Small Grains, Large Gains – An NRCS Conservation Innovation Grant Project

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Executive Summary

Small Grains, Large Gains was built around the innovation that bringing together public funding with supply chain engagement could return small grains and legume cover crops to the Midwest landscape in rotation with corn and soybeans. In this project, Practical Farmers of Iowa (PFI) tested a model that focused on engagement with three strategic stakeholder groups. 1) Farmer engagement supported adoption and awareness of the agronomic, economic, and conservation benefits of small grains, and incentivized the delay in benefits to the farmer (yield and markets) through cost share payments. 2) Supply chain engagement helped companies estimate the impact of investment in extended rotations and resulted in improved market access. Finally, 3) researcher and expert engagement advanced connectivity between experts and increased awareness of the co-benefits, structural barriers, and opportunities for increasing adoption of extended rotation.

Over the course of this project, 57 farmers planted small grains and legume cover crops on 3,107.4 acres in Iowa, Minnesota and Wisconsin. Nearly all of the cost share funds were used in the first 2 years of the grant, showing strong farmer demand for small grain plus legume cover crop practices. Production data was collected from cost share farmers, and 30 farms were entered into the Fieldprint® Calculator and Cool Farm Tool (seven were entered into Resource Stewardship Evaluation Tool as well) and analyzed for ease of use, accuracy and usability of results. Two small grains conferences, 3 grower summits and 20 shared learning calls reached 769 attendees with information on extended rotations and their benefits. PFI published 12 blogs, 9 articles in ag-media and 15 news releases about the project or extended rotations.

With project partner Sustainable Food Lab (SFL), farmer experiences and impact data were discussed with food and beverage companies to engage this stakeholder group in the much needed market development to pull small grain crops onto the landscape. Three events (a learning journey, a field day and a webinar) were attended by 105 representatives from these corporate supply chains. The events and subsequent conversations led to livestock supply chain actors pursuing another successful CIG grant with PFI and SFL designed to conduct further pilots and to the launch of a food-grade oat sourcing pilot in Minnesota and Iowa with Oatly and Seven Sundays in 2019. SFL and PFI continue to host regular communication with this group, including quarterly partner calls and newsletters.

Our final engagement group was researchers and experts. The inaugural meeting in 2017 led to the development of a successful Sustainable Agriculture Research and Education (SARE) proposal to pool small grain variety trial data and develop grower decision-support tools. We also supported a group of cropping-systems researchers in 2018 who applied for additional funding. Finally, we supported livestock and nutritionist experts convened around the KWS Cereals conference held in Winnipeg, Canada in 2019 with future collaboration to be determined.

The innovation demonstrated through this project was extremely successful. CIG funds provided the investment needed for farmers to adopt extended rotations while providing companies the evidence on positive outcomes needed to justify incorporating extended rotation support as part of corporate supply chain sustainability strategies. To take this innovation to scale across the Cornbelt, further innovation and supply chain pilots are required that incorporate small grains (grown with legume cover crops to offset purchased fertilizer) in livestock rations and increase farmer capacity to produce cover crop seed for local demand.

Introduction

Today, farmers primarily plant soybean opposite corn across the Cornbelt, but this has not always been the case. Before the 1960s the common crop rotation in states that drain into the Upper Mississippi River Basin included corn, a warm-season crop, planted opposite cool-season grasses and legumes. By the 1970s, soybean, a warm-season legume, has replaced cool season crops in the rotation. Previous to this transition, small grains like oats in Iowa and northern Illinois; winter wheat in central Illinois, Indiana and Ohio; and barley in Minnesota and Wisconsin dominated the landscape (Figure 1). Small grains were traditionally established as nurse crops for cool-season legumes like red clover and alfalfa. Other times, small grains were sole-seeded and followed by leguminous summer cover crops. In 1969, red clover covered 251,512 planted acres across 12 states in the Cornbelt. Alfalfa was planted on over 13.7 million acres in those same states (USDA NASS 1959-69). Today, nearly 36.3 million acres of soybeans are grown in Illinois, Iowa, Indiana, Minnesota, Ohio, and Wisconsin, occupying much of the acres grown opposite corn (USDA NASS 1982-2012).

