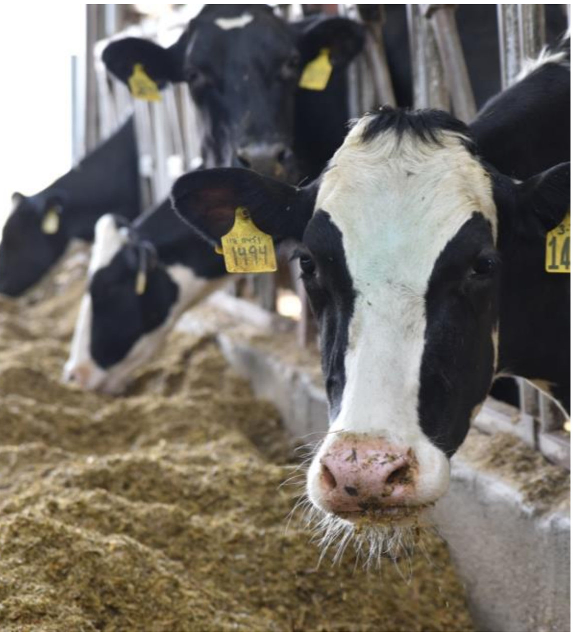
Farmers for Sustainable Food

LASA
Lafayette Ag Stewardship Alliance



Pilot Sustainability Project Years 1-4 Summary Report

September 2023

TABLE OF CONTENTS

TABLES

FIGURES

1 PROJECT 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.

LASA, founded in 2017, is a farmer-led watershed conservation group formed to create a framework to identify and promote conservation practices throughout southwestern Wisconsin. The framework was the foundation for the LASA and FSF pilot sustainability project, which is presented in this report. The pilot sustainability project uses a sustainability calculator, Fieldprint Platform, developed by Field to Market: The Alliance for Sustainable Agriculture®.

This report summarizes four years of data collection and analysis (2019 – 2022 crop years) involving 15 LASA farmers, primarily from Lafayette and Green counties in Wisconsin. The project was designed to demonstrate the efficacy and impact of conservation practices and best management practices on sustainability, farm financials and local water resources.

Farmer Participation:

- **15 farms that manage over 40,000 acres are evaluating on-farm sustainability metrics**
- **Four farms are participating in crop enterprise financial analysis**

The four years of data collection and analysis provided results that allow farmers and their partners to see how the current year's project achieved the objectives established 2019. A detailed explanation of the tools and methods used in the report can be found in the project's year-one report on the FSF website (https://farmersforsustainablefood.com/projects/lasa-sustainability-project/) The first three years of reports are also on the website, providing a detailed explanation of all metrics and how to interpret them.

Key Project Objectives

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 Indicators 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.

Field to Market – Crop Enterprise Sustainability Metrics – Available Outputs From Fieldprint Platform[1]

Biodiversity	Energy Use	Greenhouse Gas	Land Use Efficiency	Soil Carbon	Soil Conservation	Water Quality

KEY FINDINGS AVERAGE OF FOUR-YEAR PERIOD (2019-2022)

Conservation Practices

On average, farms use two or more conservation practices.

Water Quality

74% of reported acreage has mitigated the risk of excessive loss of nitrogen to subsurface water.

Soil Erosion

1.6 tons/acre/year compared to state benchmark* of 3.5 tons/acres/year for corn grain.

Energy Use

123,307 btu/ton for corn silage, 61% lower/better than national indicator.

Greenhouse Gas Emissions

90 lbs CO2e/ton

Eight percent higher/worse than the corn silage state benchmark.*

*Field to Market's state benchmark for Wisconsin.

[1] Field to Market: The Alliance for Sustainable Agriculture (FTM), 2021b. Sustainability Metrics. Field to Market. Retrieved August 22, 2022, from https://fieldtomarket.org/our-programs/sustainability-metrics/

2 ON-FARM CROP ENTERPRISE SUSTAINABILITY

Using Field to Market's Fieldprint Platform® (FPP), seven on-farm sustainability metrics were measured for each farm. The metrics use farm data collected from each farm for each year analyzed. Data was presented at the field level, farm level and project level. Comparison metrics between anonymized participating farms and state benchmarks and national indicators were 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 report (The irrigation metric was only applicable to one participating farm and the results are not presented in the report),

2) How on-farm operations and management affect scores,

3)The ability to compare individual scores against project scores, state benchmarks, and national indicator scores and;

4) Evaluate and identify ways to improve scores.

Fieldprint Platform can be used to quantify and measure if farm sustainability is continuously improving over time.[2]

