Farmers for Sustainable Food

LASA
Lafayette Ag Stewardship Alliance

Pilot Sustainability Project
Year 3 Annual Progress Report

August 2022

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1 EXECUTIVE SUMMARY

Farmers for Sustainable Food (FSF), the Lafayette Ag Stewardship Alliance (LASA) and key stakeholders in the agricultural supply chain partnered in 2019 to create a replicable Framework for Farm-Level Sustainability Projects. The framework provides a pathway for establishing sustainability projects that address financial and environmental outcomes driven by on-farm conservation across the country.

LASA, founded in 2017, is a farmer-led watershed conservation group and was formed to identify and promote conservation practices (CPs) throughout southwestern Wisconsin. LASA and FSF piloted the framework through this project. LASA is also an active innovation project within the Field to Market: The Alliance for Sustainable Agriculture™ Continuous Improvement Accelerator.

Farmer Participation:

15 farms that manage over 40,000 acres are evaluating on-farm sustainability metrics

4 farms are participating in crop enterprise financial analysis

Commitment to continue for 2 more years

This report summarizes three years of data collection and analysis (2019 – 2021 crop years) involving 15 LASA farmers, primarily from Lafayette County, Wis., to demonstrate the efficacy and impact of conservation practices and best management practices on sustainability, farm financials and local water resources using FSF's framework.

Tools used in the project included:

- On-farm sustainability – Field to Market's Fieldprint Platform™
- Farm financials – FINPACK software, Center for Farm Financial Management, University of Minnesota
- Local water resources – Prioritize, Target, and Measure Application (PTMApp), Minnesota Board of Water and Soil Resources

After completion of three years of data collection and analysis, this report is designed to present results in a way that allows farmers and partners to see how the project has achieved the purposes that were set out in 2019 and what is next. The report provides a general description of the tools and methods used. A detailed explanation of the tools and methods can be found in the project's year one report on the FSF website (https://farmersforsustainablefood.com/projects-and-resources/). The year two report, also on the website, provides a detailed explanation of all metrics and how to interpret them.

Key Project Purposes

1. Assess if current farming practices in conservation-conscious areas are having a positive impact on sustainability and water quality compared to Field to Market's National and State benchmarks.
2. Demonstrate the financial benefits of conservation practices on farms.
3. Increase the use of sustainability measurement platforms by farmers to inform land and water management decisions, leading to increased adoption of conservation measures.

2 METHODOLOGY

All data within the report was obtained from Field to Market's downloadable data (comprehensive data output file, project benchmark downloads) or from the 2020 National Indicators Report (Field to Market, n.d.). Project benchmarks in this report are reported for the three-year period of 2019-2021. Field to Market guidelines discuss that project benchmarks will be averaged over a moving five-year period once five years of data is available.

In instances where a project benchmark has been broken out by year, the comprehensive data output file was used to obtain the breakouts. For instance, the water quality metric, which is discussed in this report, is broken out for 2019, 2020, and 2021 to determine if there has been year over year improvement in the group score. Because the project benchmark provided by Field to Market is an average over the three-year project period, the comprehensive data output file was used to obtain the water quality score for each field within the project. The water quality scores were multiplied by field size to provide the proper weighting, and then summed to a project level by crop. This value was then divided by the total sum of all fields for the given crop type to obtain the crop specific project wide metric value. For all mitigation scores associated with the water quality score, there was no weighting by field size. The mitigated or not mitigated scores were simply tallied on an annual basis and divided by the total number of fields to determine the percent of fields that mitigate or do not mitigate certain criteria. Data is screened to ensure complete data is present before analysis is completed.

Total best management practices (BMP) implemented within the project can be located within the comprehensive data output file. Best management practices are self-reported and are only as accurate as the data entered into the platform. For this report, all BMPs for 2021 were summed to determine the total number of active BMPs during the 2021 growing season. To get the average active BMPs per field in 2021, the total BMP count (which includes all BMPs from the 'water conservation practices' column and the total number of fields actively using cover crop in the growing year) was divided by the total number of fields within the project during the growing season.

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3 ON-FARM SUSTAINABILITY

Using Field to Market's Fieldprint Platform™ (FPP), seven on-farm sustainability metrics were measured for each farm. The metrics use actual farm data collected from each farm for each year analyzed. Data can be presented at the field level, farm level and project level. Comparison metrics between anonymized project participants, state and national averages can be used to gauge how well each farmer is doing within the group. FPP is designed to provide insights into 1) eight sustainability metrics, seven of which were utilized for this project, 2) how on-farm operations and management affect scores, 3) ability to compare individual scores against project, state and national benchmark scores, and 4) evaluate and identify ways to improve scores. FPP, as an on-farm sustainability tool, can be used to quantify and measure farm and a sustainability project's pursuit of continuous improvement over time (Field to Market, n.d.).