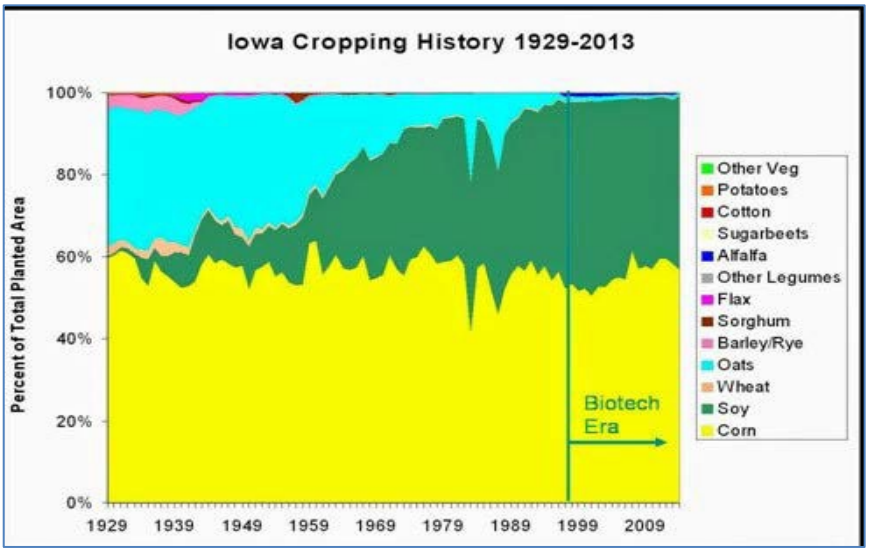

Figure 1. Iowa Cropping History 1929-2013

Today the cropping system and their markets in the Cornbelt are so embedded that a farmer who wants to grow small grain and legume crops often does not have anywhere to sell these crops, making it difficult for even the most conservation-minded farmer to adopt extended rotations as a widespread practice on their farms; a problem identified via PFI's membership survey and strategic planning process. The project "Small Grains, Large Gains" was designed to test a model for bringing small grain markets back to the Cornbelt and providing farmers with markets that provide a multitude of environmental benefits and less farmer reliance on purchased inputs when planted in rotations.

Bringing together public funding with corporate supply chain development was this project's innovation, operating under the hypothesis that market demand with public funding support could catalyze the return of small grains and legume cover crops to the landscape in rotation with corn and soybeans. The implementation of this innovation was conducted through three main areas of work: farmer engagement, supply chain engagement and researcher/expert engagement. CIG cost share dollars supported farmers' interest and ability in growing small grain crops with legumes. The project was nearly overrun with farmer demand and enthusiasm. The events provided companies and researchers the opportunity to identify further research questions that needed answering to better

support farmers to adopt these rotations. In a few cases, companies launched pilots that involved purchasing oats from the Cornbelt and leveraging cost share funds to support farmers in planting cover crops with oats or after oat harvest. The following report details the project's activities and results in narrative form, Appendix I contains a line-by-line report of deliverables tied to this grant.

Farmer Engagement

Supporting farmers to grow small grains is a key element of Small Grains, Large Gains. Cost share supported farmers' risk in growing larger quantities of small grains with uncertain markets. Learning events supported farmers with technical support to grow high quality small grains to meet market specifications and farmers' own goals. Data collected from farmers who grew small grains with cost share support documented the economic and environmental outcomes from extended rotations with small grains and legumes.

Cost Share

Cost share was offered to farmers who planted a small grain followed by a cover crop containing at least one legume species at $40/acre, provided that the farmer was not already receiving EQIP cost share on those acres. To receive the cost share, farmers had to maintain current PFI membership, attend at least one learning event, complete the practice as the program stipulated and then provide production and economic data after the small grain year and the following year of the crop rotation. At the beginning of the project, we budgeted to gradually increase the acres offered over time from 500 acres in 2017, to 1000 and 1500 in 2018 and 2019 respectively. And while we matched these projections in 2017, we expended nearly the entire remaining 2,500 acres in 2018 (Table 1). All told, 57 farmers participated in the cost share program between 2017 and 2019.

