Wisconsin Cover Crop Citizen Science Network

Project Highlights

- Over 100 farmers in over 60 counties around the state have participated since 2020, many for multiple years.
- Cover crop biomass production from sampled fields in northern counties has been competitive with farms in counties further south.
- Cereal rye and oats are favored cover crops, but multispecies mixes, often including a legume, are increasingly popular cover crop among respondents, grown by over half our participants in 2023.
- Neighbors and producer-led grower groups are at the top of the list as sources of information on cover cropping.
- We saw an average of 1.4 tons dry matter per acre (tons DM/acre) in fall 2023 compared to 0.79 in 2022, which was 0.09 tons greater than 2021. The highest reported in 2023 was 4.1 tons DM/acre from Iowa county, a multispecies mix planted after small grains on a field that received manure in 2023.
- More data on the impacts of cover cropping on nutrient management is of interest to many participants.
- We have launched a data dashboard of our cover crop findings. Future plans include short farmer videos, webinars, fact sheets and other tools to support broader access to this growing cover crop database.
- We are now registering citizen science cover cropping farmers for our 2024-5 season.

Overview

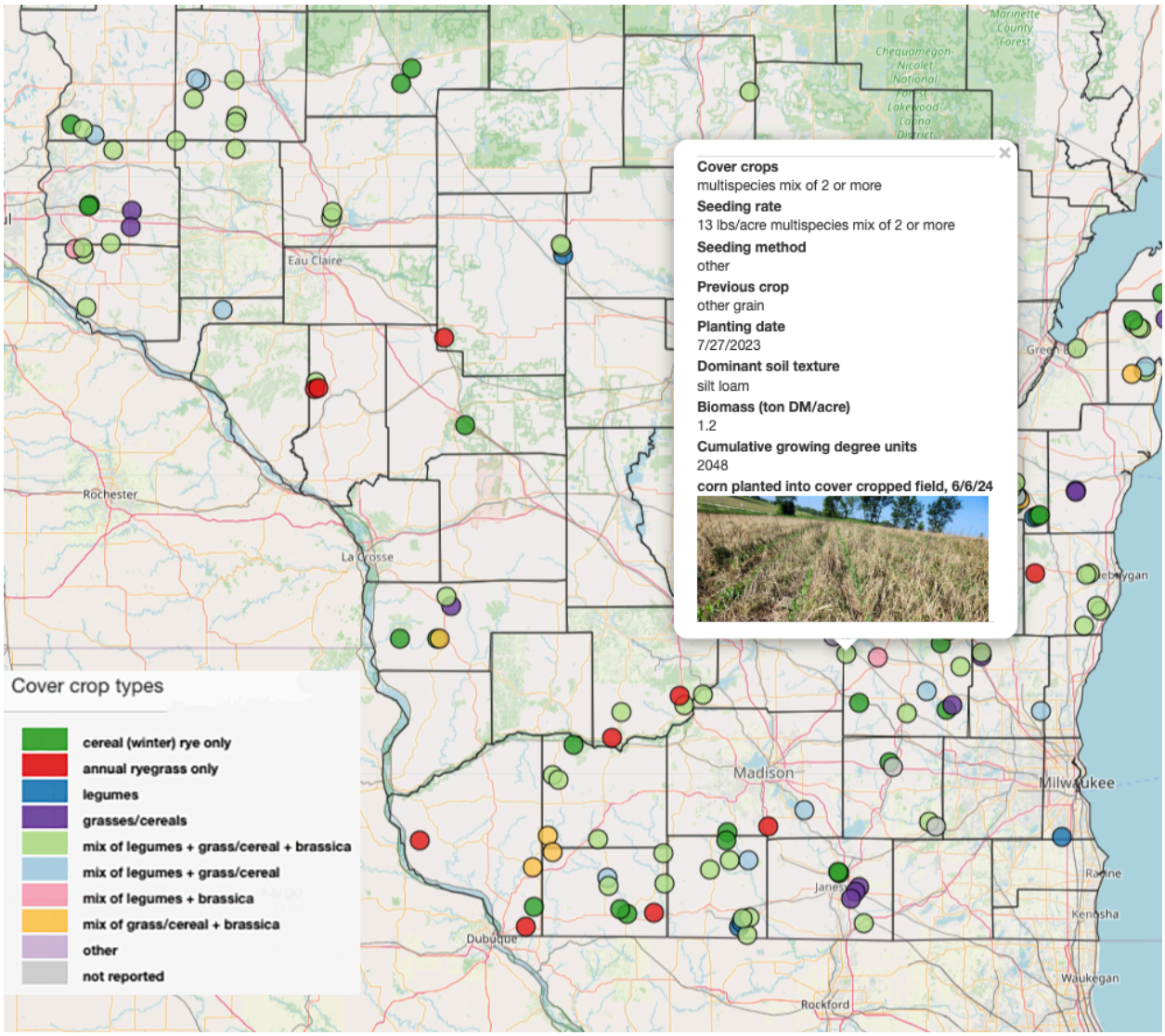
This overview includes our results from our fall survey and biomass sampling as well as information from previous years. We plan on releasing another update soon with our first set of spring cover crop sampling data!