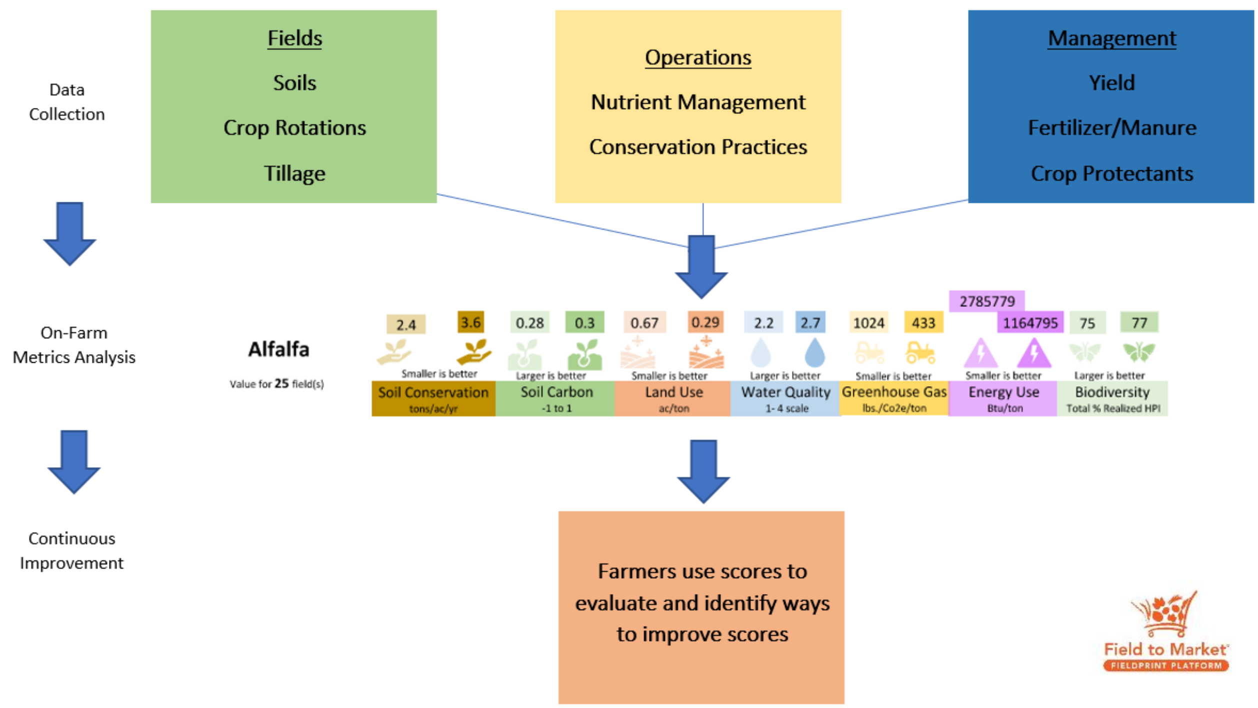


Figure 1: On-farm sustainability continuous improvement model. Data in figure is a visual representation only and does not represent any farm specific scores.

---

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

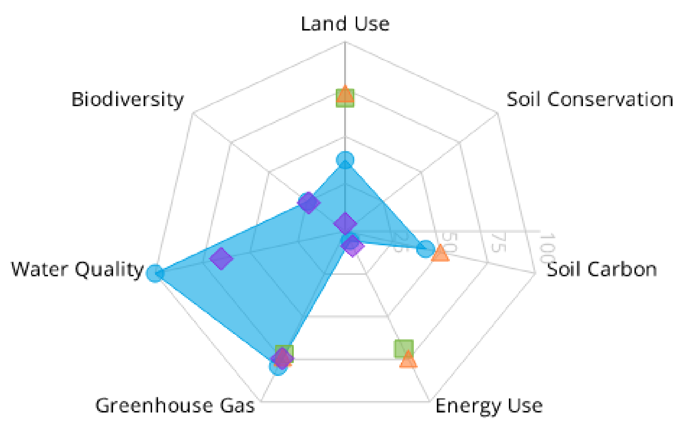
3 FOUR-YEAR PROJECT RESULTS (2019-2022)

Field and farm level – Each farm received a detailed Fieldprint Platform report for each field entered into the platform (Figure 2). The number of fields used in the analysis was based on the crops grown and acres planted. Individual field data was treated under a strict confidentiality agreement and was only shared with farmer permission or when aggregated and anonymized. An example report for corn silage is shown in Figure 2. Each report shows how individual scores compare against project, state and national benchmarks. The comparisons provided farmers insight into their farming operation and areas where they could consider making improvements.

Project benchmarks provided a useful way to show farmers how individual scores compare to those of others enrolled in the project and against state and national levels. These comparisons were useful in enabling farmers to set goals and strive for improvement over time. Table 1 contains the LASA project benchmarks for corn grain, corn silage and alfalfa. The benchmarks were created and based on the 15 farms for 2019 to 2022. At the project level, results are aggregated and anonymized.

Fieldprint Result

Fieldprint results are shown on the spidergram as relative indices on a scale of 1-100 that represent your metric scores. The indices are calculated so that smaller values indicate less resource use or environmental impact from your field. This illustration can be used to identify where the greatest opportunities for improvement are for your field, and over time can be used to evaluate progress and trade-offs between different sustainability metrics for your field.



Metric	Your Result	Project Benchmark	State Benchmark	National Benchmark
Land Use (acre / ton)	0.049	0.0382	0.0582	0.0592
Soil Conservation (ton / acre / year)	3.1	3	N/A	N/A
Soil Carbon	0.15	N/A	N/A	0
Energy Use (btu / ton)	109,204	119,343	242,976	268,076
Greenhouse Gas (lbs-CO_2e / ton)	96.9	87.9	83.2	86.8
Water Quality	0	1.39	N/A	N/A
Biodiversity	75%	76%	N/A	N/A

The Water Quality score here indicates how many of the four loss pathways have been mitigated. For more detail on each metric score please refer to the individual metric output. Benchmarks represent an average based on USDA statistical data for the period 2008-2012 and provide context for how your scores relate to this known point. Benchmarks should not be interpreted as a specific level of sustainability, or a performance target. State and National benchmarks that are not shown in the table or on the spidergram are not available for the applicable metric. Project benchmarks represent the average performance across fields enrolled in the Lafayette Ag Stewardship Alliance Project.

Figure 2: Fieldprint Platform spidergram results for a single field

Table 1: LASA Fieldprint Platform project sustainability metrics for the four-year period of 2019 to 2022. Data from Fieldprint Platform project benchmark downloads.

