adjacent Area Management	2.21	2.59	4	55.13%	64.71%	9.6%
2	Biodiversity	GMOs	1.64	1.76	2	82.05%	88.24%	6.2%
3	Community Health	Community Relations	4.13	5.06	7	58.97%	72.27%	13.3%
3	Community Health	Documented Labor	3.00	3.65	4	75.00%	91.18%	16.2%
3	Community Health	Child Labor	3.18	3.59	4	79.49%	89.71%	10.2%
3	Community Health	Base Wage	3.00	3.41	4	75.00%	85.29%	10.3%
3	Community Health	Worker Sanitation	3.31	3.18	4	82.69%	79.41%	-3.3%
3	Community Health	General Safety	1.44	1.88	5	28.72%	37.65%	8.9%
4	Energy	Percentage of Income	2.18	2.53	4	54.61%	63.24%	8.6%
4	Energy	Lighting	2.08	2.59	3	69.30%	86.27%	17.0%
4	Energy	Milking (Variable Speed Driver)	2.21	2.41	3	73.68%	80.39%	6.7%
4	Energy	Ventilation	2.45	2.76	4	61.18%	69.12%	7.9%
4	Energy	Milk Cooling	2.53	2.65	3	84.21%	88.24%	4.0%
4	Energy	Renewable Energy	1.32	1.59	3	43.86%	52.94%	9.1%
5	Farm Financials	Current Ratio	2.19	2.87	3	72.97%	95.56%	22.6%
5	Farm Financials	Equity to Asset Ratio	2.03	2.67	3	67.57%	88.89%	21.3%
5	Farm Financials	Rate of Return on Farm Assets	1.97	2.53	6	32.88%	42.22%	9.3%
5	Farm Financials	Term Debt & Capital Lease Coverage Ratio	1.89	2.40	3	63.06%	80.00%	16.9%

Module ID	Module	Question	Assessment 1	Assessment 2	Max Score	Avg Of 1 as %	Avg Of 2 as %	% change
5	Farm Financials	Farm Income	4.00	4.67	5	80.00%	93.33%	13.3%
5	Farm Financials	Work/Life Balance	2.54	3.00	4	63.51%	75.00%	11.5%
5	Farm Financials	Attitude Towards Adopting New Practices	2.32	2.80	3	77.48%	93.33%	15.9%
5	Farm Financials	Planning for the Future	2.89	3.33	6	48.20%	55.56%	7.4%
6	Nutrient Management	Nutrient Management & Record Keeping	2.64	3.29	4	66.03%	82.35%	16.3%
6	Nutrient Management	Manure Application Rate	2.82	3.18	4	70.51%	79.41%	8.9%
6	Nutrient Management	Commercial Fertilizer Application Rate	3.13	3.53	4	78.21%	88.24%	10.0%
6	Nutrient Management	Manure & Phosphorous Application Timing/Technique	3.18	3.41	4	79.49%	85.29%	5.8%
6	Nutrient Management	Nitrogen Fertilizer Application Timing/Techniques	2.49	2.71	3	82.91%	90.20%	7.3%
6	Nutrient Management	Fertilizer & Manure Application Equipment	2.49	2.65	3	82.91%	88.24%	5.3%
6	Nutrient Management	Use of Phosphorous Supplements	2.46	2.71	3	82.05%	90.20%	8.1%
8	Pest Management	Pest Identification	3.05	3.12	4	76.32%	77.94%	1.6%
8	Pest Management	Pesticide Selection	3.08	3.29	4	76.97%	82.35%	5.4%
8	Pest Management	Timing of Pesticide Application	2.89	3.24	4	72.37%	80.88%	8.5%
8	Pest Management	Weather Conditions	2.63	2.71	3	87.72%	90.20%	2.5%
8	Pest Management	Record Keeping	2.61	2.65	4	65.13%	66.18%	1.0%
8	Pest Management	Specific Management Practices (Flies)	4.00	4.47	6	66.67%	74.51%	7.8%
8	Pest Management	Specific Management Practices (Weeds)	2.21	2.59	5	44.21%	51.76%	7.6%
9	Soil Health	Soil Organic Matter	2.76	3.06	4	69.08%	76.47%	7.4%
9	Soil Health	Use of Cover Crops & Vegetative Areas	2.37	3.06	4	59.21%	76.47%	17.3%
9	Soil Health	Crop Rotations	3.24	3.29	4	80.92%	82.35%	1.4%
9	Soil Health	Tillage Practices	2.47	3.12	4	61.84%	77.94%	16.1%
9	Soil Health	Soil Conservation & Erosion Prevention	3.05	3.47	4	76.32%	86.76%	10.4%
9	Soil Health	Soil Quality Monitoring	3.05	3.24	4	76.32%	80.88%	4.6%
10	Water Management	Livestock Yard Management	3.00	3.47	4	75.00%	86.76%	11.8%
10	Water Management	Manure Storage System	3.15	3.29	4	78.85%	82.35%	3.5%
10	Water Management	Fertilizer Storage System	3.36	3.65	4	83.97%	91.18%	7.2%
10	Water Management	Silage Storage System	3.18	3.18	4	79.49%	79.41%	-0.1%
10	Water Management	Milk house Waste	2.97	3.47	4	74.36%	86.76%	12.4%
10	Water Management	Protecting On-Farm Water Sources	3.03	3.06	4	75.64%	76.47%	0.8%
10	Water Management	Water Use Plan	1.97	2.18	4	49.36%	54.41%	5.1%