Farmers are leaders in experimenting and fine tuning cover cropping as they make it work for their systems and locations. As a participatory research effort, our goal is to learn from growers about practices, benefits, and challenges of cover cropping, and share back useful information to

build knowledge and workable cover cropping strategies in Wisconsin's diverse cropping systems, soil types, and microclimates. We see cover crops as a key strategy among many contributing positively to overall soil health. We're also aggregating information into other cover crop data sets to improve statewide decision support tools like SnapPlus, and guide practical cover crop recommendations for Wisconsin.

How it works

This citizen science project began in 2020 as an effort to address the need for locally relevant information on cover cropping in Wisconsin. Since then farmers from around the state have filled out an annual survey on their cover crop practices as well as motivations, sources of support, and



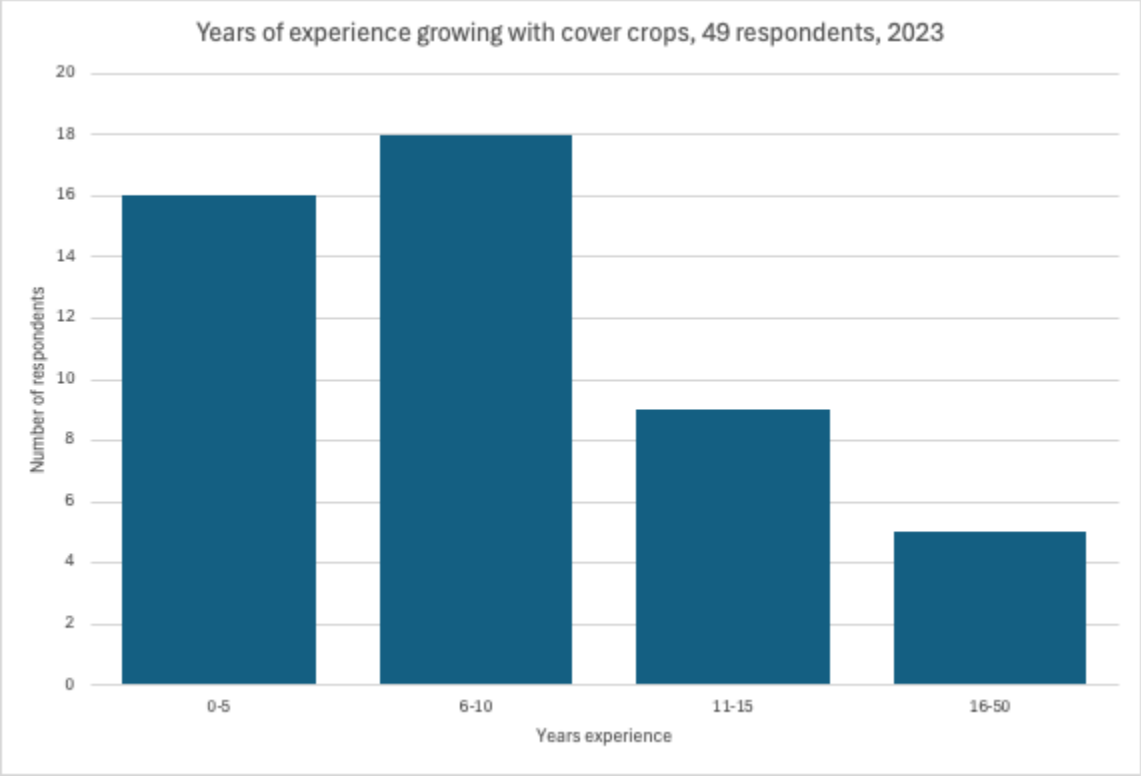
Screenshot from the citizen science cover crop dashboard created using data from this project. Colored dots are approximate locations of 49 fields sampled in fall 2023. Click on each dot to explore more at: https://evansgeospatial.com/wisc_cc_home

perceived benefits and barriers to cover cropping. They have also provided an aboveground biomass sample from one field in the fall. This year we began to collect spring biomass samples for the first time. In return, we provide farmers with information on the amount of biomass their cover crop produced as well as forage and nutrient analyses.

Each summer we send out invitations via email to join the citizen science project to extension agricultural educators, producer-led groups, land and water conservation county offices, and others. Beginning in October, participating producers complete an online 35 question form regarding cover cropping experiments and experience, including crops planted, dates, seeding rates, fertility management and tillage. Participating farmers receive a sampling kit, with a PVC pipe 2x2 foot quadrat and clippers, along with instructions on how to cut a representative sample of a fall cover crop at the soil surface. Any weeds present are not separated from the samples. We also include a scale and pre-addressed envelopes so that plant samples can be weighed in the field and then easily shipped to labs for a biomass estimate as well as nutrient and forage analysis. At the end of the growing season we provide participants with $100 honorarium as well as their personal biomass estimates and nutrient information.

