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Dairy Stewardship Alliance- Sustainability Indicators for Dairy Farms

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ABSTRACT

Sustainable dairy farming practices enhance the natural environment and herd health while supporting profitability and improving the quality of life for farmers, their families and their communities. The Dairy Stewardship Alliance's research on sustainability indicators is a collaborative effort with the Center for Sustainable Agriculture at the University of Vermont, Ben & Jerry's Inc., the St. Albans Cooperative Creamery, University of Vermont Extension and the Vermont Agency of Agriculture.

Together, we have been developing and researching a self-assessment for sustainability indicators for dairy farmers which promote a broader use of sustainable agriculture practices. The Alliance provides direct support for farmers to help them develop a better understanding of their production practices, to explore alternatives and to implement changes to improve the sustainability of their farm operations.

A partnership among a farmers' dairy cooperative, University Extension, and private industry supports dairy farmers as they adopt sustainable practices. The project manager provides all farmers with a self-assessment tool and offers feedback to clarify with them the areas where technical assistance is needed, specifically regulatory assistance and help with the implementation of state and federal accepted practices.

Performance target:
Of 520 farms in the dairy co-op, 10% will participate in the Dairy Stewardship Sustainability Indicators research and 40 farms will implement at least 2 new identified sustainable production practices.

Expected Outcomes:

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

2. During this period, 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 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.

1.1 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 and begun to work to test and refine the assessment with an original group of 52 farmers who voluntarily agreed to be a part of the research. Prior to a second assessment, these farms each identify and implement changes, and are moving forward to complete the post-test assessment which will indicate areas of change and needs for further technical assistance.

We have now reached the point that we are ready to expand the scope of the self assessment beyond our original partnership, and make it more readily available to ALL Vermont dairy farmers. The Alliance has gained a great deal of interest and momentum. We plan to eventually expand the availability throughout the Northeast.

Originally conceived as a hard copy set of ten modules, the 90 page manual is extremely costly to reproduce and to assess results. If additional funds can be identified, we are ready to move forward to develop an on-line version of the sustainability indicators as an on-line self-assessment that can be completed and submitted electronically.

1.2 Objectives/ Performance targets

1.2.1 Performance Target:

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.

After the first 20 months, the Alliance has identified 57 farms who volunteered to complete the assessment. These farms are all involved at different stages of our process, with 40 actually involved in completing the assessment a second time after having implemented changes to increase stewardship practices on their farms within the final year of the research.

1.3 Accomplishments

1.3.1 Milestones

- While the DSA was originally partnering with St. Alban's Co-operative and its 520 members, participation has expanded to farmers from two other regional dairy co-ops, Agri-Mark and Organic Valley. The Treasurer of St. Alban's Coop Board of Directors is a participant in the research, and four farmers now serve on our advisory task force. In addition to announcements about the results of the sustainability indicators, articles about the farmer exchange of 13 farm families (36 participants (to The Netherlands appeared in dairy and farming trade/industry magazines and regional newspapers.

- The goal initial goal was to identify 10% of the St. Alban's Co-op 520 farms for participation in this research by Extension, USDA Natural Resource Conservation Service, Vermont Pasture Network, University of Vermont Extension, Vermont's Agency of Agriculture and other farmers.
- As of 12/3/07, 57 farmers have enrolled to complete the assessment, which already exceeds our final goal. The original 12 farms served as a group of advisors who helped to edit the text of the manuals. In late 2008, we will complete the final editing of the manual for sustainability indicators, which will then be tested with a final group of farmers.
- The final goal is to have the Self Assessment for Sustainability Indicators pre- and post-assessments completed by 40 farms for planning and decision making concerning new sustainable practices to implement and to identify technical assistance needs.
- We continue to collect edits for the modules in order to make the modules more farmer friendly and to standardize results. Our target is to have 76% of the farms who complete the assessment move forward to identify sustainable practices that they can implement on their farms and complete the assessment a second time after their changes have been made.
- The Annual report for 2007 which documents the sustainable indicators and changes implemented for all farms is available at www.uvm.edu/sustainableagriculture in their publications section.