	Budgeted Acres	Actual Acres	Cost Share Rate
2017	500	500	$40/acre
2018	1,000	2,381	$40/acre
2019	1,500	226.4	$25/acre
Total:	3,000	3,107.4	

Table 1. Cost Share Budget vs. Actual

Due to this strong demand in 2018 we lowered the cost share rate to $25/acre in 2019 and still had overwhelming interest, with farmers adding their applications to a wait list for acres. This signifies farmer willingness to practice extended rotations and cover cropping with the right level of support, indicates that the optimal payment rate for Practice 328 could be revised to a slightly higher compensation amount than its current payment schedule. This would be an effective enticement to increase the practice of conservation crop rotation one of NRCS' soil health principles.

Farmer Data and Tools Analysis

Due to the timeline of the grant, we had two cohorts of cost share farmers who provided data for the tools analysis. These farmers used cost share from PFI in 2017 ("2017 cohort") and 2018 ("2018 cohort") to plant a small grain (barley, oats, rye, triticale, or wheat) followed by a cover crop with at least one leguminous species. For the 2017 cohort, production data was collected via one survey in August of 2017 following small grain harvest and the same production information was collected again

in November-December of 2018 for whatever crop followed the small grain on that same field. There were no restrictions or requirements on what farmers could plant in the 2018 crop year. The majority planted corn, but hay and soybeans were also cultivated. For the 2018 cohort, only 2018 small grain data was collected as 2019 crop harvest occurred after the end date of this grant.

Once survey data was obtained from farmers, data was then entered into three sustainability or natural resource stewardship tools which use models to estimate the farming system's impact on a variety of natural resource concerns. For this project we entered data into Field to Market's Fieldprint® Calculator (FPC), Cool Farm Alliance's Cool Farm Tool (CFT) and the Natural Resource Conservation Service's Resource Stewardship Evaluation Tool (RSET).

In order to keep data entry as similar as possible, farmers with multiple management practices (i.e. different cover crops, two fields with one tilled and one no-till, etc.) had to be entered as uniqueanalyses for each set of management practices they conducted. Therefore, of the 2017 cohort, seven farmers were associated with the Federal CIG project and eight analyses were conducted of their management systems. Of the 2018 cohort, 23 farmers' data were entered into the tools as 29 separate crop-year analyses. The outputs produced by the three tools were then compared, to the extent possible, to each other and to the direction and magnitude of response on resource concerns we would expect to see from published scientific literature. The outputs were also assessed on their utility for informing technical assistance to farmers and for their ability to capture and verify impact claims in agricultural supply chains.

The results of farmer data analysis confirmed that greenhouse gas reductions of 35-56% were possible by moving farmers from the high emitting end of the production spectrum to the low emitting end of the production spectrum through practices such as growing lower input crops (small grains), decreasing fertilizer inputs for high-input crops (corn) and reducing herbicide inputs to the whole rotation. Results of the tools on other key environmental outcomes such as soil conservation and water quality were less conclusive, models often returned results contrary to what peer review literature would lead us to expect. The Fieldprint® Calculator and Cool Farm Tool today offer useable strategies to capture and report approximate reductions in greenhouse gas emissions for the purpose of supply chain claims, but further investigation is needed to provide more fine-tuned and accurate estimates for other resource concerns. However, none of the tools as they exist today result in farmer change, companies need to invest in supporting farmer learning networks and credible agronomists to translate outputs from the sustainability tools into farmer management decisions and to support peer learning. For an in depth, tool-by-tool account of the results see Appendix II.

Farmer Events

As markets have disappeared for small grain crops, so too has technical support and advisors. A cornerstone of this project was recruiting farmers and experts to share their knowledge about small grain production, marketing, cover crops and livestock integration with their peers and capturing that knowledge to the extent possible and sharing it (see Communication & Resource Development in next section). As part of this project we hosted monthly shared learning calls for farmers with topics ranging from small grain variety selection, to fungicide efficacy, to milling market specifications, to milling small grains for animal feed. The calls were held over lunch (noon – 1) on the first Friday of the month so they would be easily accessible to farmers across the three-state project area. Over three years, 20 calls were held with 498 attendees.

As part of this project, PFI launched a series of annual small grains conferences. The 2018 conference occurred July 30, 2019 in Mankato, Minnesota with 65 attendees. In 2019 we held the conference in Wisconsin Dells, Wisconsin on August 15-16 with 59 attendees. Unpredictable weather and the August timing of the conference kept attendance at both conferences lower than we hoped.