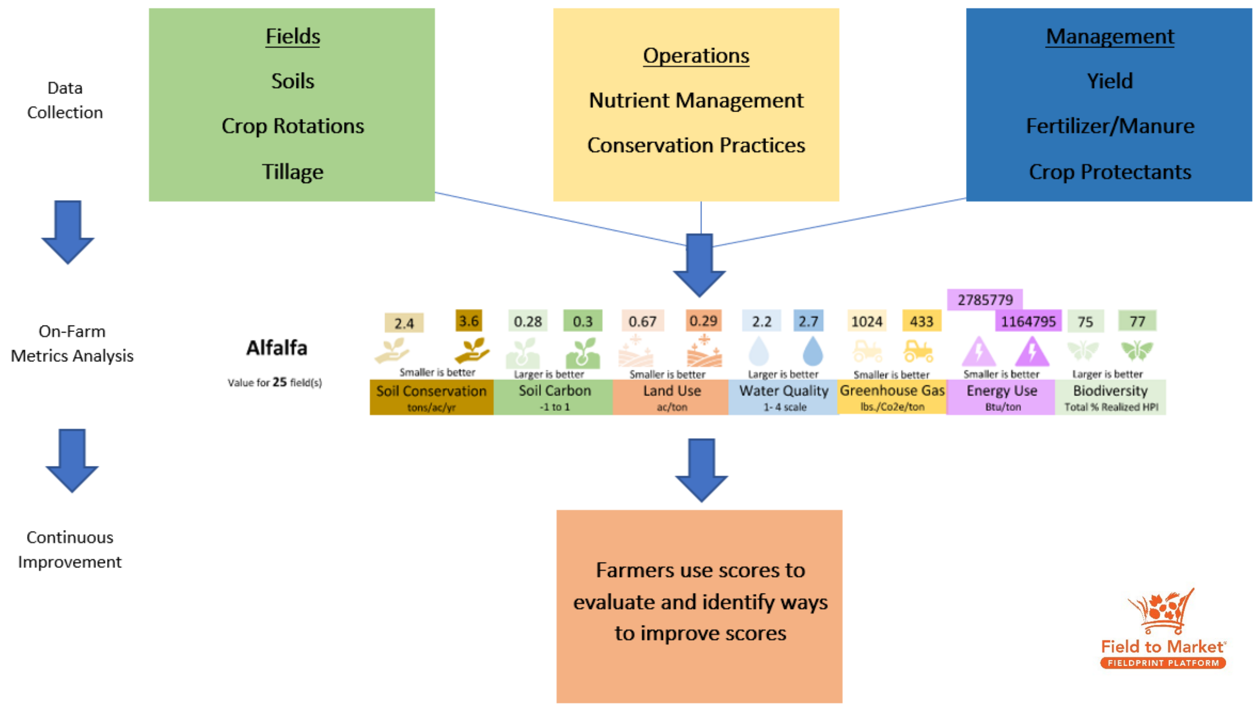


Figure 1: On-farm sustainability continuous improvement model. Data in figure is a visual representation only and does not represent any project specific scores.

4 THREE-YEAR PROJECT RESULTS (2019-2021)

Project benchmarks are a useful way to show a farmer how individual scores compare to those of others enrolled in the project as well as at the state and national levels. They are also useful to set goals and strive for improvement over time. Table 1 contains the LASA project benchmarks for corn grain, corn silage and alfalfa based on 15 farms for the three-year project period of 2019 to 2021. The benchmarks are averaged over all three years.

Table 1: LASA Fieldprint Platform project sustainability metrics for the three-year period of 2019 to 2021. Data from Fieldprint Platform project benchmark downloads.

	Corn Grain	Corn Silage	Alfalfa
Soil Conservation*	.... ton/ac/yr		
	1.4	3	3.6
Energy Use**	... btu/bu ...	.... btu/ton	
	24,781	119,343	1,164,795
Greenhouse Gas**	lbs. CO_2e/bu	lbs. CO_2e/ton	
	13.3	87.9	432.9
Water Quality	.... unitless		
	1.22	1.39	2.66
Biodiversity	.... %		
	72.6	76.1	77.2
Land Use**	....ac/bu....	.................ac/ton.................	
	0.0043	0.0382	0.2954

*Weighted average by field sizes

**Weighted average by yields

The project and interested farmers can compare metrics to national indicators and state benchmarks to better understand how the project performs against national and state averages. Field to Market has published updated national indicator metrics for 2020 (FTM, 2021). The comparisons are listed in Table 2.