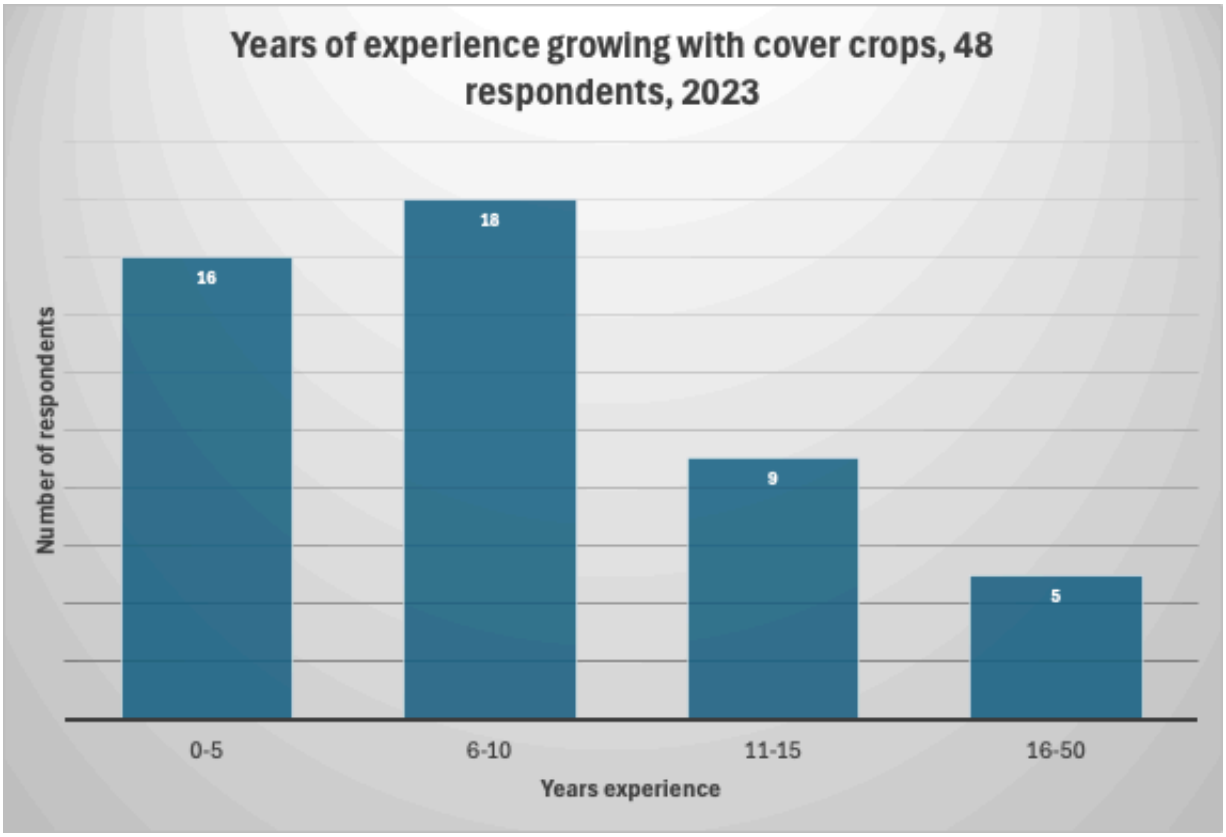
Project Results Fall 2023

Out of an original pool of 58 registered growers for fall 2023 sampling; 25 (43%) had participated at least once in previous years. Of those 58 registrants, 49 completed the agronomic survey and 43 successfully completed the survey and sampled their fall cover crops. The 49 survey participants, several of whom grow in more than one county, represented 61 counties



around the state: Dodge, Green, Barron, Lafayette, Calumet, Chippewa, Fond du Lac, and St. Croix counties were most represented, each with at least 3 participants. One farmer submitted survey information from more than one field, and others left some responses blank, so totals reported in response to questions vary slightly.

For the last five years, our project has included growers with a range of experience in cover cropping from 1 to 50.



Soil Fertility, Cover Crop Management, and Costs

Dominant soil textures reported were silt loam at 14 (26%) fields, clay loam at 12 (24%) fields, and sandy loam or loam, each at 5 (10%) fields. No-till was the dominant tillage system by far, at 76%, with mulch-till at 8%. Reported soil conditions at cover crop seeding time in 2023 were 60% dry and 40% adequate. 80% of our 49 survey participants reported drilling their cover crop seeds, 6% broadcast incorporated, 6% broadcast no incorporated, 2% frost seeded, and 6% used other methods including aerial, planter, no-till drill. Interseeding was mentioned by 3 growers.

