



Northharvest

BEAN GROWER

RESEARCH ISSUE 2025

AGWEEK



Improving beans for production and consumption

A look at dry bean
research in North
Dakota and Minnesota

Agweek
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On the cover:

Michael Wunsch, research plant pathologist at Carrington Research Extension Center, inspects pinto beans taken from plants affected by white mold on Aug. 27, 2024.



FROM THE CHAIR

Funding research to improve growing and selling beans



Norm Krause
Chair, NBGA
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Minnesota Dry
Bean Research and
Promotion Council
(District 2)

Greetings,

I hope this issue finds our fellow growers well and excited to get back into the fields after a long winter. For anyone who isn't aware, NBGA, along with our North Dakota Dry Bean Council and Minnesota Dry Bean Research and Promotion Council friends, have been funding dry bean-related research in an attempt to help make things better for our fellow bean growers.

This annual research edition is intended to shine a light on that research.

Dry beans are a specialty crop. They can be finicky, and as there is little to no private sector research in our industry, ultimately, it's our job to help make sure that there is regular, ongoing research happening – and that the projects being conducted are useful to all of us.

Supporting this research is hugely important to helping our growers in the long run. It's important to everyone's bottom line, as well as to our land management and the future of our industry. Many of the projects funded are intended to help bean growers best manage our fields, attempting to achieve the highest yields while minimizing input costs. There is a lot of information in this issue, and we sure hope you find it useful in making decisions for your operation this spring.

In this 2025 Research Issue of Northarvest BeanGrower, you'll be able to read about the research projects we have supported in the past year. Many of those projects deal directly with in-field practices, covering everything from bacterial blight detection to soybean cyst nematodes to row spacing trials to rolling best practices to nitrogen management and much more.

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Rolling plus residual herbicide could help weed control

By Jenny Schlecht | Agweek

The majority of dry edible bean acres get rolled in the Northharvest Bean Growers Association region, according to a survey.

About 51% get rolled preemergence. Another 8.6% get rolled before planting and 4.6% get rolled postemergence. About 36.3% of acres don't get rolled at all. Joe Ikley, North Dakota State University Extension weed specialist, said there were questions about how the compaction from rolling impacted weed pressure. He began his research on a limited basis and then received funding for a two-year study from NBGA.

The study looked at three sites of beans, though one site, in Fargo, did not generate much information because of wet conditions, Ikley said on the Getting It Right Dry Bean Series put on by NBGA and North Dakota State University.

But information from a site at Amenia and a site at Carrington has allowed him to draw some conclusions. In all three years at Amenia, rolling without applying residual herbicide yielded the most weed pressure, followed by not rolling and not applying residual herbicide.

"We basically doubled our grass pressure and tripled our broadleaf pressure just by rolling that soil," Ikley said.



Pre-emergence herbicide before or after land rolling for dry edible beans can help keep weeds at bay, research shows. Addison Rall / Real Ag Stock

But when Broadaxe herbicide was used — whether without rolling or before or after rolling — weed pressures were significantly lessened.

While rolling certainly seemed to increase weed pressure at the Amenia site, the same was not true at Carrington, where rolling did not seem to influence the weed density in either year tested.

But preliminary conclusions from the weed rolling project overall suggest that rolling stimulates weed emergence,

which allows more weeds to get killed by a residual herbicide.

"We're seeing an overall benefit to reducing our weed seedbank by rolling," Ikley said.

In addition, he said the project also showed the importance of an emergence herbicide, particularly if you roll.

"If you're going to roll, get that residual down and it's going to help with our weed control," Ikley said. 

Key Takeaway: Field rolling in dry beans

If you're going to roll your dry edible bean fields, make sure to use a pre-emergence herbicide, too.



Getting it Right Dry Bean Production Series offers latest in research and best practices

The 2025 Getting it Right Dry Bean Production Series offers seven videos with North Dakota State University Extension researchers explaining the latest in research and best practices in dry bean production.

Getting It Right is an annual crop production conference featuring the

latest research-based production information presented by NDSU specialists. The dry bean series is sponsored by Northharvest Bean Growers Association.

This year's videos, recorded on Feb. 10, 2025, feature information on dry bean

diseases, white mold, weed control, insect control, bean markets, bean varieties, and on NBGA activities.

The videos are available on the Carrington Research Extension Center's YouTube channel. Find the playlist at bit.ly/2025GettingItRight. 