Table 2: National indicators vs project benchmarks by crop type

		Corn Grain	Corn Silage	Alfalfa
Soil Conservation		.... tons/ac/yr		
	Project	**1.4**	**3.0**	**3.6**
	National indicator	4.7	4.7	NA
Energy Use		.... btu/bu	.... btu/ton	
	Project	**24,781**	**119,343**	**1,164,795**
	National indicator	37,791	312,716	NA
Greenhouse Gas		lbs. CO_2e/bu	lbs. CO_2e/ton	
	Project	**13.3**	**87.9**	**433**
	National indicator	10.7	122.2	NA
Land Use		...ac/bu...	...................ac/ton..................	
	Project	**0.0043**	**0.0382**	**0.2954**
	National indicator	0.058	0.0493	NA

Table 2 shows that across all categories except for corn grain greenhouse gas emissions, the project is, on average, performing better than the national indicator. Greenhouse gas emissions for corn grain are 30% higher in the LASA program compared to national indicators.

5 WATER QUALITY

Water quality is the priority resource concern in the region and project area due to the high density of cold-water trout streams and shallow soils over bedrock/groundwater aquifers. Excess sediment, phosphorus and nitrogen can result in impairment to fish and wildlife habitat and drinking water. FPP uses USDA's STEP tool, an index tool designed to rate the potential for nutrients to run off the edge of the field or leach below the rootzone for four categories of nutrient loss. STEP operates by determining the site-specific risk of nutrient loss and then evaluating the farm management practices based on how they do or do not mitigate site-specific risk. The four pathways are aggregated to provide a single water quality metric between 0 and 4. Each point expresses if a specific nutrient loss has been mitigated.

Water Quality Score

18% increase between 2019-2021

An increased score is preferred

unit of measure: Scored between 0 and 4.

numeric score in crop year 2021: 2.26 unitless

The water quality metric is comprised of four pathway mitigation processes: surface phosphorus pathway, subsurface phosphorus pathway, surface nitrogen pathway, and subsurface nitrogen pathway. A larger value is preferred as it shows that more pathways were mitigated (i.e., fewer nutrients were able to leave the field from the surface and/or subsurface). The cumulative score for the project increased 18% between 2019 and 2021.

Figure 2: Water quality score and explanation

The LASA group has now completed data entry for 2019-2021, providing insights into three years of field data for project participants. The aggregated score for the LASA project in 2021 is 2.26 out of 4 (weighted by field size), suggesting that on average, each of the 15 farmers is mitigating two pathways. A breakdown of each nutrient loss mitigation pathway is provided in Table 3. The graph shows the percentage of fields within the project that are mitigating each pathway. As an example, for the aggregated score, 50 percent equates to a score of 2/4 for the project. The project score went from 1.9 to 2.3 out of 4 between 2019 and 2021, an improvement of 18 percent.

Table 3: Water quality loss pathway explanation showing changes from 2019 to 2021.

	Loss Pathway	
	Phosphorus	**Nitrogen**
Surface Pathway Mitigation	52% of the fields mitigated surface phosphorus in 2021. **Increase of 2%**	58% of the fields mitigated surface nitrogen in 2021. **Decrease of 3%**
Subsurface Pathway Mitigation	13% of the fields mitigated subsurface phosphorus in 2021. **Increase of 10%**	88% of the fields mitigated subsurface nitrogen in 2021. **Increase of 13%**

Table 3 outlines the different phosphorus and nitrogen loss pathways that are calculated with the FPP and the results from the project for the 2021 crop year.

Figure 3 outlines the different pathways that are mitigated within the LASA project for all three years. This figure is a visual interpretation of Table 3 and shows how over time, the water quality metric has improved across the project.