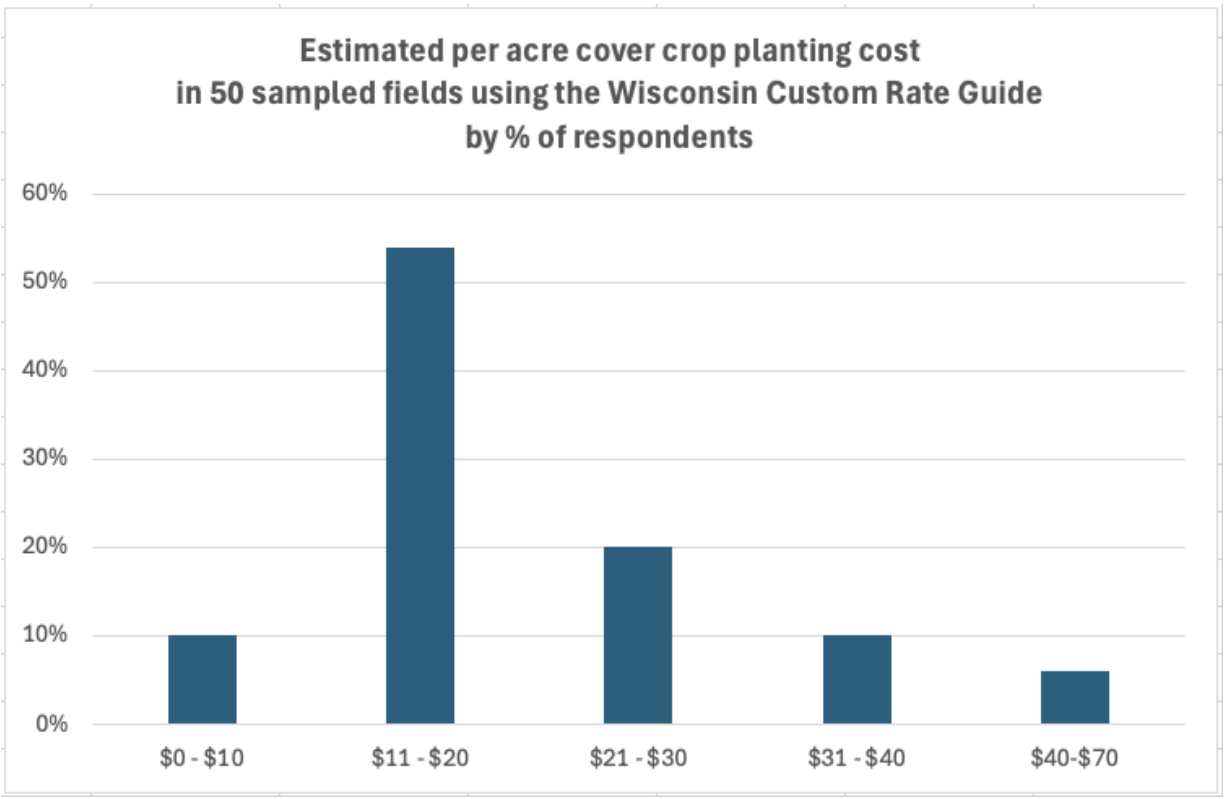
Manure was applied on cover crops to 24 (49%) fields, 9 prior to seeding and 15 post cover crop planting. Cover crop seeds were saved by 14 (28%) of respondents.

For cover crop termination, the largest group, 23 participants, selected “plant green, herbicide termination,” 8 participants chose “killing frost (fall),” and 8 selected “early spring, herbicide application (14 plus days prior to crop establishment).”

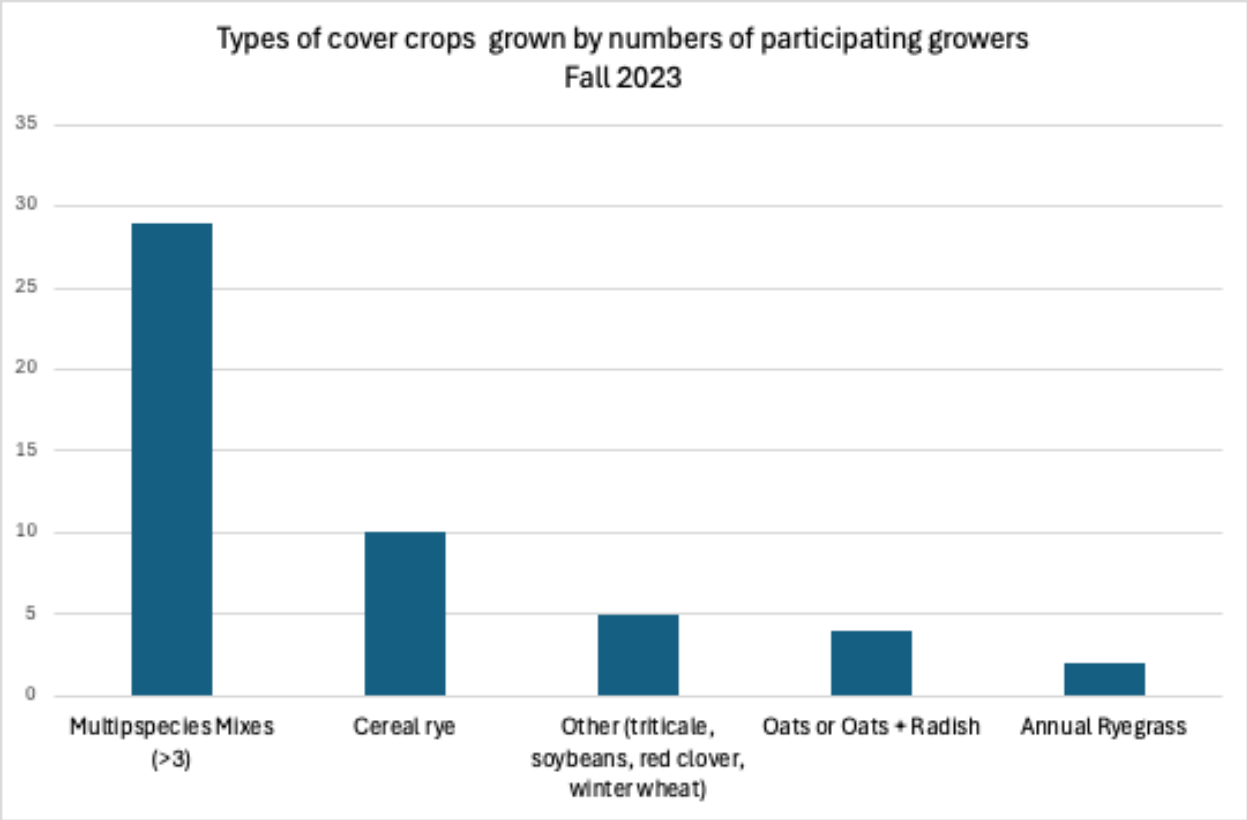
Most of our 49 participants planted their cover crops after wheat (23 fields) with corn silage and corn for grain representing 7 fields each. Other prior crops included vegetables (4 fields), soybeans (4 fields) and “other grain” (5 fields).