1.3.2 Impacts - Dairy Stewardship Alliance

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)

- After the first 20 months of this three year research project, 57 farmers have applied to complete baseline assessments of their Indicators for Sustainability for all modules of their dairy farming practices. 46% farms have already received summary reports and identified sustainable practices to implement. During this period, farmers identified sustainable farming practices to improve in the next phase and utilized the self-assessment to guide them in meeting the state required Accepted Animal Practices (AAPs) and Large Farm Operations/ Medium Farm Operations certification requirements.
- Through farmer input, the Dairy Stewardship Alliance identified biodiversity, energy enhancement, water quality and farm safety as the most immediate areas for needed technical assistance in order to increase their sustainability practices. The modules are now being editing a final version of the Sustainability Indicators Self Assessment. Our intent is to present recommendations in a New England Dairy Stewardship Forum to be held in early 2009.
- We continue partnering with Wageningen University and their "Caring Dairy" project in the Netherlands, who are also developing "Sustainability Indicators" for dairy farms as a sister project with Ben & Jerry's – Holland and CONO coop, makers of Beemster Cheese.
- Twelve (12) University of Vermont students within the College of Agriculture and Life Sciences have begun completing the assessment for their home dairy farms and at the University of Vermont's dairy research farm!
- A related goal established this year, is to make the Sustainability Indicators Self Assessment modules available on-line through a website in 2009.

2 Summary

2.1Background

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 for sustainability indicators 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.

2.1 Purpose

The purposes of this initiative are to:

A. Provide an on-farm assessment tool for sustainability indicators for dairy farms
B. Educate and communicate information on sustainable dairy farming practices
C. 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.

3 Methodology

3.1 Strategy

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

- ANIMAL WELFARE
- NUTRIENT MANAGEMENT
- BIODIVERSITY
- ORGANIC (included only for informational purposes)
- COMMUNITY HEALTH
- PEST MANAGEMENT
- ENERGY
- HEALTH
- FARM FINANCIALS
- WATER MANAGEMENT

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 one presents 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 6.1)

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 3-1 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

3.1 Modules and Topics

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

Module Topics (continued)

	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

	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

3.2 Database Methodology

3.2.1 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 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.