	Corn Grain	Corn Silage	Alfalfa
Soil Conservation*	…………………. ton/ac/yr …………………		
	1.6	3	4.1
Energy Use**	… btu/bu …	…………….. btu/ton ……………..	
	23,542	123,307	1,034,953
Greenhouse Gas**	lbs. CO_2e/bu	lbs. CO_2e/ton	
	12.7	89.8	396.4
Water Quality	…………………… unitless ……………………		
	1.35	1.37	2.69
Biodiversity	……………………… % ………………………		
	72	76	77
Land Use**	….ac/bu….	……………..ac/ton……………	
	0.004	0.038	0.279

*Weighted average by area (field size)

**Weighted average by production (yield)

State benchmarks and national indicators – Farmers in the project were able to compare metrics to state benchmarks and national indicators to better understand how the project performs against state and national averages. State benchmarks were last updated between 2008 and 2012. The national indicators were last updated in 2020.[3] The most current data is used within this report. The comparisons are listed in Table 2.

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

Table 2: National indicators vs project benchmarks by crop type

		Corn Grain	Corn Silage	Alfalfa
Soil Conservation		……………………… tons/ac/yr ……………………………		
	Project	**1.6**	**3.0**	**4.1**
	State Benchmark	**3.5**	**N/A**	**N/A**
	National indicator	4.7	4.7	NA
Energy Use		……… btu/bu ………	……… btu/ton ………	
	Project	**23,542**	**123,307**	**1,034,953**
	State Benchmark	**25,291**	**242,976**	**N/A**
	National indicator	37,791	312,716	NA
Greenhouse Gas		lbs. CO_2e/bu	lbs. CO_2e/ton	
	Project	**12.7**	**89.8**	**396.4**
	State Benchmark	**9.3**	**83.2**	**N/A**
	National indicator	10.7	122.2	N/A
Land Use		…ac/bu…	………………..ac/ton………………	
	Project	**0.0040**	**0.0380**	**0.279**
	State Benchmark	**0.0069**	**0.0582**	**N/A**
	National indicator	0.0058	0.0493	N/A

Across all categories except for corn grain greenhouse gas emissions, the LASA group project benchmark is, on average, performing better than the national indicator (Table 2). Greenhouse gas emissions for corn grain are 19% higher in the LASA group compared to national indicators. LASA performs better than Wisconsin state benchmarks in energy use, land use and soil conservation for corn grain but produces higher greenhouse gas emissions in corn grain and corn silage. Comparisons cannot be made against alfalfa at this time due to lack of information from the United States Department of Agriculture.

4 FIELDPRINT WATER QUALITY METRIC

Water quality is the priority resource concern in the region and farmed 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 Stewardship Tool for Environmental Performance (STEP), 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.

A score of 1 or above means a farmer has mitigated excessive nutrient loss to the environment for a pathway.

Water Quality Score

5% annualized rate of change between 2019-2022

An increased score is preferred

unit of measure: Scored between 0 and 4.

numeric score in crop year 2022: 2.35 unitless

The water quality metric is comprised of four pathway mitigation processes:

- surface phosphorus pathway
- subsurface phosphorus pathway
- surface nitrogen pathway
- subsurface nitrogen pathway.

A larger value is preferred as it shows that more pathways were mitigated (i.e., lower risk of nutrients leaving the field from the surface [runoff] and/or subsurface [leaching]). The cumulative score for the project increased 22% between 2019 and 2022. This is an annualized rate of change of 5%.

Figure 3: Water quality score and explanation

The 2022 water quality score for the LASA project was calculated to be 2.35 out of 4 (weighted by field size). This suggests that on average, each of the 15 farmers mitigated two pathways during the 2022 cropping season. A breakdown of each nutrient loss mitigation pathway for 2022 is provided in Table 3. Figure 4 shows the percentage of fields within the project that mitigated each pathway for all four years of project data.

Table 3: Water quality loss pathway explanation showing changes from 2019 to 2022.

	Loss Pathway	
	Phosphorus	**Nitrogen**
Surface Pathway Mitigation	70% of the field acres mitigated excessive risk of surface phosphorus in 2022. **Annualized improvement of 7%**	78% of the field acres mitigated excessive risk of surface nitrogen in 2022. **Annualized improvement of 3%**
Subsurface Pathway Mitigation	6% of the field acres mitigated excessive risk of subsurface phosphorus in 2022. **Annualized improvement of 33%**	81% of the field acres mitigated excessive risk of subsurface nitrogen in 2022. **Annualized improvement of 5%**

The different phosphorus and nitrogen loss pathway 2022 results calculated with FPP are presented in Table 3. Results are shown as a percentage of the total field acres mitigated for each pathway.

The different pathways that are mitigated within the LASA project for four years are shown in Figure 4. This figure is a visual interpretation of Table 3 and shows how over time, the water quality metric has improved across the project.