Seed cost and sources

In terms of cost, 14 growers reported spending between $5 and $20 per acre, 22 growers spent $21 to $40 per acre, and 14 growers spent $41 up to $68 per acre. Cover crop planting costs per acre (using the Wisconsin Custom Rate Guide) were estimated by our respondents to be between $5 and $70 per acre, with most people (53%) estimating between $11 and $20.



Of 50 respondents, 38 or ~70% did not save cover crop seed, while 16 or ~30% did save cover crop seed. There were at least 7 mentions of seed cost and seed saving to reduce cost in the comments section. Cover crop seed cost ranged from $4 to $70 an acre and was fairly evenly distributed across that range.



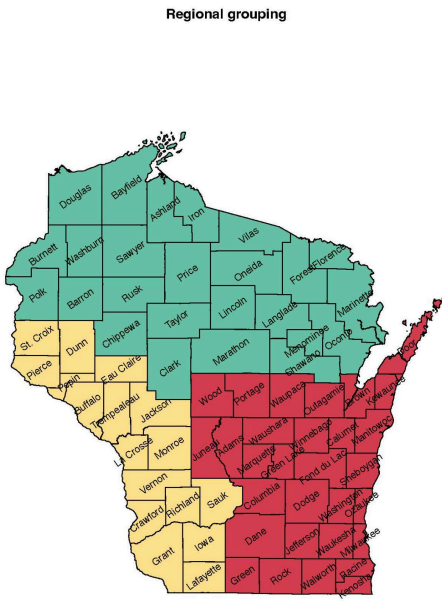
Cover crop types and biomass production

Multispecies mixes (>3 species) dominated the cover crops participants grew, a shift from previous years when most participants grew cereal rye. Multispecies mixes of at least 3 species represented 29 (58%) fields, cereal (winter) rye was planted in 10 (20%). Oats went in at 2 fields, with other fields using triticale, annual rye, radish, red clover and winter wheat as cover crops.

For biomass production, we saw an average of 1.4 dry matter tons per acre (tons DM/acre) in fall 2023 compared to 0.79 in 2022, which was 0.09 tons greater than 2021. The highest reported in 2023 was 4.1 tons DM/acre from Iowa county, a multispecies mix planted after small grains on a field that was manured in 2023. As noted, we found no strong association between latitude and biomass production, with growers above Highway 29, or about the 45th parallel, producing up to 2.8 tons DM/acre of biomass.

Average fall cover crop biomass results from 106 fields sampled in the fall seasons of 2020 through 2023.

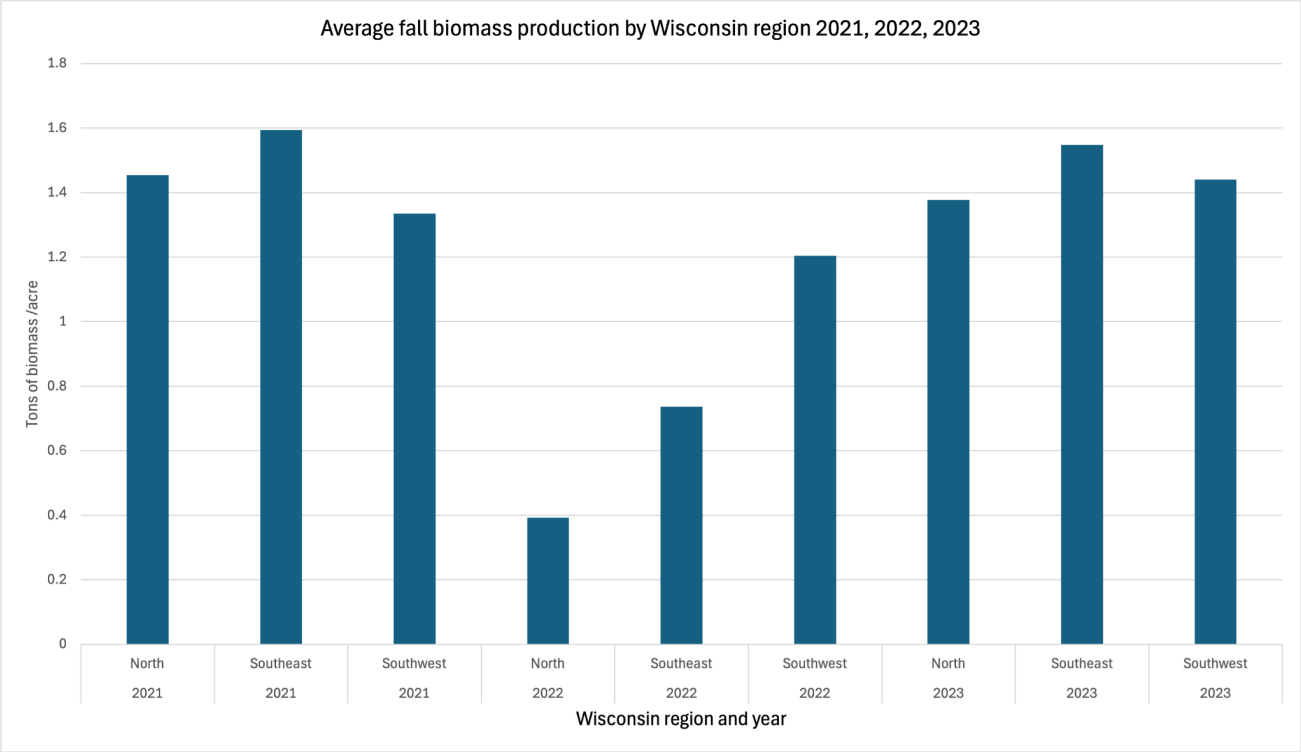
Sampling year	Region	Avg biomass tons DM/acre	Number of fields sampled
2020	North	2.8	1
2020	Southeast	2.3	3
2020	Southwest	1	5
2021	North	1.5	3
2021	Southeast	16	9
2021	Southwest	1.3	9
2022	North	0.4	4
2022	Southeast	0.7	27
2022	Southwest	1.2	3
2023	North	1.4	9
2023	Southeast	1.5	23
2023	Southwest	1.4	10