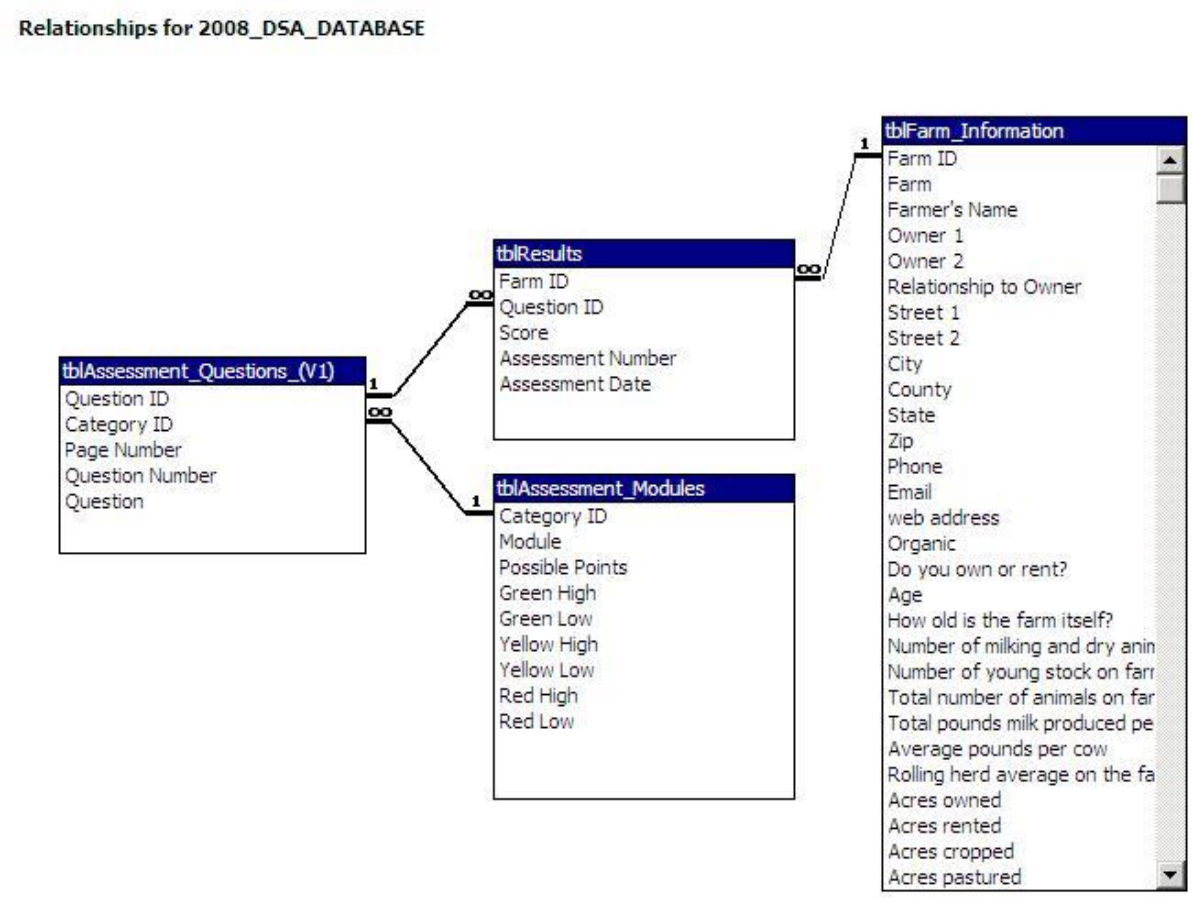


Figure 3-1 Inferential Integrity in the DSA Database

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 collection.

3.2.2 Transparency of Analytical Processes

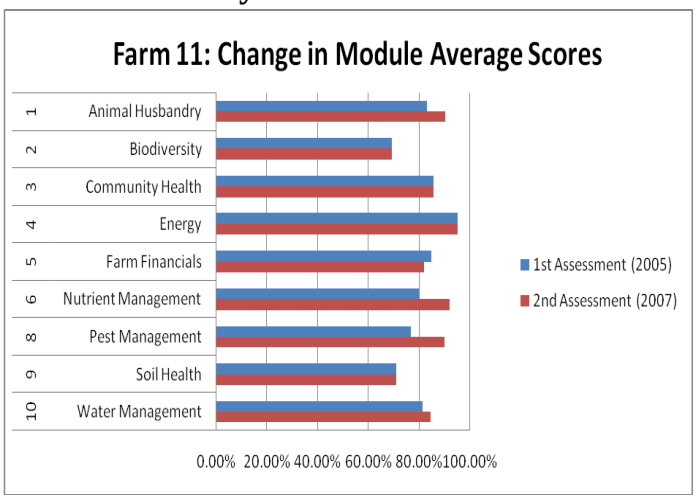
Users can audit the database to see named ranges, formulas, and macros that are creating the interlocking system of calculations, linked cells, and formatted summaries that work together as an intricate system to create a final analysis. This ensures there are no hidden steps in the analysis.

3.2.3 Separation of Data and Presentation

Access separates the analytical 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.