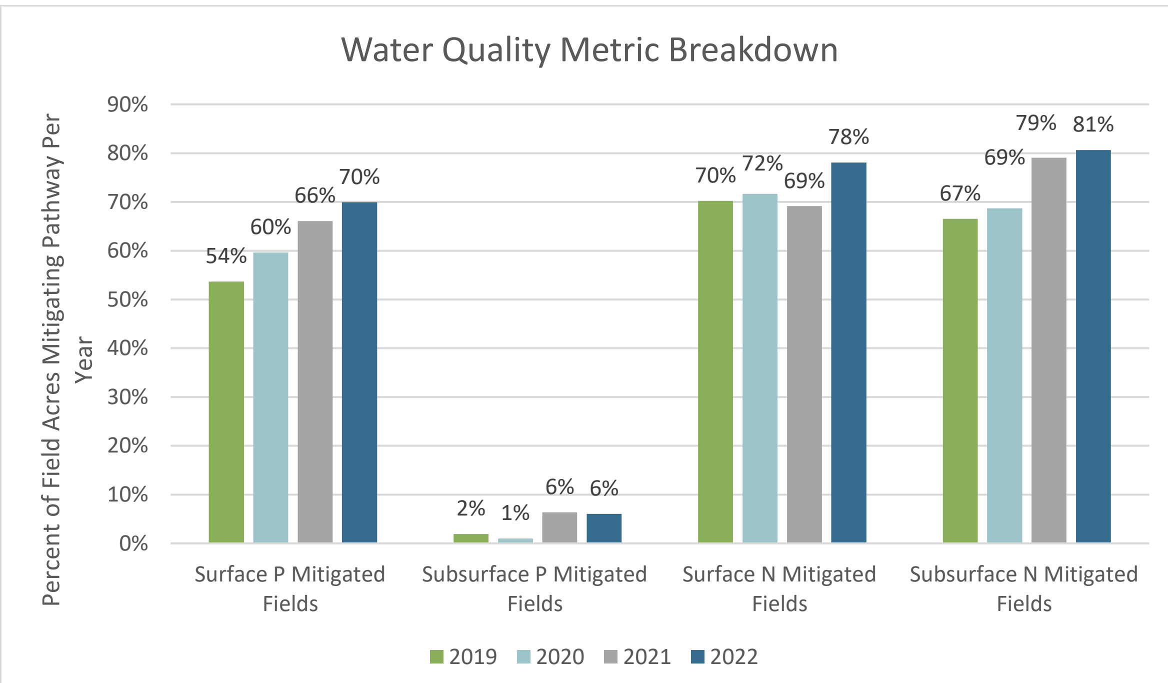


Figure 4: Water quality metric breakdown for four-year period. Pathway mitigation percentages show the percent of field acres in the project that mitigated a pathway.

There were more than two conservation practices in place in each of the 15 farms' 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 two conservation practices in place per field. The top six practices used within the LASA project are grassed waterways, contouring, cover crops, reduced tillage, strip-cropping and no-tillage.

5 CROP PRODUCTION FINANCIAL BENCHMARKING

Financial analyses, including enterprise analysis for corn for grain, corn silage, and alfalfa, were complete for four years: 2019, 2020, 2021 and 2022. Data collected in this report is recorded from actual financial records kept on each farm. Benchmark numbers used are from the FINBIN database managed by the Center for Farm Financial Management. Some limitations to benchmark data exist due to low database farms of special sorts such as: use of cover crops, grown with cover crop, no-till, and non-organic. Three 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 the following areas: yields, direct cost of production, and net return per acre, 2022 direct expenses of seed, fertilizer, chemical, fuel & oil, and cost of production with labor and management.

The standardized value used for net 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. 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.

5.1 CORN GRAIN PRODUCTION ANALYSIS

The average corn for grain acres for project farms was 728.5 acres. Minnesota/Wisconsin combined database averaged 571.5 acres (739 farms) while the average acres for Wisconsin database was 680.2 acres

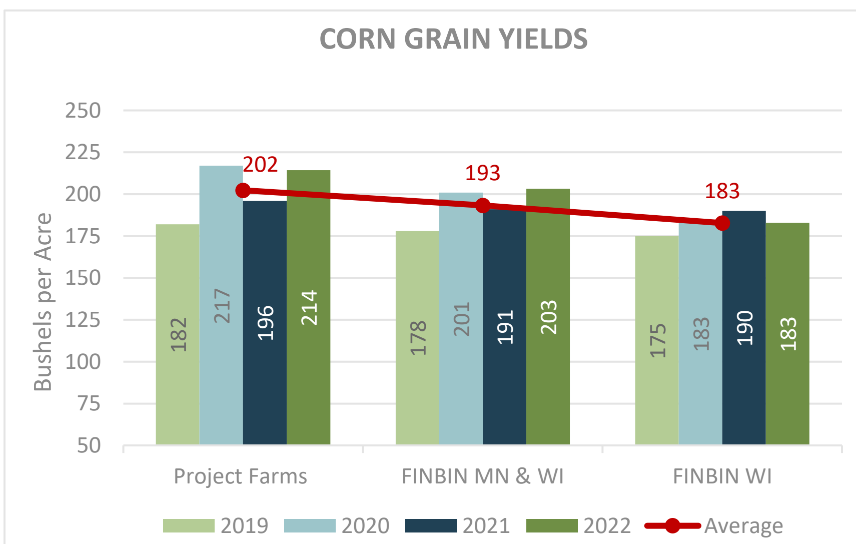


Figure 5: Corn Grain Yield Comparisons to FINBIN

(22 farms) for corn for grain. The database farms were sorted to include farms that produced 251-1500 acres of corn for grain.

The average 2022 yield of the project farms was 214 dry bushels of grain per acre. When comparing the project farms to the FINBIN database sets over four years, yields on average are greater for the project farms (202 bu/acre). Direct cost of production in 2022 for project farms was $3.50 which is lowest when comparing against database sets. Four-year averages, however, remain the highest for project farms at $3.80. The average net return per acre in 2022 for project farms was $491.23 which is highest when comparing against database sets. Four-year average, however, remains below benchmarks due to higher production costs and low commodity prices the first two years of the project. Net return per acre includes bushels per acre times a standard value of $6.20 less all expenses. Minnesota/Wisconsin combined standard value is $6.33, Wisconsin only grain is $6.20 and WI with cover was $6.11 per bushel. The net return per acre may also include the value of corn fodder, cover crop taken as forage, government payments, and crop insurance revenue if applicable.