However, the attendees who came gained useful information and planned to translate it into their operations as shown by evaluation results. From Minnesota evaluations, 95% of attendees ranked the overall quality of the event very good or excellent and over 90% estimated a moderate to very large change in knowledge. A full 100% of attendees said that they plan to share what they learned at the conference with others in their network. The discussion at the conference and the evaluations revealed that markets for small grains continue to be the primary challenge for growers who want to diversify their rotations. When asked to respond free-form to the question "What are challenges that make you NOT want to grow small grains?", 73% of responders referenced lack of profitable markets. Of the farmers who attended the Wisconsin small grain conference, 75% responded that they were considering a change in production and conservation practices (including diversifying rotations) as a result of what they learned at the conference. They also responded that their average small grain acres three years ago was 38 acres while today the average acres were 54 showing a positive trend toward adding more acres. Session videos and slide decks from the Wisconsin Conference are available on the PFI website.

Figure 2. At Janesville, WI field day, host Willie Hughes (right) chats with a representative from Pipeline Foods at the buyers' and sellers' lunch. July 12, 2018

Finally, we held three grower summits between 2017-2019 which allowed a platform for farmers to gather and discuss challenges and strategies in small grains production. On August 17, 2017 14 farmers attended a small grains boot camp in Ames, IA where farmers brainstormed benefits and challenges to extended crop rotation and learned communication strategies to share their knowledge about small grain production with other farmers. On July 12, 2018 we held a field day in Janesville, WI hosted by a cost share participant with 93 attendees and a Keota, IA cost share farmer hosted a field day on June 20, 2019 attended by 40. On annual tallies of post event evaluations 67% - 79% of attendees at these small grains events and other field days featuring small grains or extended rotations responded that they were considering changing production practices.

Communications & Resource Development

To complement the slate of in-person events, PFI created online resources to capture farmer

knowledge about growing small grains and raise awareness about the benefits of extended rotations for the landscape. Over the course of this grant PFI published 12 blogs, 9 articles in ag-media and 15 news releases about the project or extended rotations. See Table 2 for a complete list of these publications.

Table 2. Media Generated for Small Grains, Large Gains

Type	Title (Hyperlinked if Applicable)	Publication Date
Blog	Rotationally Raised, Episode 12: Small Grains in the Corn Belt, A Sustainable Supply Chain	3/17/2017
Blog	Fertilizers, Herbicides and Fungicides for Small Grains	4/26/2017
Blog	The Ditlevson Small Grains Playbook	6/23/2017
Blog	Crop Insurance Options for Your Small Grains	9/19/2017
Blog	Are Brewing and Distilling Markets for Small Grains Right for You?	3/14/2018
Blog	Field Day Recap: Small Grains, Modest Gains - A Pragmatic Approach	8/13/2018
Blog	Stay on the Right Side of the Law When Selling Cover Crop Seed	9/25/2018
Blog	Sign Up for 2019 Small Grains Cost Share	9/26/2018
Blog	Winnowing Down Oat Variety Trial Results	2/13/2019
Blog	How to Apply for EQIP Funding for Small Grains Production	3/4/2019
Blog	Downsizing Fertilizer Bills with a Summer Cover Crop	3/14/2019
Blog	Enterprise Budgets for Small Grains in Organic Transition Offer Management Insight	3/29/2019
Ag Media	Feeding Small-Grains Cover Crops	3/22/2017
Ag Media	"Sowing Your Oats" Takes On New Meaning for Innovative Iowa Farmers	9/8/2017
Ag Media	Current Farm Economy Prompts Crop Changes, Business Adaptations	9/28/2017
Ag Media	Frost-Seeding Red Clover into Winter Small Grains	1/26/2018
Ag Media	Combine clinic for small grains harvesting held in Grundy Center	6/29/2018
Ag Media	Shriver Farms here is one of Iowa's largest organic ag operations	9/20/2018
Ag Media	Hybrid Rye: An Alternative Crop Worth Consideration	10/11/2018
Ag Media	Millet anyone? Facing soil crisis, US farmers look beyond corn and soybeans	10/28/2018
Ag Media	Cover crop feeds corn crop	3/18/2019
News Release	New Video Series Aims to Help Farmers Grow Small Grains	2/8/2017
News Release	Frantzen Farm field day will showcase benefits, uses of hybrid rye and Kernza grain crops – June 29, New Hampton	6/15/2017
News Release	Small grains production will be the focus of new Practical Farmers conference plus several field days this summer	6/21/2017
News Release	Field day will focus on transitioning to organic crop farming – July 11, Ida Grove	6/22/2017
News Release	Small grains directory connects farmers to buyers	6/28/2017
News Release	Field day will explore ways to diversify with cover crops and small grains – June 19, near Weldon	5/31/2018
News Release	Field day will explore many uses of small grains, from grazing to brewing – June 28, in Bedford	6/13/2018