4 Findings/Results

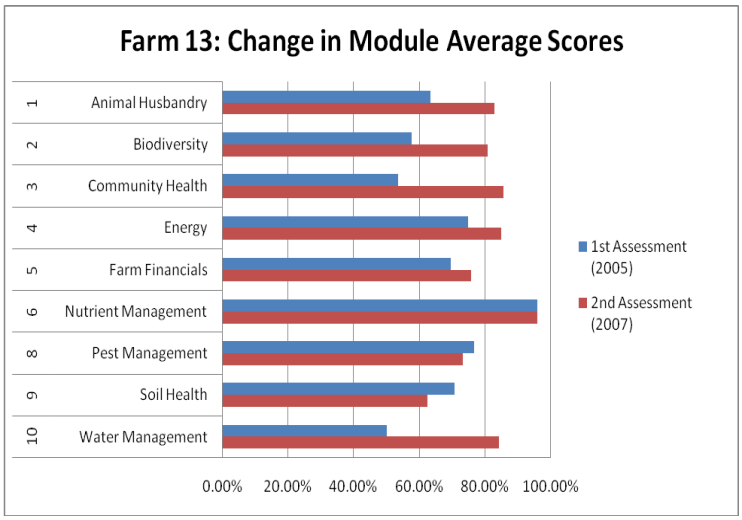
4.1 Farm 11 Charts and Summary



Example of the Comparison of Results from Farm 11

Farm 11 shows marked improvement between the first and second assessments in 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. This shows 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, indicating that the new management practices that they 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. Financial indicators are affected by farm management and by the variable economy, and farmers can expect it to fluctuate more than some of the other modules.

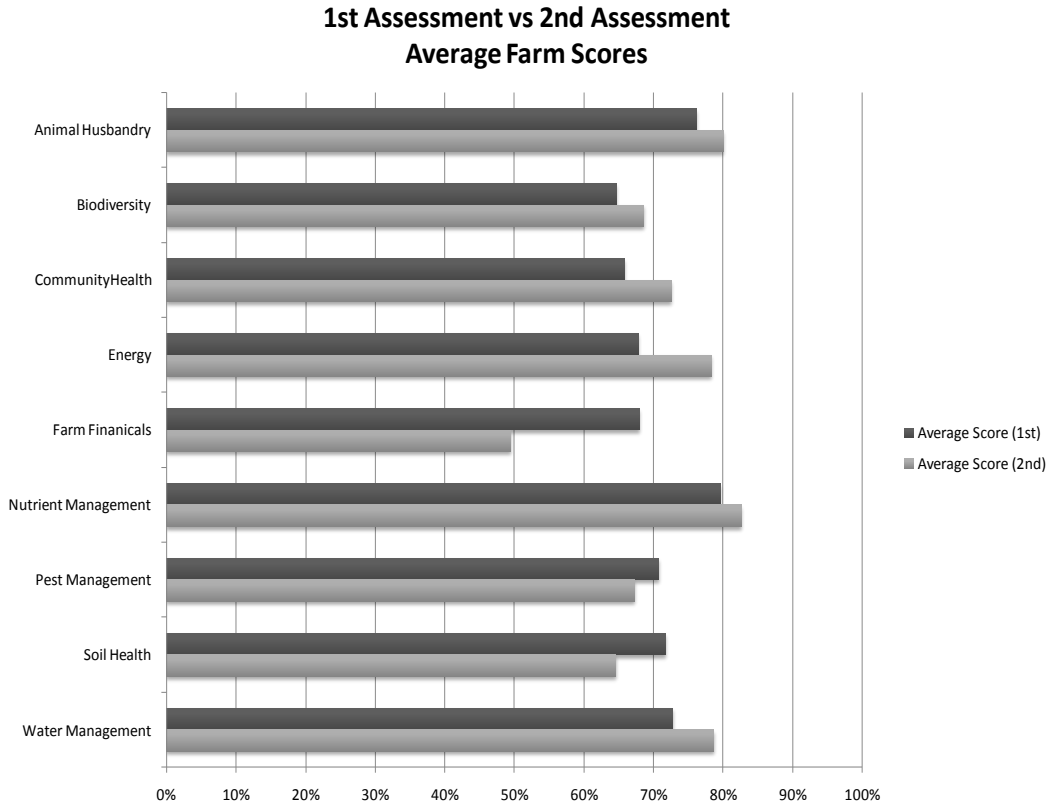
4.2 Farm 13 Charts and Summary



Comparison of Results from Farm 13

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 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 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 their more sustainable management plan, and 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 farm down when unsure what category the farms practices fell under.

4.3 1st and 2nd Assessments Charts and Summary



Sustainability Indicators - Comparison of Results for Overall Farm Averages

The overall change for all the farms between the first and second assessment was positive. Energy management went up 9.6% and community health went up 8.4%. However there were some modules that went down. Soil health and pest management both went down by about 3%. Altogether the modules showed 41.8% points of improvement and 5.6% points of regressing, for a net change of 36.2% improvement.