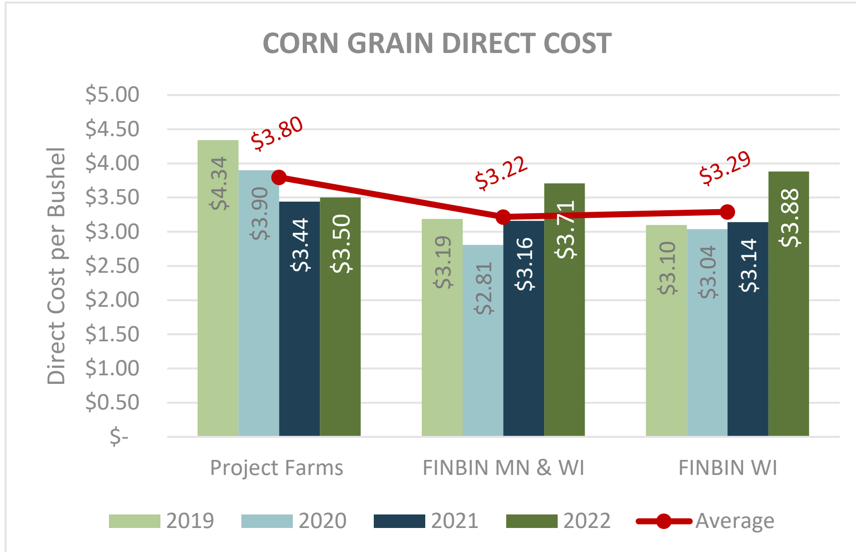


Figure 6: Corn Grain Direct Costs Compared to FINBIN

Four-year average trend of corn for grain for project farms indicate stable yields and positive net return 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.

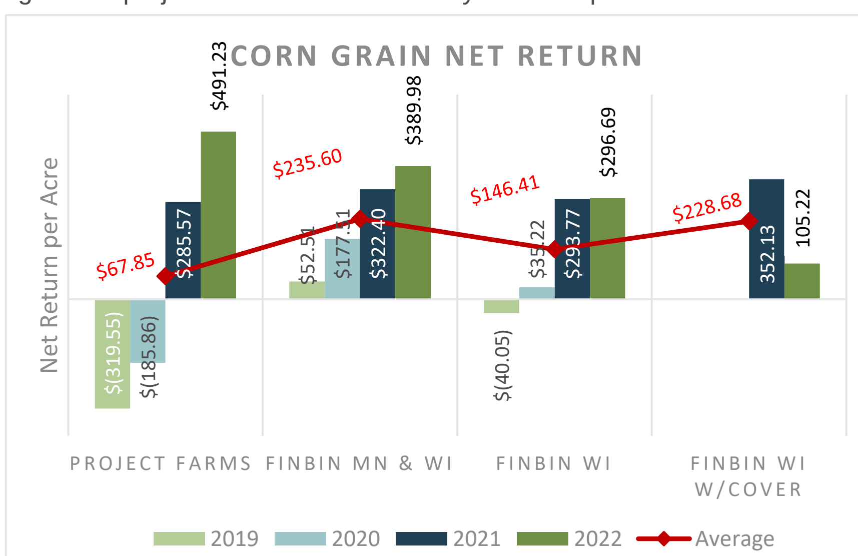


Figure 7: Corn Grain Net Return Compared to FINBIN

5.2 CORN SILAGE PRODUCTION ANALYSIS

The average corn silage acres for three project farms was 998 acres. Minnesota/Wisconsin combined database averaged 500 acres (41 farms) while the average acres for Wisconsin data base was 359 acres (22 farms) for corn silage. The data base farms were sorted to include farms that produced 251-1500 acres of corn silage for Minnesota/Wisconsin combined and farms that produced over 101 acres were included in the Wisconsin data cohort.

The average 2022 yield for project farms was 26.9 tons per acre. When comparing the project farms to the FINBIN database sets over four years, yields on average are slightly greater for the project farms (23.9T/acre). Direct cost of production in 2022 for project farms was $33.95 which is highest when comparing against database sets. Four-year averages also show highest direct costs for project farms at $35.60. The average net return per acre in 2022 on project farms was $287.88 which falls closely in line when comparing against database sets. The four-year average net return per acre is lowest with project farms compared to database sets. Net return per acre includes tons per acre times a standard value less all expense. Standard value is $51.33 per ton, WI and MN was $51.55, WI $52.28 per ton and WI with cover crop $52.07 per