For reporting purposes, we grouped counties into three "growing regions" southeast (red), southwest (yellow), and north (green).

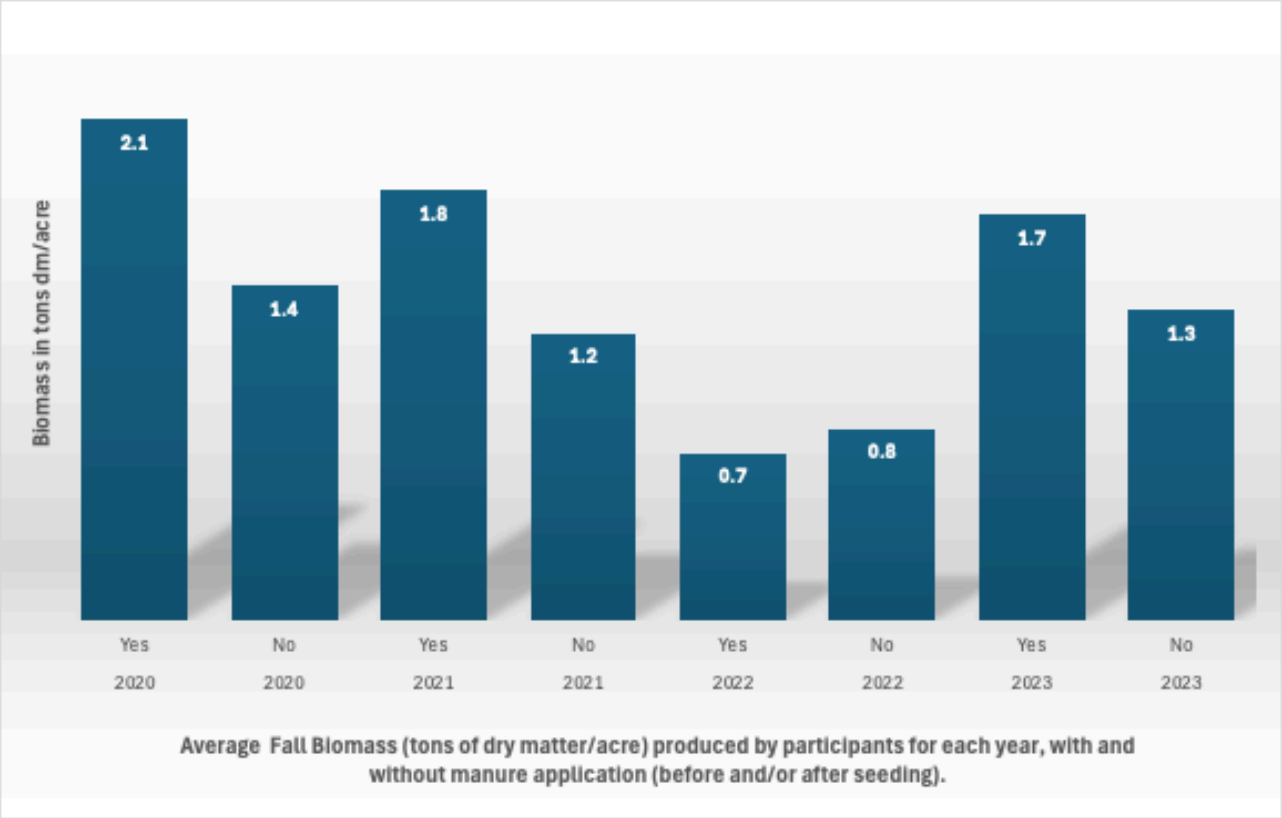
We piloted a new approach beginning in fall of 2023, sending out sampling kits to each farmer to collect their own field biomass. By comparing 2023 self-sampled results to previous years when staff collected all biomass samples we saw results fall within anticipated ranges.

Cereal rye biomass ranged from 0.1 to 3.7 tons DM/acre; Multispecies mixes from 0.9 to 4.1 tons DM/acre; Oats from 0.6 to 3.1; and winter wheat from 1 to 1.9 tons DM/acre of biomass.



As the average fall biomass results indicate, growers taking their own biomass samples did not produce data outside of anticipated ranges. Averages were lower overall for 2022, a year with multiple challenges. Crop planting was slightly delayed with less-than-ideal temperatures in early May slowing progress. Below normal precipitation and temperatures throughout the growing season contributed to slower cover crop development. However, overall cover crop yields for many, especially in the southeast were above average.

As noted, about half our participants used manure before or after cover crop seeding. We saw a positive correlation with biomass production.