Sustainability Indicators - Comparison of Results for Overall Farm Averages

Interpretation of Results

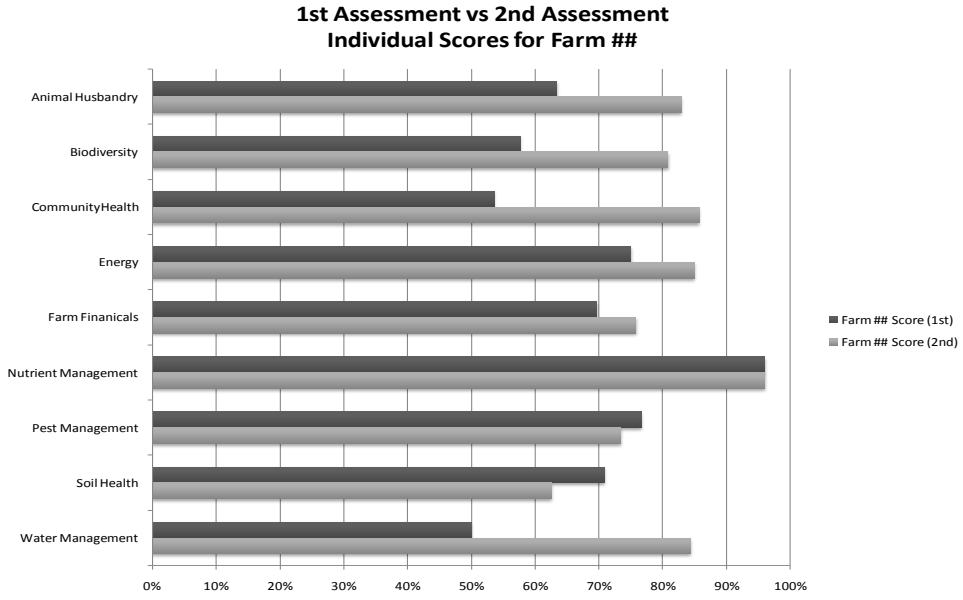
In the second assessments, on average, farmers scored lower on both the soil health and pest management modules than they had on assessment one. After reviewing the results there are some trends that can be seen. These trends could be due to certain circumstances affecting farms, primarily the weather, which is an unpredictable circumstance that tends to affect large numbers of farms in one area. Our experience after interviewing involved farmers, indicated that the lower scores could also be due to problems with the phrasing of the questions, which are being edited for the final version. For example, a confinement operation, not growing their own crops, may not respond accurately to the questions in these sections, because some of the questions did not seem applicable to their farm.

Or, an organic farm, not using chemical pesticides, may score themselves lower based on their interpretation of the questions. This implies that there was something confusing or different about the question. The same trend can be seen in question four of pest management. Not all of the decrease in the total score can be attributed to questioning error, because we see some questions where some farms will score higher, some will score lower, and others will say the same. It is true that the farms that scored lower may have been confused as to what the question was asking and thus scored themselves lower than they should have. During the first assessment people from the Dairy Stewardship Alliance were there to help the farmers navigate the questions, and often made personal visits. For the second assessment, without this help, the farmers may not have been sure what answers best fit their farm because of the overall wording. This means that the assessment, or particular modules in the assessment might be poorly phrased and some farms may have found them confusing. Also, as mentioned earlier, one or two questions in particular may have been poorly phrased causing almost everyone to score lower on those particular questions.

Overall however, 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. Whatever area needs the most work, or whatever changes seem the most feasible are made, while the rest of the farm is managed in a similar way as before. This seems to be a very effective and doable method because farmers are able to make significant steps toward sustainability without completely overhauling their farms or becoming burnt out. If farms focus on two or three modules a year then they will be able to make changes at a reasonable pace. Eventually, they can make a full circle and implement new improvements in the areas of the farms that they tackled first. This makes implementing changes toward sustainability a systematic and ongoing process.