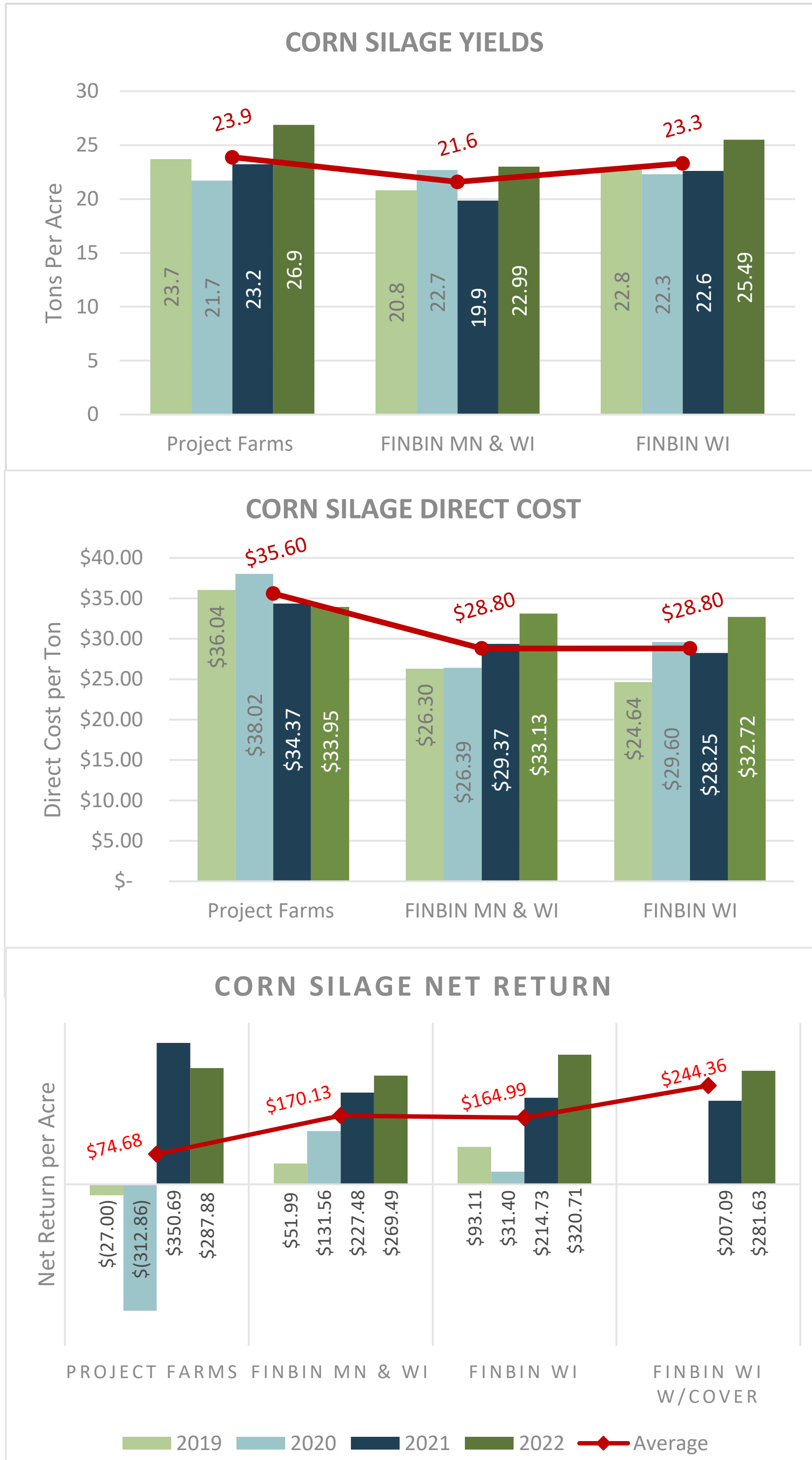


Figure 8: Corn Silage Yields, Direct Cost, and Net Return Compared to FINBIN

ton. The value per ton of corn silage varies due to some farms in the data set harvesting brown midrib corn silage that demands a higher value per ton.

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 (ex. higher crop residue = increased soil conservation, run-off reduction, increased water quality). Farm managers do have the opportunity to consider added-value of harvesting additional forage versus termination on a following cover crop. Aside from project farms having higher cost of production, they still have nearly the same net return per acre when compared to the benchmarks.

5.3 ALFALFA PRODUCTION ANALYSIS

The average alfalfa acres for three project farms was 1075 acres. Minnesota/Wisconsin combined database averaged 392 acres (38 farms) while the average acres for Wisconsin database was 316 acres (26 farms) for alfalfa. The database farms were sorted to include farms that produced 251-1500 acres of alfalfa for Minnesota/Wisconsin combined, and farms with 100-1500 acres of alfalfa were included in the Wisconsin data cohort.

The average 2022 yield for project farms was 5.6 tons per acre. When comparing the project farms to the FINBIN database sets over four-years, yields on average are greater for the project farms (5.9T/acre). Direct cost of production in 2022 for project farms was $90.46 which fell in the middle when comparing database sets. Four-year averages show highest direct costs for project farms at $95.29. The average net return per acre in 2022 on project farms was $600.62 which is highest when comparing against database sets. Four-year average is also highest with project farms compared to database sets. Net return per acre includes tons per acre times a standard value less all expense. Standard value is $220 per ton,