Appendix : Sample Sustainability Indicator Module:

Nutrient Management Module

DESCRIPTION

Nutrients are needed to sustain healthy animals and crops but overuse or mismanagement of nutrients, in particular nitrogen and phosphorus, can lead to nutrient pollution of ground or surface waters. Purchased feed and fertilizer are by far the largest sources of nutrient imports onto a farm, accounting for 89.5% of imported nitrogen and 96% of imported phosphorus. Reliance on these external nutrient sources is becoming problematic in that 59-81% of imported nitrogen and phosphorus remain on a dairy farm over one year.[1] This results in a build-up of nutrients in the soil and an increased chance that nutrients will be transported to water sources, resulting in environmental harm to surface and ground water.

While dairy farms are certainly not the only source of this pollution, contributions from farmland can be significant and participation from the dairy farmer community is therefore essential to improving overall water quality. In Vermont, Lake Champlain, a critical water resource, is experiencing a serious decline in water quality, in part due to sediment and nutrients from agricultural runoff from barnyards, manured and fertilized fields and cropland erosion. Also, many drinking water wells have been found to have nitrate-nitrogen levels exceeding the Vermont public health standard.[2]

Adopting best practices for nutrient management is important to maintaining ground water that is safe for drinking and surface waters that can support healthy aquatic ecosystems, function as industrial and commercial water supplies, and provide recreational enjoyment. This module is devoted to controlling direct nutrient use on farms, specifically with respect to nutrient applications to fields. Recommendations regarding nutrient management plans, use of fertilizer and manure, and use of dietary phosphorus supplements are intended as an introduction to best management practices to improve farm performance and environmental health. Actual changes to nutrient management should be made in cooperation with experts, such as UVM extension representatives, feed or fertilizer specialists, or other consultants. Controlling water pollution from other nutrient sources, such as manure or silage, is addressed in the Water Management Module.

INCENTIVES FOR CHANGE

- **Cost savings.** Appropriate nutrient management can reduce unnecessary feed and fertilizer purchases, improving crop production efficiency and farm profitability. The Vermont Dairy Farm Sustainability Project found that, by reducing phosphate fertilizer application by 40% (average reduction over a 3 year period), farms could reduce total fertilizer expenditures by an average of $2800/farm or $27/acre, while maintaining farm yields. One farm decreased phosphate fertilizer use by 8.3 tons/year for savings of $4200/year.[3]

- **Improved on-farm water quality.** Minimizing impact on surface and ground water is beneficial to the extent that these water resources become inputs on the farm. Maintaining healthy drinking water can reduce the chance for illness, and associated costs, from contaminated water.

- **Regulatory environment and funding.** The EPA recently passed water quality legislation requiring that farms with large 'concentrated animal feeding operations' (CAFO) obtain a permit for operation. However, in order to get a permit, a farmer must first develop and implement a comprehensive nutrient management plan. While Vermont's current limit of "large" CAFO operations is 675 milking cows, there is discussion of reducing this number to 200. Additionally, regulation of phosphorus in Vermont requires that farmers take action to reduce the amount of phosphorus coming onto the farm.[4] As this and other water quality legislation becomes more stringent, dairy farms will increasingly need to demonstrate nutrient management best practices.