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Nitrogen Fixing

NDSU's nitrogen fixation research could yield high rewards for dry bean industry

By Michael Johnson | Agweek

Like in the human body, there are helpful and not-so helpful bacteria at work in plants such as dry edible beans. The helpful bacteria (known as Rhizobium) that can “infect” dry beans feeding on nutrients coming into the plant also work to convert nitrogen from the atmosphere into useful nutrients for the plant's growth and development. This process is known as symbiotic nitrogen fixation, and it's unique to legume crops.

Finding the strains that are both competitive and efficient in nitrogen fixation and developing plants with those characteristics is the goal of North Dakota State University research started

in October 2024. The research is made possible through a \$199,700 USDA Specialty Crop Block Grant. Funds for these projects are allocated to each state department of agriculture based on the acreage of specialty crops produced. The Specialty Crop Block Grants are available for crops with less acreage than some of the major commodities, like corn and soybeans, and help with funding research projects. This is a two-year project according to NDSU bean breeder Juan Osorno.

Osorno considers this one of the more exciting research projects in the world of dry beans because of its potential to improve the uptake of nitrogen by beans,

which would be a major boost to dry bean performance.

“The problem is, among the legumes, dry beans are known to be one of the least efficient fixers of this association,” Osorno said.

He said in comparing dry edible beans like navy beans to soybeans, soybeans are far superior in symbiotic nitrate fixation. While dry beans may fixate only up to about 25% of their nitrogen from the atmosphere, soybeans can get nearly 50% via this process.

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Dr. Barney Geddes is in the NDSU microbiology department and plays a major role in this study, as he collected 500 samples of bacteria isolates in dry bean fields across Minnesota and North Dakota. Among the isolates, the goal is to find the most competitive and most efficient in fixing nitrogen. From there, the goal is to further find out which strains are most effective with different varieties of dry beans.

While they have collected these natural strains they are also exploring high hydrogenase lab-created strains. This research looks to increase biological nitrogen fixation in dry beans by using new hydrogen-recycling rhizobium strains. There is some mixed theories on the effectiveness of these genetically modified strains, but Osorno wants to study it to make some determinations.

A fair amount of the work for this project will be done in greenhouses and laboratories at NDSU. Field trials would incorporate fields in North Dakota, the Red River Valley and two other locations in Minnesota in 2026.

“But there is a lot of preliminary work that needs to happen in the lab and in the greenhouse first in order to select that smaller group of strains that we want to really try out there and see if they do the trick that we want,” Osorno said.

Out of these 500 strains, he hopes that perhaps there are 20 strains that they can utilize moving forward with further research.

The project started in October 2024, so it’s still too early to have any results from the study, but the effort is nonetheless exciting for Osorno.

“I almost consider this project a little bit of a high risk, but high reward,” Osorno said. “We’re making efforts into this. We’re not sure if we’re going to be successful, but if we’re successful, boy ... we’re going to hit it big, right?”

An unexpected risk that has been added to the project is the unknowns surrounding the federal funding for the project.

“It’s been a roller coaster here in terms of uncertainty about things that we do, because a lot of our research, of course, is either directly or indirectly funded by federal grants,” Osorno said. 

Key Takeaway: Nitrogen fixing

Research into bacteria strains that are both competitive and efficient in nitrogen fixation and developing plants with those characteristics is the goal of NDSU research started in October 2024.



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Researchers are evaluating optimal amounts of fertilizer in dry beans. Erin Ehnle Brown / Real Ag Stock

Researchers evaluate nitrogen application rates for edible beans in Minnesota

By Ariana Schumacher | Agweek

Knowing the right amount of nitrogen to apply to your fields is critical, whether it's for improving yields or lowering your input costs. Daniel Kaiser, soils extension specialist with the University of Minnesota, says there hadn't been much research into correct nitrogen amounts for black beans in the past.

"If you look at historical research in the state of Minnesota, I mean, kidneys, pintos, navy beans, those were kind of the main classes that were researched at one point in time," he said. "With black beans and kind of the yields they were finding, they were concerned about using some of the same nitrogen guidelines."

The study consists of simple nitrogen rate trials divided into different classes. There are four locations that have navy and black beans and two irrigated spots that have red kidney beans.

"Really the idea there is, with the classes all at the same location, I can compare

If I am saving money on my inputs, I'm ultimately making more money in the long run.

— Noah Boelter



the nitrogen responses between everything just to see if they are the same," said Kaiser.

In Minnesota, their recommendations have a built-in yield goal based system.

"Theoretically, if you use that system, if you've got something like black beans that would yield more, that you should need more nitrogen," Kaiser said. "That is really what we are trying to test is to see if that was the case."