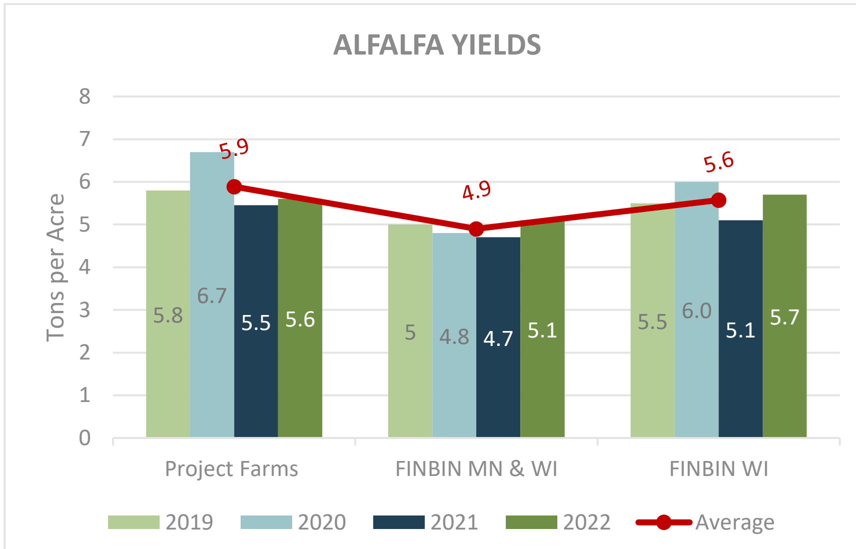


Figure 9: Alfalfa Yields Compared to FINBIN

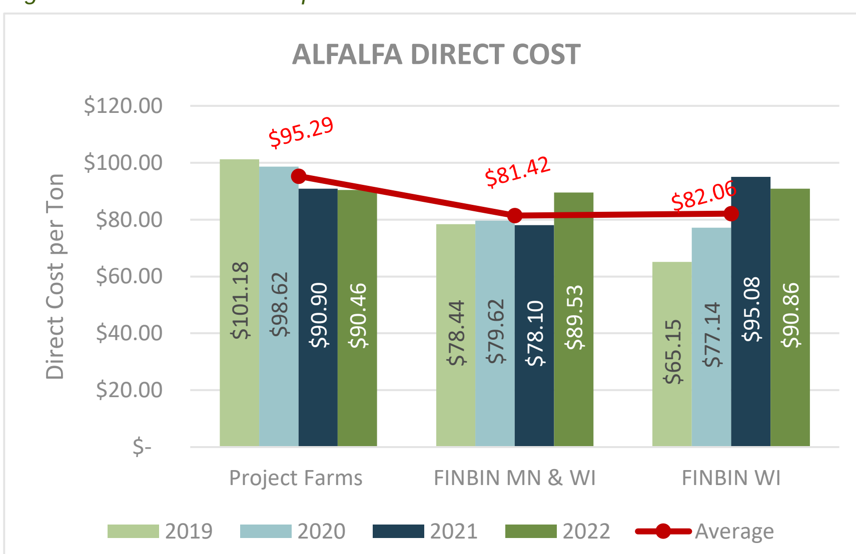


Figure 10: Alfalfa Direct Costs Compared to FINBIN

Minnesota/Wisconsin combined farms were $173.27, and Wisconsin only was $189.00 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 net return per acre.

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.

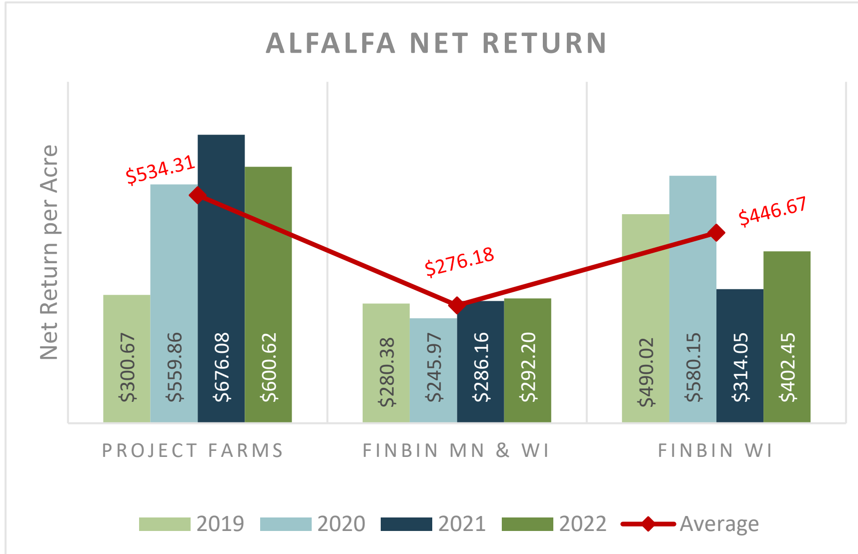


Figure 11: Alfalfa Net Return Compared to FINBIN

5.4 COMPARING DIRECT EXPENSES

After four years of data collection, it was noticed that direct expenses for corn silage and corn grain were most impacted by the implementation of environmental-friendly practices on farm. In 2022, cost of production including labor was lower for both corn silage and corn grain grown on project farms compared to all WI farms that grew a cover crop.

Corn silage: fertilizer and chemical costs increased by 9.2% and 10.9% respectively. Seed and fuel & oil costs decreased by 4.9% and 22.7% respectively. Project farms did result in a decreased cost of production per ton by 4.6% compared to all WI farms using cover crop.

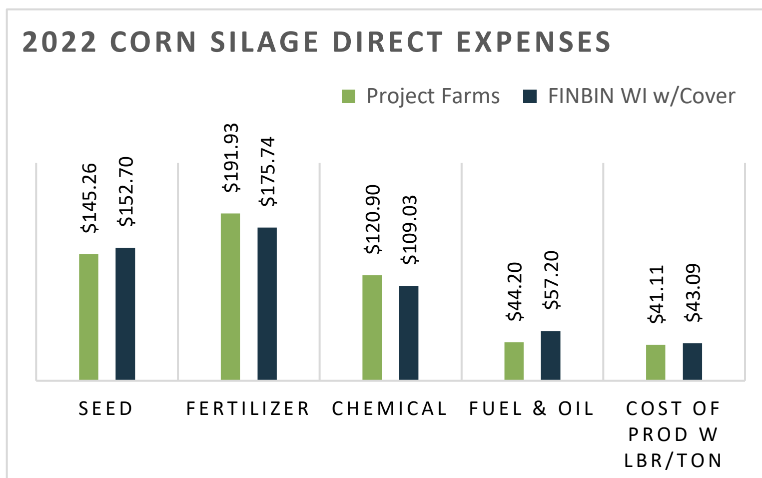


Figure 12: Corn Silage Direct Expenses 2022

Corn Grain: seed and chemical costs increased by 0.2% and 69.1% respectively. Fertilizer and fuel & oil costs decreased by 32.2% and 35.7% respectively. Project farms did result in a decreased cost of production per bushel by 30% compared to all WI farms using cover crop.