SAMPLE: NUTRIENT MANAGEMENT ASSESSMENT QUESTIONS

For all questions, please choose the categories that best identify your current management practices. Use the Summary sheet on the last page of this module to evaluate overall performance.

- **NUTRIENT MANAGEMENT & RECORD KEEPING**:
  1. No nutrient management plan exists for the farm. Nutrient use is driven by compliance with applicable state or local regulations governing nutrient use.
  2. Nutrient management plan is based on some soil testing and recommendations of the University of Vermont or another credible source. Recommended nutrient application rates are exceeded by 5-25% as 'insurance' for a good yield level.
  3. In addition to #2, the plan is based on soil tests ever 1-3 years and recommended application rates not exceeded by more than 10%. Detailed nutrient records are kept (soil test results, crop yields, nutrient application rates and timing, etc.).
  4. In addition to #3, recommended application rates are never exceeded. Additionally, detailed records are used to guide and improve the nutrient management plan on an annual basis.

Record keeping can help farmers further understand, monitor, and therefore improve, farm performance. It also demonstrates good management and can provide valuable data if management practices are ever challenged. While a bit of effort needs to be invested up front, implementation and maintenance of a nutrient management and record-keeping plan will ultimately save both time (e.g. records are readily available when needed for taxes or other purposes) and money in the long term. A nutrient management plan, developed in conjunction with the UVM Extension service, consultant or other expert resource, covers multiple nutrient flows on farms, including use of manure, fertilizer, and feed and supplements. Some best practices associated with nutrient management plans are captured in the questions in this module.

- **MANURE APPLICATION RATE:**
  1. Application rates are unknown or manure is applied until all manure is used up (without regard to nutrient requirements of field or crop).
  2. Application rates are determined by crop-specific phosphorus needs (per UVM or other published standards) and realistic yield goals (goals are within 10% of 5-year average yield).
  3. In addition to #2, application rates are loosely determined by soil nutrient need according to soil tests performed every 3-5 years. To prevent over-application, most excess manure is applied to neighboring fields or otherwise properly disposed of.
  4. In addition to #3, rates are determined by strictly following application recommendations from soil tests conducted every 1-3 years and application reflects manure nutrient content, as determined by laboratory analysis. To prevent over-application, all excess manure is applied to neighboring fields or otherwise properly disposed of.

Manure is a valuable source of nitrogen, phosphorus and potassium for crop production but it is important that the use of manure on fields focuses on crop utilization of manure nutrients rather than manure waste disposal. Over-application of manure can result in buildup of nutrients in the soil and increased potential that nutrients will be leached through the soil to groundwater or transported to surface waters via runoff. The amount of manure applied should therefore be closely matched to the needs of each field. Any excess manure remaining after application should be applied to neighboring fields or otherwise properly disposed of. As a benchmark for the amount of land that will be needed for your farm, best practice requires .5 to 1.0 animal units (AU) per acre of cropland that is environmentally, economically, and agronomically suitable for the application of manure.[5] One AU is equivalent to 1,000 pounds so a 1,400-pound dairy cow would be 1.4 AUs.[6]

To more closely match manure application rates to soil and crop needs, the farmer should base application rates on the following:

- Soil Testing*:* Soil testing, conducted at least every 3 years, is a great way to determine soil nutrient content and other characteristics that affect crop uptake of nutrients. UVM offers soil test kits that provide information on soil pH, available phosphorus, aluminum (which affects plant uptake of phosphorus) and other nutrients, and soil fertility recommendations. Soil testing is a non-time-intensive, non-costly way to better understand and manage on-farm nutrients.
- Manure Nutrient Content: The percentage of nutrients in manure will vary, depending on such factors as type of cow, composition of feed, additions of other substances to manure, and collection and storage methods. Because of the wide potential variation in nutrient content, a manure nutrient analysis, which can be done at UVM, is highly recommended as the best means of determining exact nutrient content for precision crop nutrient applications. If such an analysis is not possible, using published averages for manure nutrient levels is the next best alternative.
- Type of Crop and Crop Yield: Different crops and yield levels will result in varying crop nutrient needs. Manure use should be based on nutrient need of the crop being grown, together with realistic yield goals (within 10% of average yields from the last 5 years). Ideally, nutrient content should be matched with crop need and soil nutrient content per the results of soil testing. However, using general published standards is the next best alternative.