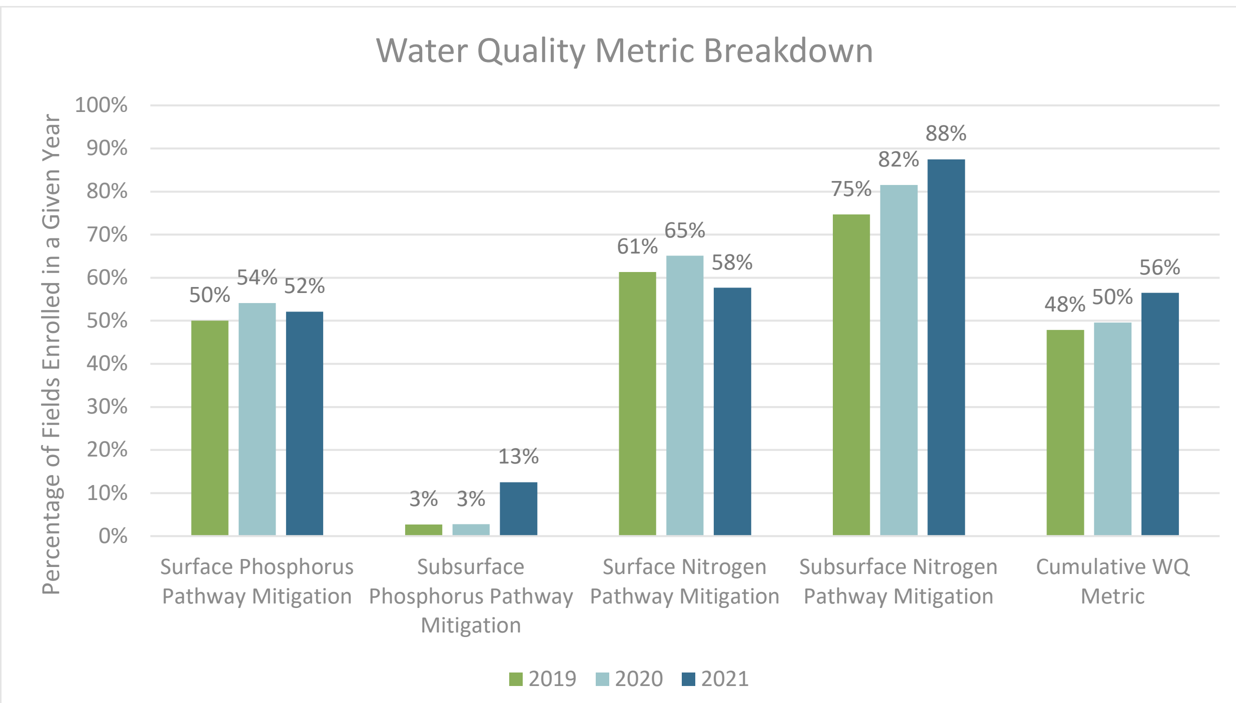


Figure 3: Water quality metric breakdown for three-year period. Pathway mitigation percentages show the percent of fields in the project that mitigated a pathway. The cumulative water quality (WQ) metric percentages show the water quality score on a scale of 0 to 4. A 50% reading of the cumulative water quality metric suggests that a score of 2 of 4 was obtained.

An average of five conservation practices were in place in each of the 15 farm's fields, which covered 15,000 acres.

Farms using the Fieldprint Platform self-report conservation practices that are implemented on each field within the platform. Between the 15 farmers there were an average of five conservation practices in place per field. The top six practices used within the LASA project are grassed waterways (159 CPs), contouring (130), cover crops (129), reduced tillage (112), stripcropping (102) and no-tillage (31).

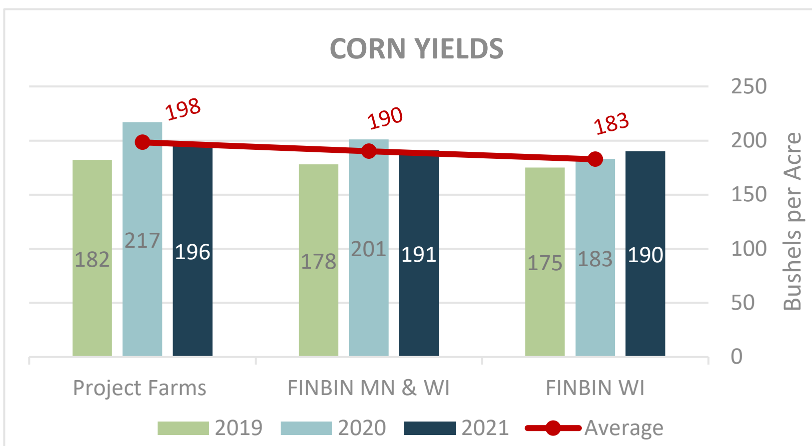
6 FARM FINANCIALS

Financial analyses, including enterprise analysis for corn for grain, corn silage and alfalfa, were completed for three years: 2019, 2020 and 2021. Data collected in this report is recorded from actual financial records kept on each farm. Benchmark numbers are from the FINBIN database managed by the Center for Farm Financial Management. To maintain financial confidentiality, some limitations to benchmark data exist due to a low number of farms in the database that have identified special categories such as: use of cover crops, grown with cover crop, no-till and non-organic. Four project farms are averaging five conservation practices per field, creating a challenge to identify financial return on investment on one specific conservation practice. Financial data in this project has been reviewed and analyzed to identify trends in yields, direct cost of production and gross return.

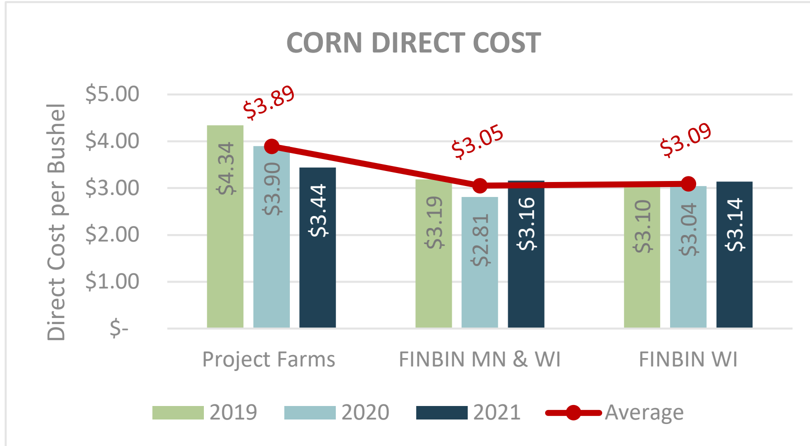
The standardized value used for gross return per acre is determined annually by averaging the commodity value over the previous year as determined by each individual summary group. This value is used for feed inventories on the balance sheet to create consistency. Direct expenses include seed, fertilizer, chemical, crop insurance, custom hire, land rent, fuel and oil, repairs and operating interest. Manure hauling expense is split 50/50 between livestock custom hire and crop fertilizer expenses. This shared allocation lowers purchased fertilizer costs and shares the manure expense to both enterprises.