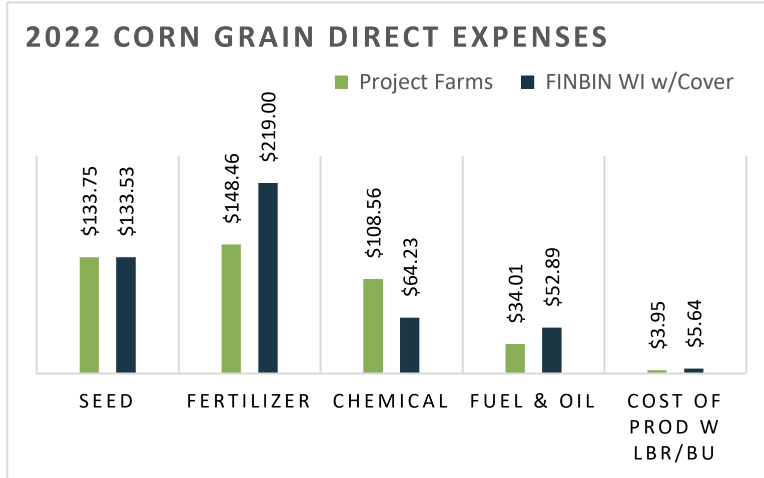


Figure 13: Corn Grain Direct Expenses 2022

5.5 WHOLE FARM ANALYSIS

Aside from enterprise analysis and implementing environmental practices, it is important to step back and look at the whole farm. Daily decisions are made that impact enterprise productivity and profitability; however, a farm manager must also review whole farm profitability and financial position. The farm financial scorecard (https://www.cffm.umn.edu/wp-content/uploads/2019/02/FarmFinanceScorecard.pdf), provided by the Center for Farm Financial Management, uses recommended measures from the Farm Financial Standards Council (FFSC). These metrics provide a whole farm tool that benchmarks a farm against industry standards in the areas of liquidity, solvency, profitability, repayment capacity, and financial efficiency. Two ratios analyzed in this project to evaluate financial position include current ratio (liquidity) and term debt coverage ratio (repayment capacity). Data shows that the four-year average liquidity and repayment capacity ratios for project farms show stronger current ratios, 165% greater, and term debt coverage ratios, 52.6% greater, than average farms in WI. All farms are above industry benchmarks. A current ratio over 2 and a term debt coverage ratio over 1.5 are considered to be strong. Current Ratio indicates farms can pay bills, family living expenses, and taxes as they come due within 12 months. Term Debt Coverage Ratio indicates farms have the ability to make intermediate and long-term debt payments on time.

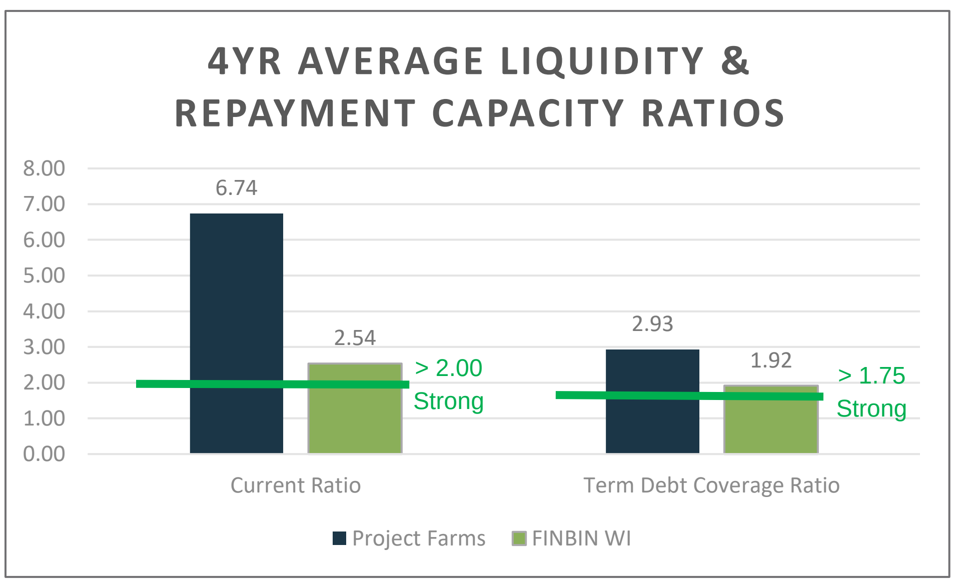


Figure 14:Four Year Average Liquidity and Repayment Capacity Ratio

5.6 CONCLUSION OF FINANCIAL BENCHMARKING ANALYSIS

Four years of data in this project are beginning to solidify conclusions that farms can make a positive impact on land stewardship through environmental-friendly practices implemented in cropping systems resulting in yield advantages, positive net returns per acre, and maintaining strong financial positions.

6 PROJECT SPONSORS

This project was made possible by:

- Cargill
- 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
- Wisconsin Department of Agriculture, Trade and Consumer Protection

7 APPENDIX

Field to Market: The Alliance for Sustainable Agriculture (FTM), 2021a. 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), 2021b. Sustainability Metrics. Field to Market. Retrieved August 22, 2022, from https://fieldtomarket.org/our-programs/sustainability-metrics/