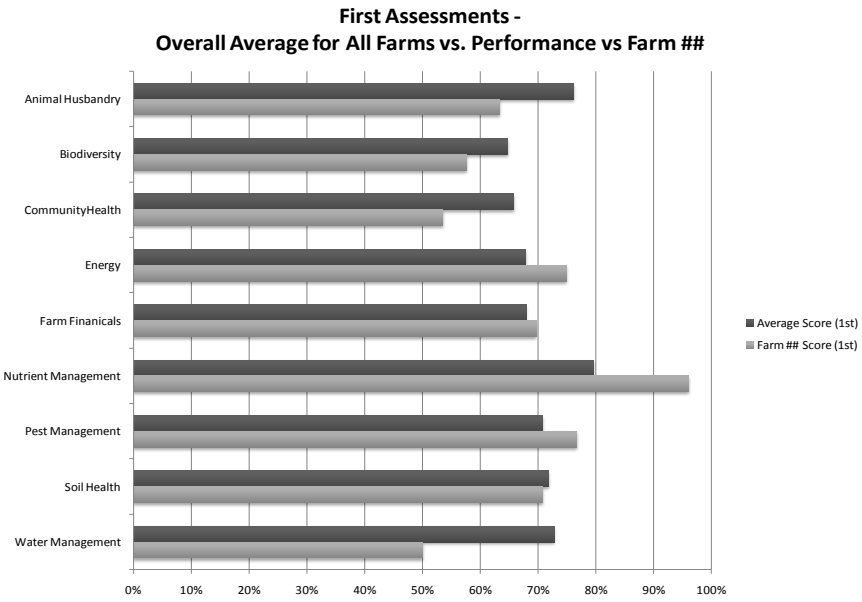
Sample of Results Reported to Participating Farms:

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

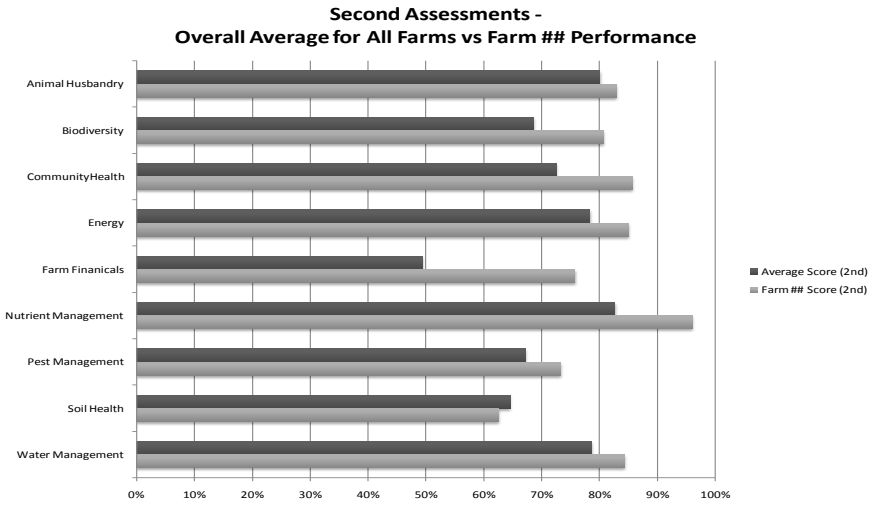
Farmer Graph 2.1 allows the farm to compare their own individual scores between the two assessments, and to recognize where the stewardship practices implemented have increased their sustainability indicators in the various modules. By identifying areas where Farm ## scored the lowest in the first assessment, the 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 narrative reports recognizing the indicators where they have made improvement, and identifying areas for continued changes is stewardship practices in order to increase their scores on Sustainability Indicator 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 individual Farm ##. For example, 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 Farm ## scored lower than the overall averages for all farms that they have the most opportunity to identify changes is stewardship practices in order to increase their scores on follow-up Sustainability Indicator self assessment.



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 also remained higher than the average for On-farm energy, Farm Financials, Nutrient Management and Pest Management modules.

After 16 months, having made significant changes, Farm ## was recognized as having made the greatest improvement in stewardship practices and the resulting scores in overall sustainability indicators. have the most opportunity to identify changes is stewardship practices in order to increase their scores on follow-up Sustainability Indicator self assessment.