Type	Title (Hyperlinked if Applicable)	Publication Date
	near Dayton	
News Release	Small-grains conference will explore production, marketing of small grains – July 30, in Mankato, Minnesota	7/10/2018
News Release	Doug Alert and Margaret Smith of Hampton will receive 2019 Sustainable Agriculture Achievement Award from Practical Farmers of Iowa	1/17/2019
News Release	Field day will explore pasture-based pig health – June 14, near Elliott	6/4/2019
News Release	Field day will explore weed control with fire and electricity in organic row crops – June 25, near Decorah	6/7/2019
News Release	Back-to-back field days at Mugge farm will explore beneficial insect habitat, organic row crop production – July 17, near Sutherland	6/28/2019
News Release	Field day will explore strategies for building farm resilience – Aug. 16, near Harlan	8/2/2019

Supply Chain Engagement

The second large area of work in this project was to engage supply chain stakeholders, including food companies and suppliers, in learning about the benefits of extended rotations with small grains and legumes and working with them to develop markets for small grains in the Cornbelt. PFI with partner Sustainable Food Lab (SFL) accomplished this through several learning events with company representatives and in one-on-one work to dig deeper into individual companies' questions and support in the design of pilots or further research needs that could explore extended rotations for feasibility and applicability in their supply chains.

Supply Chain Learning Events

Figure 3. Learning journey attendees walk into a soil pit in a field of oats on Jeremy Gustafson's farm near Boone, IA.

In June 2017, PFI and SFL hosted more than 45 representatives from food and beverage companies and others to learn about how farming practices can influence soil health and to brainstorm ways that their companies and organizations could increase farmer's use of soil health building practices. The Learning Journey consisted of two field visits to the farm of Jeremy Gustafson near Boone, IA – including a soil demonstration from Iowa NRCS – and to the Iowa State University Agronomy research farm where Dr. Matt Liebman has conducted a long-term cropping system comparison. Attendees then split into three groups and visited one of three, smaller group visits with farmers who are using soil health building practices at various stages on their farms.

Participants were asked to answer a set of questions prior to and following the Learning Journey. Their responses showed small but important changes in their understanding of which farm practices most influence soil health, water quality and greenhouse gas emissions. Many representatives came to the event with a good understanding that practices which keep roots in the ground year-round are important to improving soil health. Even so, they came to realize even more the superiority of roots in the ground to a nutrient management as their main supply chain strategy on improving soil health. For a more detailed analysis of the pre and post survey results see Appendix III.

July 10, 2018, PFI and SFL hosted more than 15 representatives from food and beverage companies and others to learn about how farming practices can influence soil health and to brainstorm

ways that their companies and organizations could increase farmer's usage of these practices. The Learning Journey (LJ) consisted of an afternoon workshop that included a demonstration with the rainfall simulator and a discussion on the role of cool season crops to reduce runoff and GHGs (see Leaky System video), followed by an all-day field visit with farmers on Hughes Family Farm in Janesville, Wisconsin. Participants were given an opportunity to sit with a PFI agronomist after the field day for a company-only Small Grain and Cover Crop Agronomy 101 session. This Learning Journey resulted in a pilot with Oatly and Seven Sundays and a partnership with Target to support the small grains work as part of Target's Ag Water Challenge commitment (see Ceres blog post and informational sheet on Oat program).