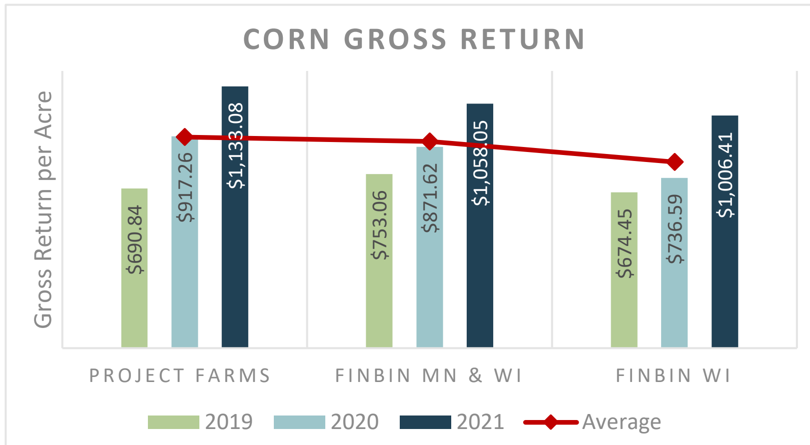
Corn Grain Production Analysis

The average corn for grain acres for project farms was 700 acres. Minnesota/Wisconsin combined database averaged 573 acres (768 farms) while the average acres for Wisconsin database was 606.9 acres (16 farms). The database farms were sorted to include farms that produced 251-1,500 acres of corn for grain.



The average 2021 yield of the project farms was 196 dry bushels of grain per acre. When comparing the farms to the FINBIN database sets over three years, yields on average are greater for the farms (198 bu/acre). Direct cost of production in 2021 for project farms was $3.44, which is highest when comparing against database sets. Three-year averages also show highest direct costs for the farms at $3.89. The average gross return per acre in 2021 for project farms was $1133.08, which is highest when comparing against database sets. Three-year average is also slightly higher with the farms compared to database sets. Gross return per acre includes bushels per acre times a standard value of $5.65 unless grain is contracted, then the priced value is used. Minnesota/Wisconsin combined standard value is $5.40 and Wisconsin-only grain is $5.21 per bushel. The gross return also includes the value of corn fodder, government payments and crop insurance revenue if applicable.