Average Fall Biomass (tons of dry matter/acre) produced by participants for each year, with and without manure application (before and/or after seeding).

Barriers, Motivations, and Sources of Cover Crop Information

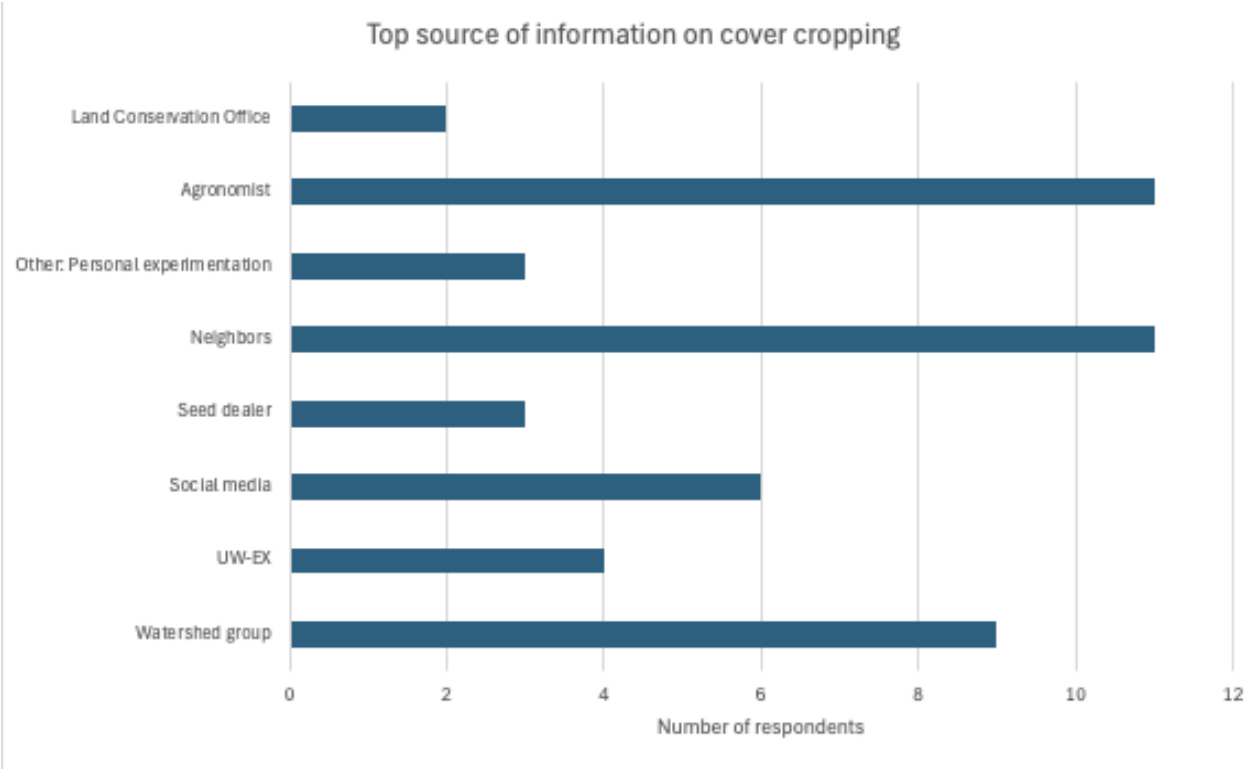
While agronomists remain far and away growers' top selection as a source of information on nutrient management, information on cover cropping came from a much greater diversity of sources, see results below. Three growers selected "other" and wrote in "personal experimentation" or "personal experience." In previous years we did not include the "neighbor" option in our drop down menu, but personal experimentation has been cited by participants as an important source of cover cropping information in all years of the survey.

We asked if planting a cover crop delays when growers would otherwise plant their cash crop. Of the 51 responses, 41 (82%) replied "no," planting a cover crop does not delay when they would otherwise plant a cash crop while 9 (18%) replied "yes."

We also inquired in 2022 if planting a cover crop delays when growers would otherwise plant their cash crop, an allowed for a write-in vs a yes/no answer. Of the 54 respondents 37 (69%) replied "no." And while 17 growers (31%) did indicate that planting a cover crop delays planting a cash crop all but 3 of those affirmative responses were qualified in some way. Written responses included, "sometimes," "a little," "somewhat, but not a major concern," "perhaps a little," "very little, but some delay," "yes, but only because it is intended for forage production."

The 3 respondents with unqualified “yes” responses included this comment, “This year, yes. Cold spring, and I wanted some growth out of cover before I planted and terminated.”

Neighbors and agronomists topped the list as key sources of information on cover cropping, along with watershed groups.



We asked participants “Which of the following would make the biggest difference to you in terms of support for using cover crops?” Our list of options included: *Additional extension or agency personnel in your county, Cost sharing for cover cropping, Cost reduction for the next cash crop (due to N credits, weed suppression, etc.), More neighbors using cover crops, More information on adapting field equipment to cover cropping, More agronomist/consultant support in cover cropping, Crop insurance breaks for cover cropping. Other.*

Comments from those who chose “other,” included:

- data showcasing agronomic gains (nutrient uptake and assessing total fertility discharge), increased trafficability, profit/a (yield, etc)
- “Time will always be the limiting factor that determines how many acres of cover crops I get planted. I don't know what any agency can do to relieve that problem other than keeping my wife happy or watching my kids for me.”
- "more agronomist/consultant support in cover cropping"
- “We need to share data proving the viability of no-till and cover crops and the importance of these practices to our environment. This is important to the future of farming. This

may require incentives to remain competitive during transition from conventional to no-till and covers for those who are skeptical."