On April 4, 2019 PFI and SFL hosted a webinar for supply chain partners presenting what we are learning from 2 years of small grains data. More than 25 partners attended the webinar including representatives from the following organizations: Danone, General Mills, Oatly, Seven Sundays, Cargill, Blue Apron, EDF, Walton Family Foundation, Mars Petcare, Unilever, Grain Millers, and Iowa Department of Agriculture and Land Stewardship. PFI and the SFL presented economic data and sustainability metrics from 2 years of small grains data and led a discussion on key ingredients for supporting third crop diversification. The webinar recording and synopsis of the discussion is available online. Companies need to understand what the sustainability case is to justify pursuing small grains and cover crops as a supply chain sustainability strategy. A key goal of this work is to credibly collect and share evidence on water quality, soil health and greenhouse gas benefits from these extended crop rotations.

Supply Chain Pilots and Next Steps

In 2018 SFL, PFI, Grain Millers, Oatly and Seven Sundays launched an oat market pilot to support the scale of both conventional oats for Oatly's plant based oat drink and organic oats for Seven Sundays' muesli. Oatly and Seven Sundays will utilize cost share through the CIG grant, coupled with coaching support from PFI and Grain Millers to increase farmer success and track sustainability metrics. Oatly and Seven Sundays have committed additional funds to track additional soil health metrics.

PFI and SFL organized quarterly calls to meet the learning needs of corporate partners focused on the following content: Sustainability metrics generated from the use of the Cool Farm Tool, Fieldprint® Calculator, and RSET; Meta-analysis on feeding small grains to ruminant and non-ruminant animals: inclusion rates and tradeoffs in performance and efficiency; Supply chain barriers for sourcing small grains for food and feed in the Midwest; and Identification of key requirements for CIG renewal to address barriers.

These quarterly calls resulted in the submission of a successful 2018 CIG grant and expanded corporate partners to include key consumer packaged goods (CPG) companies, retailers, and traders in both livestock productions systems, new food markets for novel plant-based milks, and regenerative / organic products. This CIG grant also served as a catalyst for additional grant funding to expand the reach of our Small Grains, Large Grains work. SFL was awarded grants from McKnight Foundation and Walton Family Foundation to support existing projects and address key knowledge or research gaps identified. For a full outline of all work conducted and planned related to this project see Appendix IV.

Researcher Engagement

In order to close the knowledge or tool gaps that farmers and supply chain stakeholders identified to implement extended rotations, we engaged a community of researchers and other experts. This group first convened on August 17, 2017 with 12 researchers from North Dakota State University, University of Wisconsin at Madison, University of Wisconsin – Platteville, University of Minnesota –

Crookston and Iowa State University. Their disciplines ranged from small grain breeders, to animal nutrition to soil scientists. Due to this discussion, PFI was able to organize and write a successful North Central Region SARE grant to develop a coordinated project across small grain variety trials in the upper Midwest to gather trial data, test varieties in more locations and develop an online "selector tool" that uses genetics by environment model to predict the best performing variety by the farmer's location.

PFI was the host for one day of the Corn in Context meeting July 24-25, 2018 held in Ames, IA. Crop rotation experts from land grant universities including: University of Guelph, Ontario; USDA-ARS at E. Nebraska Research and Extension Center, Lincoln, NE; USDA-ARS Beltsville, MD; Michigan State University Kellogg Biological State Hickory Corners, MI; The Marsden Farm Experiment Iowa State University Boone ,IA; University of Minnesota Long-Term Agricultural Research Network and The Variable Input Crop Management Systems trial Lamberton, MN; Penn State NESARE Sustainable Dairy Cropping Systems Project, Univ. Park, PA; Russell Ranch Sustainable Agriculture Facility UC Davis, CA; The Wisconsin Integrated Cropping Systems Trial Arlington, WI shared research results from long-term trials comparing performance of extended crop rotation to short, monocrop systems, prioritized gaps in the current literature and developed next steps for the group's work to advance a more in-depth understanding of diverse cropping systems effect on corn production across the U.S. On day two of the meeting, the group focused on setting priorities of work to accomplish over short, medium and longer term timelines. The group identified that there was a greater need of coordination of soil-related measurements across the sites and to develop a data housing framework to compile existing data.