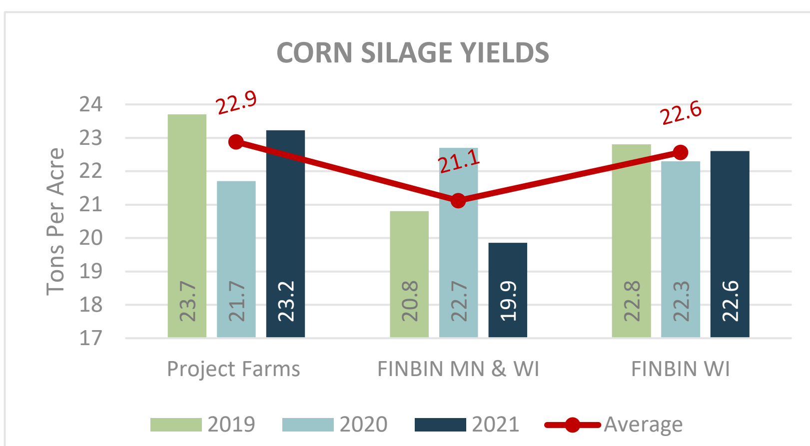




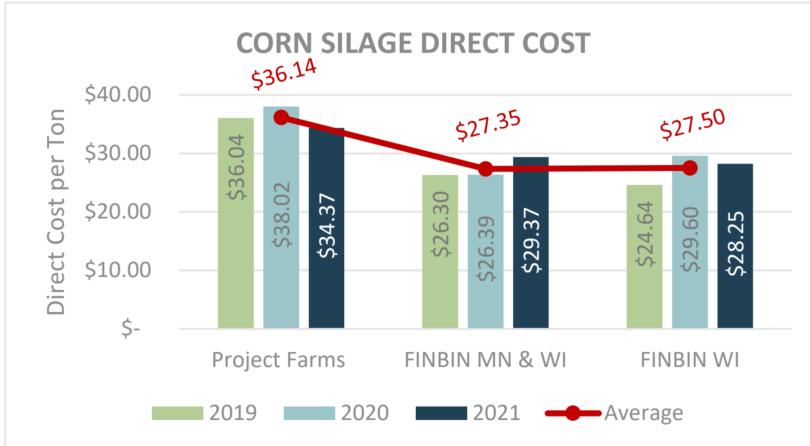
Three-year trends of corn for grain for project farms indicate stable yields and positive returns per acre. It is determined that volatility in market price has more impact on profitability than implementing environmental practices on farm. Individual farm managers need to determine long-term value on their farms for increased environmental benefits and increased financial stability. Trends are showing that cost of production is less than market price, allowing farms to be profitable when feeding homegrown feed to livestock versus purchasing feeds.

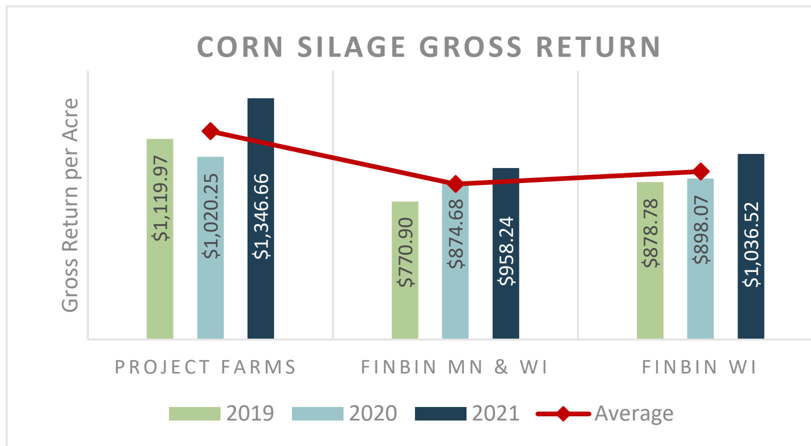
Corn Silage Production Analysis

The average corn silage acres for three project farms was 1,007 acres. Minnesota/Wisconsin combined database averaged 464.6 acres (64 farms) while the average acres for Wisconsin database was 116.68 acres (44 farms) for corn silage. The data



base farms were sorted to include farms that produced 251-1,500 acres of corn silage for Minnesota/ Wisconsin combined, and all farms were included in the Wisconsin data cohort.



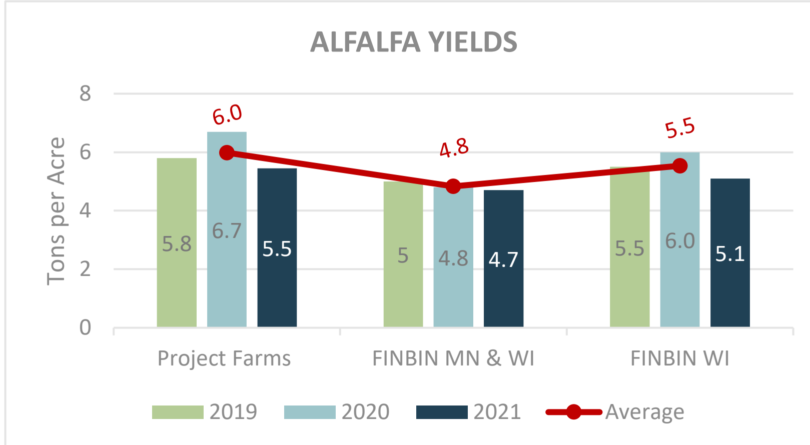


The average 2021 yield for project farms was 23.2 tons per acre. When comparing the farms to the FINBIN database sets over three years, yields on average are slightly greater for the project farms (22.9T/acre). Direct cost of production in 2021 for project farms was $34.37, which is highest when comparing against database sets. Three-year averages also show highest direct costs for project farms at $36.14. The average gross return per acre in 2021 on project farms was $1346.66, which is highest when comparing against database sets. Three-year average is also higher with the farms compared to database sets. Gross return per acre includes tons per acre times a standard value of $55 per ton, Minnesota/ Wisconsin was $44.01, and Wisconsin was $46.01 per ton. The value per ton of corn silage on the project farms is higher due to the farms all harvesting brown midrib corn silage.