Throughout this study, they have not seen a lot of difference between black and navy beans, even though black beans have a higher yield potential.

Kaiser has been trying to move away from the yield goal based system with edible beans and some other crops.

"It doesn't really matter in terms of what your max yield potential is," Kaiser said. "For most cases, we just kind of need to figure out what the optimal rate is and that's kind of what the growers should shoot for regardless of whatever yields they might be getting."

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Kaiser said the number for nitrogen has remained pretty close to where it has been historically.

"If you look across the years in classes, we were coming at close to maybe 120 to 130 pounds of N being optimal and that's for both irrigated where we have split applications and for non-irrigated," Kaiser said.

In a simultaneous study, Noah Boelter research analyst of CLC Ag and Energy Center, is researching nitrogen applications on edible beans in larger plots. In this study, he had three trials, one applying 20 units of nitrogen, one applying 40 and the final applying 60. Boelter found that the trial with the 40

units of nitrogen had the highest average yield.

Boelter was surprised to find that applying less nitrogen could result in a higher average yield.

"If I am saving money on my inputs, I'm ultimately making more money in the long run," he said. "I think that's probably the most important reasons are just so people can see that the things they've done their whole lives, you know, you can change up your operation and try to do something different and hopefully make your money in the long run."

These studies are aimed to benefit edible bean growers. Yield is not the most important thing to look

at; producers also have to evaluate their input costs.

"So, they can be sure that they're getting the most bang for their buck because a lot of people are chasing a high yield when that's not necessarily going to make you the most money," Boelter said.

Boelter said that using less nitrogen can sometimes also be better for the soil health.

Refreshing and restudying nitrogen application rates is an important thing to do.

"I can't obviously run studies year after year, but it's good at least we have some back checks to make sure we are where we need to be," Kaiser said. NBGA



Noah Boelter



Daniel Kaiser

Key Takeaway: Nitrogen needs

Research at the University of Minnesota shows that dry bean farmers may be able to save money by decreasing their nitrogen fertilizer use without seeing a big hit to yields.



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When is the best time to plant spring cover crops in dry bean fields?

By Ann Bailey | Agweek

Research under way at the North Dakota State University Carrington Research Extension Center aims to determine the optimal time to plant spring cover crop in dry bean fields.

The spring cover crops, like fall cover crops, would be planted to reduce soil erosion in the dry bean fields.

A previous study, conducted by Greg Endres, NDSU Extension cropping systems specialist at Carrington Research Extension Center, showed that planting dry edible beans into winter rye not only reduced soil erosion but also suppressed weeds and soaked up excess moisture.

During that study, which ran from the fall of 2017 to 2021, Endres planted winter wheat into ground in which pinto beans would be planted the next spring. The Palomino variety of pinto beans was seeded into winter rye residue and into growing fields using the no-till method. The rows were spaced 21 or 30 inches apart.

There was interest from farmers in planting spring cover crops because they sometimes don't know in the fall what crop they will be planting the next year. If, in the spring, they do decide to plant dry edible beans, the fields often blow before the crop emerges or when the plants are small because there was little residue left from the previous crop and farmers often roll their fields after harvest, said Mike Ostlie, an agronomist and director of the Carrington Research Extension Center.

"Most every year we get one or two days when the dry beans are coming out of the ground and we see soil moving," Ostlie said.

He launched the first year of the four-year spring cover crop study at the Carrington Research Extension Center in 2024.

Researchers at the center planted barley, which puts on biomass more quickly than oats and rye, which were the other two cover crop options.

The researchers also studied optimal times to plant the cover crop. One of the options that resonated with Ostlie is to plant the barley when spring fertilizer is applied.

"If you're out there putting on phosphorus, you could plant barley then," Ostlie said, noting that some farmers apply the fertilizer three to four weeks before planting dry edible beans, which would give the barley cover crop time to grow.

Another option is seeding the barley at the same time as the edible beans. The risk with that option is that the cover crops grow at a faster pace than the dry beans, which could result in the latter's yield reduction.

Besides the optimal planting date for the spring cover crop, the study also looked at when the barley should be desiccated.

"We're not really expecting the options to hold us through until the fall, but in the minimum, trying to cut down spring



Dry beans are susceptible to damage from wind and other elements. Planting into cover crops may help, so research is looking at the best way to do it. Photo taken June 13, 2017, after a wind and hail event in Pembina County, North Dakota. Joshua Komer / Forum News Service file photo

erosion," Ostlie said. "We have the ability to protect the soil through this type of practice; it's one thing we can control."