In 2019, our researcher meeting focused on livestock integration with small grains and extended rotation. In 2019, we went to animal science researchers interested in small grain integration by attending the KWS Hybrid Rye Pig Feeding Seminar in Winnipeg Canada. KWS Cereals hosted about 110 attendees from across the U.S. and Canada from various sectors – academia, industry, and farmers. The seminar primarily focused on the following themes: potentials of hybrid rye in pork production, hybrid rye and its effects on animal health, breeding qualities, substituting corn with rye, and the nutritional and economical value of hybrid rye. In the U.S. KWS Cereals is conducting feeding trials at the University of Illinois (swine) and South Dakota State University (beef). The object of these research trials is to determine the nutritional value of hybrid rye in comparison to corn.

Roadmap: Conclusions and a Path Forward

From this project we have learned that farmers are eager to investigate alternative crops and reduce purchased inputs – particularly due to the recent agricultural economic climate. EQIP practice 328 payment rates are currently too low to increase adoption of small grains production due to market risk for farmers. A higher payment rate of $25-40 for practice 328 would encourage more adoption of this practice. And the fact that farmers still struggled to find reliable market opportunities for small grains points to a need to increase the number but more importantly the *variety* of small grains purchasers to drive consistent market demand.

While we generally saw that tools are accurate enough to be useful for general impact verification, more work is needed to fine-tune verification tools to allow them to accurately capture the benefits of a diverse rotation. We have also found that there is a common trap for companies to equate measurement alone as a way to drive farmer behavior change. Farmers require a peer learning network and trusted agronomic advice, these supports help reduce risk for famers in making change and therefore move beyond measurement to impact; creating real value across the supply chain.

Summary of Recommendations:

- Increase payment rate for EQIP Practice 328 to $25-40 per acre to mitigate continuing market risk of crop diversification for farmers just starting to grow small grains.
- Develop secondary market outlets for small grains as well as increasing demand in the food-grade sector for Cornbelt-grown small grains to reduce risk of profit loss if grain does not meet food-grade market specifications.
- Pair sustainability impact tools with skilled technician and peer support to translate tool results into farmer management decisions. Continue to refine sustainability tools to capture benefits of extended rotation systems accurately to improve their usefulness for technical advisors, farmers and company impact claims.
- Develop risk-mitigation policies for small grains in the Corn Belt such as improved rates and access to crop insurance or government buying programs for excess grain to provide some market security.

The path forward for scaling small grains in the Corn Belt must rely on not only continuing to push for more food-grade markets for small grains in the region, but also develop more secondary markets. Shifts in crop rotations and how animals are integrated and fed on farms since the 1960s has caused a critical shortage of secondary markets for small grains today. Reviving secondary markets for small grains in the form of livestock feed and cover crop seed production is a critical step to create a market-based solution to keep conservation cropping systems in place.

Practical Farmers and Sustainable Food Lab has already taken steps to actualize this vision for scaling small grains by applying for a new Federal CIG grant which was awarded in 2018. In this project we will complete feeding trials (DanoneWave, McDonalds) and feasibility studies (Smithfield) to provide the last piece of the business case for scaling small grains through feed rations. We will demonstrate outcomes on animal performance and health and analyze the relative cost and availability of small grains. Together, these elements will put the livestock sector in the position of being a solution provider and industry leader in improving water quality and reducing GHG emissions in the Cornbelt. A second strategy will engage Unilever and Pepsi to offer cover crop cost share to increase the sustainability of their supply chains and increase cover crop use. Through this we will demonstrate to other companies that the results are substantial and replicable and that food and beverage companies that do not require small grains, like Pepsi beverages or Unilever's brand Hellman's mayonnaise, can collaborate around whole rotations that promote increased demand for small grains as seed for cover crops.

Collaboration around single commodities does not result in the greatest potential conservation impact in the Cornbelt. Developing scalability for market-based solutions to increase use of extended crop rotations will be the work of a diverse set of stakeholders collaborating across commodities and sectors. This next innovation needed to drive adoption of extended rotations with small grains is building a business case and market solution for pre-competitive end-user collaboration around soil friendly crop rotations in commodity systems. To read the full, detailed version of the "Roadmap to scale small grains market development in the Cornbelt" see Appendix V.