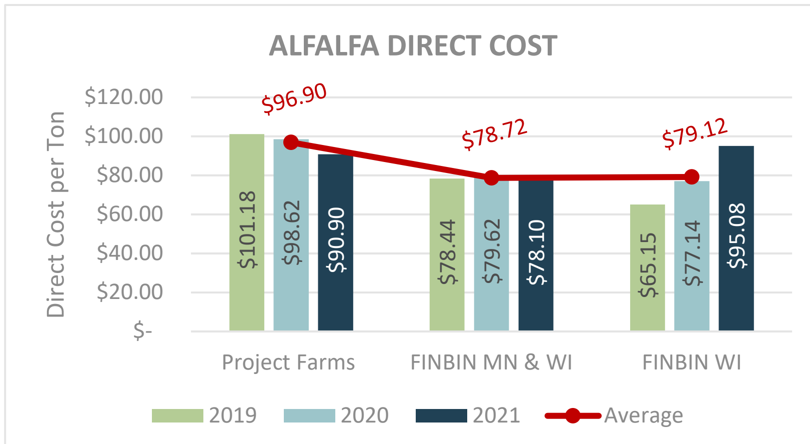
All project farms utilize cover crops following corn silage harvest. This cover crop is terminated prior to planting the following year's crop, and the corn silage crop absorbs the cover crop expense. Corn silage production is critical on livestock operations with minimal opportunity to purchase this feed, therefore increasing the importance of maximizing financial efficiency with added benefit of increasing environmental impact (e.g. higher crop residue = increased soil conservation, run-off reduction, increased water quality). Farm managers have the opportunity to consider added value of harvesting additional forage versus termination on a following cover crop. Aside from project farms having the highest cost of production, they still net the greatest return per acre.

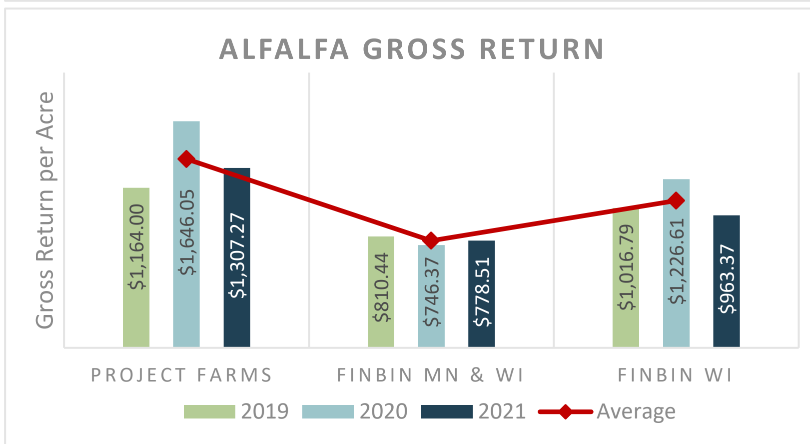
Alfalfa Production Analysis

The average alfalfa acres for three project farms was 918 acres. Minnesota/Wisconsin combined database averaged 222.9 acres (143 farms) while the average acres for Wisconsin database was 301.8 acres (27 farms) for alfalfa. The database farms were sorted to include farms that produced 251-1,500 acres of alfalfa for Minnesota/Wisconsin combined, and farms with 100-1,500 acres of alfalfa were included in the Wisconsin data cohort.



The average 2021 yield for project farms was 5.5 tons per acre. When comparing the farms to the FINBIN database sets over three years, yields on average are greater for the project farms (6.0T/acre). Direct cost of production in 2021 for project farms was $90.90 which fell in the middle when comparing database sets. Three-year averages show highest direct costs for the farms at $96.90. The average gross return per acre in 2021 on project farms was $1307.27, which is highest when compared to database sets. Three-year average is also higher with project farms compared to database sets. Gross return per acre includes tons per acre times a standard value of $240 per ton, Minnesota/Wisconsin combined farms were $165.43, and Wisconsin-only was $188.90 per ton. The value per ton of alfalfa hay on the three project farms is higher due to intense dairy operations producing high-quality forage which increases crop value and increases gross and net returns.





All project farms apply manure after the third year of production and have implemented at least three conservation practices: contours, strip cropping and grassed waterways. Direct management practices like fertilizer, chemical and manure applications show greater impact on higher yields and value.

7 LOCAL WATER RESOURCES

The local water resource component of the project looked at the water quality impact to local rivers and lakes from implemented conservation practices (CP) and best management practices (BMPs). The PTMApp tool was used to evaluate the effectiveness of local conservation projects for reducing sediment, nitrogen and phosphorus delivered to local rivers and lakes. This information can help create better dialogue around agriculture and water quality issues as well as target outreach, technical assistance and financial assistance to those farms and fields where adoption of CPs and BMPs will produce cost-effective land treatment. An extensive review of how PTMApp was used within the LASA project can be found in the year two report (https://farmersforsustainablefood.com/projects-and-resources/).