- (Info on) cover cropping in urban agriculture

"Which of the following would make the biggest difference to you in terms of support for using cover crops?"	Percent of Respondents (number of respondent)
Cost reduction for the next cash crop due to N credits, weed suppression, etc.)	37% (19)
Cost Sharing	31% (14)
Other	14% (5)
Crop Insurance	8% (4)
More Neighbors Cover Cropping	6% (3)
More info on adapting equipment	2%
More agronomists	2%

Influence of crop insurance rebate on cover cropping practices

In 2023 we asked, "Do you use crop insurance? If so, does it influence your cover cropping decision?" Of 48 respondents in 2023, 32 use crop insurance (67%), with all but 3 reporting that it does not influence cover crop practices.

Comments from the three exceptions included: "Yes their rules make it more difficult. I like to plant green & let my cover crop grow longer;" "It does influence the way we cover crop since we don't want to the cover crop to count as an insurable crop," and, "yes it does effect planting deadlines."

Other comments on insurance include: "it does not affect my cover crop decisions as long as I'm still eligible to purchase the insurance;" "I do appreciate the fact that insurance companies have realized the benefits and are giving a rebate," and "It doesn't influence my decisions but it has been nice to get the $5 credit on my crop insurance."

In 2022, of 52 respondents to the question, “Do you take crop insurance and does it influence your cover cropping decisions,?” 21 (40%) replied “no” to crop insurance. Of the 31 (60%) who said "yes" to taking crop insurance, only two respondents replied that crop insurance does influence their cover cropping decisions. Their explanations of the influence were: "We will be putting in some check strips when we try new cover crop practices." And, "Yes The discount helps cover the cost of cover cropping."

Looking Forward

We are deeply grateful for the ongoing support from our collaborators including dedicated farmers who take the time to share the ups and downs of cover crop experimentation and practice. Looking ahead, we have spring sampling data for the first time, and are working on uploading that to our Wisconsin cover crop data dashboard. We will release another report with that information very soon. We are also working creating guidance on reading biomass and nutrient quality reports on cover crops and improving our outreach around our project results. In addition we have created a metadata portal so interested researchers will be able to download agronomic data. Stay tuned!

This report was written by Mrill Ingram with the support from Dan Smith, Dan Marzu, Dave Evans, Dane Elmquist, and Gregg Sanford.

The Michael Fields Agricultural Institute's Wisconsin Cover Crop Citizen Science Project is a partnership with UW-Madison's NPM Program, The Nature Conservancy, the USDA Dairy Forage Research Center, and UW-Madison's WICST project. We are grateful to our collaborating Wisconsin farmers and to our Soil Health Alliance for Research and Engagement (SHARE) project partners.

For more information on this project, including research access to our growing database please email Mrill Ingram (mingram@wisc.edu).

Cover Crops for Pollinators - Eliza Pessereau, M.S.

Wisconsin has over 400 species of native, wild bees, many of which provide pollination to valuable crops such as cranberry, apple, and cherry as well as native plants. However, many species are in decline due to the loss of natural habitat and flowers in the landscape, which provide bees with food in the form of pollen and nectar. One way that farmers can support these pollinators is by planting broadleaf cover crops (radish, oilseed rape, clover, etc) which produce both pollen and nectar. However, these cover crops need to flower in order to be beneficial, and frequently are terminated before flowering.

In summer 2023 we conducted an online survey paired with follow-up interviews to understand if current management of broadleaf cover crops might be supporting pollinators. The survey was sent to farmer groups in Wisconsin through CCROP, DATCP, USDA, and The Nature Conservancy. We received responses from 24 farmers across 24 counties in Wisconsin, 79% of whom were row crop farmers. Many participants are also part of the citizen science cover crop project. Farmers reported planting 32 types of broadleaf cover crops including radish, red clover, buckwheat, crimson clover, turnip, and field or forage pea. Sixty-seven percent (67%) of farmers typically plant between 1 and 50 acres of broadleaf cover crops.

Seventy-six (76%) percent of farmers said that at least some of the crops in their cover crop mix bloom for a minimum of a few weeks, meaning that for those few weeks these farmers are providing food for nearby pollinators. Sixty percent (60%) of farmers even mentioned that they see insects “very often” on their broadleaf cover crops, particularly on clover (47% of responses) and buckwheat (42%). Three farmers interseeded their cover crops with corn and one grazed his cover crops, allowing them to bloom for up to 3 months.

Forty-five percent of farmers whose cover crops bloom for at least a few weeks also terminated their cover crops using herbicides and 62% do so in spring, posing a risk to pollinating insects. Terminating cover crops early in the morning or late in the evening when fewer pollinators are active could mitigate this risk, although some species may still be active. Although 36% of interview participants mentioned that supporting pollinators was not their primary goal for planting broadleaf cover crops, 92% answered that they had considered how their cover crops could be benefiting pollinators. To learn more about how to support pollinators with your cover crops, including termination recommendations, check out Cover Cropping for Pollinators & Beneficial Insects from SARE.

This study would not have been possible without its participants and funding from the UW Madison Center for Integrated Agricultural Systems, which allowed us to compensate farmers for their contributions.

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