- **COMMERCIAL FERTILIZER APPLICATION RATE:**
  1. Application is based on historical practice; specific application rate is unknown.
  2. Rates are determined by crop-specific nutrient needs (per University or other published standards) and realistic yield goals (goals are within 10% of 5-year average yield).
  3. In addition to #2, application rates are loosely determined by soil nutrient need according to soil tests performed every 3-5 years and manure nutrient credits and legume nitrogen credits (per University guidelines published standards) are reflected in application rates.
  4. In addition to #2 (not #3), rates are determined by strictly following application recommendations from soil tests (conducted every 1-3 years) and by annual Pre-Side dress Nitrate Tests. Every effort is made to use only on-farm nutrient sources (manure, compost, cover crops, etc.).

Given that manure is an excellent and abundant source of crop nutrients, every effort should be made to effectively utilize manure (or other on-farm, organic nutrient sources) to satisfy crop nutrient need. However, and when inorganic commercial fertilizer is needed to supplement manure nutrients, precisely matching it to crop need will minimize fertilizer costs and nutrient build-up in soils. As discussed in the "Manure Application Rate" section, soil testing and closely following corresponding nutrient recommendations is a best management practice. These nutrient recommendations should take into account crop type and yield (as discussed above).

- [1]Weber, Greg. "Vermont Dairy Farm Sustainability Project, Inc. (VDFSP) DRAFT Summary." Provided by Greg Weber, formerly of VDFSP, via e-mail in June 2003.
- [2]Klausner. 1993. Quoted in Weber, Greg. "Vermont Dairy Farm Sustainability Project, Inc. (VDFSP) DRAFT Summary." Provided by Greg Weber, formerly of VDFSP, via e-mail in June 2003.
- [3]*Vermont NRCS Farm*A*Syst.* "Worksheet #3: Assessing the Risk of Groundwater Contamination from Fertilizer Storage and Handling." May 1998. Vermont Natural Resources Conservation Service (NRCS). 2003. 23 Nov. 2003. <ftp://ftp-fc.sc.egov.usda.gov/VT/Technical/FarmASyst/Worksheet3-Fertilizer_Storage&Handling.pdf>.
- [4]Jokela, Bill. "UVM Missiquoi Water Quality Factsheets: Dairy Farmers Save Dollars and Nutrients by Participating in HUA Crop Management Service." University of Vermont, Department of Plant and Soil Sciences. 15 Nov. 2002. 8 Dec. 2003. <http://pss.uvm.edu/vtcrops/LMWQ/Lmwq5.pdf>.
- [5]*Vermont Dairy Farm Sustainability Project, Inc.* 2002 update. 8 Dec. 2003. <http://www.sare.org/reporting/report_viewer.asp?pn=LNE01-151&ry=2002&rf=0>.
- [6]"Feeding Strategies to Reduce Phosphorus Inputs from Dairy Sources." A collaboration effort published by the William H. Miner Agricultural Research Institute. Provided by Diane Bothfeld of St. Albans Cooperative Creamery, Oct. 2003.

10. Outreach / Newsletter Articles

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By Gary DiGuiseppe

A five-year-old project to help members of a Vermont dairy cooperative achieve greater sustainability in their operations is now ready to go regional.

The Dairy Stewardship Alliance was launched in 2003 by the famed, environmentally-inclined ice cream makers Ben & Jerry's, along with the 520-member St. Albans Cooperative Creamery and the University of Vermont's Center for Sustainable Agriculture. Allen Matthews of the Center explains, "It was a research project when we started, to look at how to actually identify issues on the farm that the farmers needed some additional information on; that information could come back to Extension professionals, and they could put their training programs together."

But there was another purpose; to help the farmers self-assess their own sustainable practices, and to compare those assessments to those of other producers. "They give themselves a ranking in each of the different module areas," Matthews explains, "and then they send that in. We've put all that information in a database, and then they get a report back, and the report says, 'Here's how you graded yourself in all these areas.' They get a chart that shows what their score is, but then they also get a chart that shows how everybody else that's done it have scored themselves, and so they get to compare what their practices are with the other folks."

The modules are in areas ranging from the environment (soil health, water management, nutrient management, and biodiversity) to herd maintenance (animal husbandry, pest management, and farm financials), to social consciousness and conservation of resources (energy and community health). Each is broken down further into a number of topics; in "biodiversity," for instance, the farmer grades him or herself on genetic diversity of crops, management of riparian areas and of adjacent areas, crop field management and other topics.