To illustrate the impact of current conservation practices and potential benefits of new conservation practices, PTMApp was run for the Silver Spring Creek watershed. Silver Spring Creek was chosen because it is listed as impaired for fish and wildlife habitat with the sediment and non-point source pollution as the cause. Model results estimate that current adopted conservation (grassed waterways, contouring, cover crops and no-till/reduced till) by project farms in the Silver Spring Creek watershed have reduced sediment loading by 28% (about 2 tons/acre/year) compared to a baseline conventional farming scenario (fall and spring tillage, no cover crops and no contouring). The model then estimated that adding cover crops on 50% of fields in the watershed would result in a 54% reduction from baseline conditions.

This demonstrates that current conservation is helping reduce sediment loading to Silver Spring Creek and that the PTMApp tool can be used to develop new conservation implementation scenarios, using conservation practices acceptable to farmers in the watershed, to achieve sediment reduction goals for the Silver Spring Creek watershed.

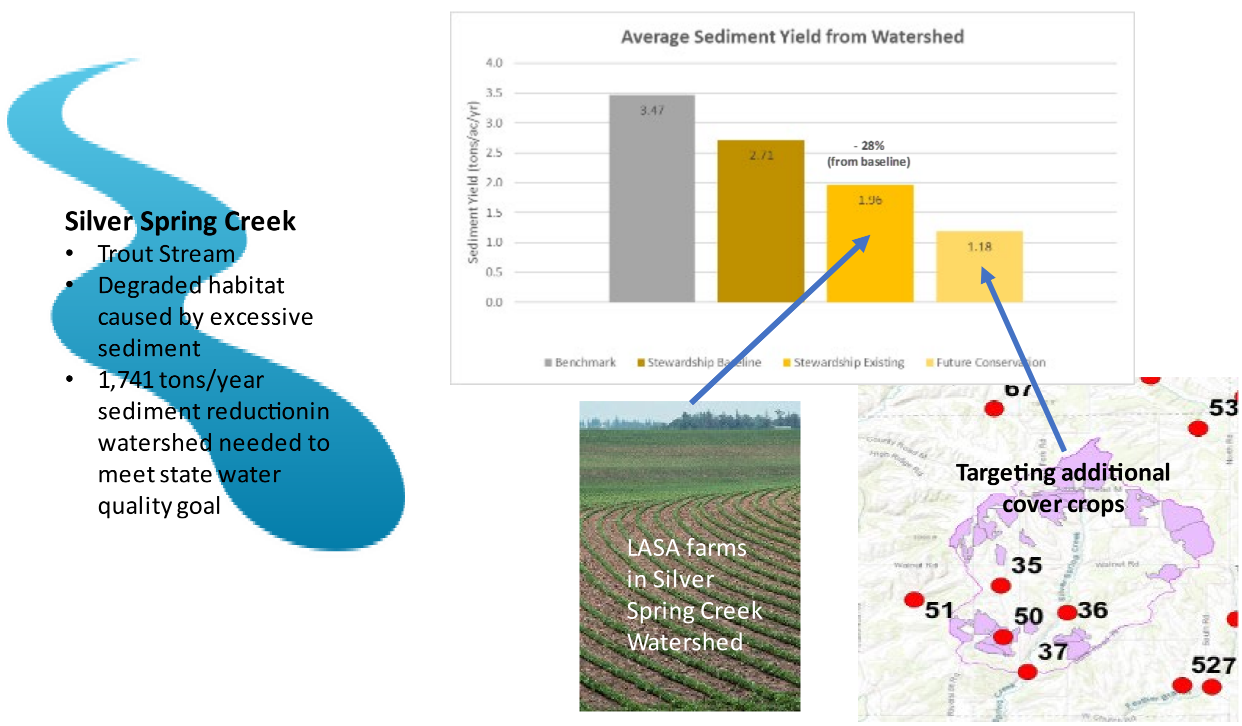


Figure 4: Silver Spring Creek benefit estimation example

8 NEXT STEPS

The Lafayette Ag Stewardship Alliance has decided to move forward with two additional years of data collection with the Fieldprint Platform. This continuation of data collection will provide a total of five years of data that can be used to review changes over time.

This project was made possible by:

Compeer Financial Fund for Rural America, Dairy Farmers of Wisconsin, Farmers for Sustainable Food, Grande Cheese Company, Houston Engineering, Inc., Lafayette Ag Stewardship Alliance, Nestlé, Professional Dairy Producers Foundation, Southwest Wisconsin Technical College, The Innovation Center for U.S. Dairy, The Nature Conservancy, University of Wisconsin-Madison Extension, Wisconsin Corn Growers Association and the Wisconsin Department of Agriculture, Trade and Consumer Protection.

9 CITATIONS

Field to Market: The Alliance for Sustainable Agriculture (FTM), 2021. Environmental Outcomes from On-Farm Agricultural Production in the United States (Fourth Edition). ISBN: 978-0-578-33372-4

Field to Market: The Alliance for Sustainable Agriculture (FTM), n.d.. Sustainability Metrics. Field to Market. Retrieved August 22, 2022, from https://fieldtomarket.org/our-programs/sustainability-metrics/