The Alliance doesn't weight the modules by trying to assess their relative importance, but it does try to standardize the information in each. For "soil management," as an example, Matthews says one of the topics is soil tests; they look at whether the participant conducts soil tests and how often, and whether the results are being used. The same goes for all the other modules and the topics within them. "We're looking at the whole farm," he says, "not just one aspect of it."

After the participants get the results comparing them with other farmers, Matthews says they look for places to make improvement. "We provide some educational sessions on energy efficiencies, or water quality, or nutrient management practices, and then a year later they do the assessment again, and see what their changes have been, and how they now compare with everybody." He says it's been interesting: "The farmers are brutally honest with their own assessment of themselves, so they really don't rank themselves highly in an area where they're not following through on a practice."

The Alliance got started at the same time Vermont's Agency of Agriculture was pursuing something similar; the Agency was using guidelines from the US Department of Agriculture's Natural Resources Conservation Service to develop Best Management Practices for dairy farms that would ultimately have the force of law behind them. Matthews says, "They needed a way to get this information out in a practical way to farmers. Ben & Jerry's is interested in stewardship and sustainability, and so they were a natural partner, and St. Albans Coop provides the milk for Ben & Jerry's ice cream. So, that was the connection."

The Alliance defines "sustainable dairy farming practices" as those which "enhance the natural environment and herd health while supporting profitability and improving the quality of life for farmers, their families and their communities." As Matthews points out, "You're not going to be sustainable unless your farm's in business." The program is not targeted toward farms of a specific c size; Matthews says one of the most active participants milks 550 cows and is looking at installing robotic milkers, while another is a 75-head, grass-fed operation. Nor is it geared toward organic producers; the first farms in the Alliance, he says, were members of the Young Cooperators, a group of conventional confinement operations that are all at least second-generation. Matthews says, "They were the group that actually helped us look at the self-assessment modules, added the modules so that they were practical for farmers to read, and challenged some of the assumptions that were in it."

The next step is to get more farmers involved. Only 10% of the St. Albans members participated in the research; Matthews says, “The idea is to try to now take the model and make it available on line, so that if a farmer is interested, they can complete the self-assessment, hit a ‘Submit’ button, and then they would get an actual report back that would show how their practices were related to other farms in the Northeast.”

The Alliance is partnering with a similar project in the Netherlands that also has a Ben & Jerry’s connection; the ice cream brand is owned by the Anglo- Dutch consumer products company Unilever, and eleven Dutch farms that were supplying the milk for Ben & Jerry’s in Europe formed their own module-driven project, dubbed “Caring Dairy.” Those indicators have in turn been adopted by a 500-member cooperative, CONO Coop, which is using them as part of a continuous quality improvement program for their members. Matthews says the farmers who sign up for the program get a 50-euro incentive bonus per 100 kg, roughly 50 cents/cwt; 92% of the CONO farmers have signed up, he says, adding “I’m expecting that that’s the kind of thing that’s going to happen here, too.”Matthews is also hoping sustainability can translate into direct cash benefits to producers through the fledgling carbon sequestration market. There is already a Chicago Climate Exchange, where “pollution credits” are traded. Farmers who trap carbon with grass, crops and trees can sell the right to claim that carbon to industry. The Alliance is working with two Vermont companies, the Sustainable Food Laboratory and The Earth Partners, on using the measurements and metrics from their modules to calculate the amount of carbon their cooperators can claim. “I don’t want anybody to feel like they were going to do this just to go through the motions; that they’re really going to be able to get something out of it,” Matthews says. “And that’s why I’m really excited about this other next phase; it’s what we’re calling ‘low-carbon farming,’ and trying to put this whole world of carbon sequestration into a language that farmers can understand, and can actually benefit from.”

But Matthews says the savings from the Alliance’s project are already tangible. “Most of the farmers that I know,” he says, “are already good stewards of the land, and they know by investing in the sustainability of their farm, it’s not just an economic line, it really is the environmental health of the soil and the water quality for them and their neighbors…I guess the sustainability is trying to help to look beyond the fluctuating price of milk; how can you reduce your off-farm inputs, so you aren’t so vulnerable?”

NOTES:

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