Planting spring cover crops with dry beans isn't a practice that would be practical for farmers to do every year, but it does give them another option for reducing soil erosion. The spring cover crop research results will provide them with information to get them the best results.

"Really what we want to do is to remove the risk from the decisions when people do decide to go this route," Ostlie said. NBGA

Key Takeaway: Spring cover crop timing

Research is looking at the best time to plant cover crops in the spring to help protect vulnerable dry bean plants. The options so far appear to be planting with fertilizer application or planting a cover crop at the same time as planting beans.



Drain tile spacing doesn't matter much in reducing plant stress in dry beans

By Ann Bailey | Agweek

A four-year study of the response of dry edible beans to drainage and fungicide treatment appears to show that wider spacings are as effective as narrow spacings at reducing plant stress

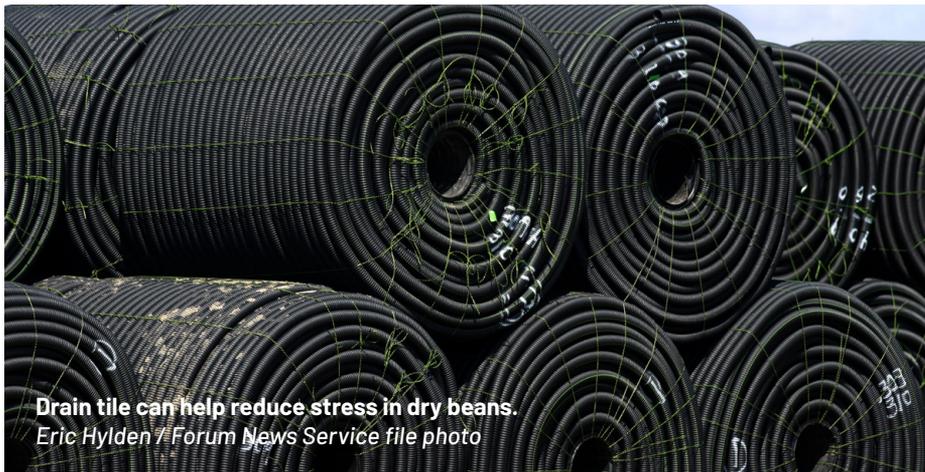
"Even at 60 feet you get a good reduction of stress," said Lindsay Pease, Extension nutrient and water specialist at the Northwest Minnesota Research and Outlook Center in Crookston.

Pease, Ashok Chanda, University of Minnesota sugarbeet plant pathologist at the center, and Jeff Strock, University of Minnesota soil, water and climate department professor, conducted the study, which began in 2021.

Tile drainage became a common agricultural practice among farmers during successive years of wet conditions. Research shows that draining the fields benefits farmers by allowing them to plant earlier in the spring, improving plant stand yields and less disease pressure on crops. Too much moisture can result in plant diseases, including *rhizoctonia solani*, a root disease which can cause major yield reduction.

Though it's well known that there is a connection between saturated soils and root disease, there previously had not been research on how subsurface drainage spacing interacted with disease management in the Red River Basin.

The aim of drain tiling is to provide the balance of water and air in the soil that creates an environment optimal for plant growth. If farmers don't have that information, it's difficult for them to



Drain tile can help reduce stress in dry beans.
Eric Hylden / Forum News Service file photo

weigh the costs of installing subsurface drainage systems against the potential benefits they have for crop production

Northarvest Bean Growers Association funded \$135,706 for the four-year dry bean response to drainage and fungicide treatment study.

The goal of the four-year research project was to develop and evaluate drain spacing and fungicide application in a corn, beans, wheat and sugarbeet rotational cropping system.

Researchers conducted the study on a site of about 4 acres with drain spacings of 15-, 25-, 40- and 60-feet and on a control, which was not drained.

In 2024, similar to the previous year's research results, it didn't appear that drain spacing had an effect on navy bean yields.

"That's good news for farmers because as you get narrower spacings, it's more

expensive," Pease said. "Even at 60 feet, you get a good reduction of stress."

Even though there wasn't an excessive amount of rain in 2024, there were days when the soil was saturated, and the tile drainage reduced the stress on the dry beans that typically would have occurred under those conditions, Pease said.

"It does show drainage was beneficial, in general," she said.

Comparisons between in-furrow and seed treatments showed the results of the two were similar in 2024, she said. The in-furrow treatment in 2024 was 9.5 fluid ounces per acre of Quadris fungicide.

The 2023 research results showed that Vibrance seed treatments performed better than the in-furrow fungicide treatments and the control. In 2022 when the growing season was extremely wet, research results showed that the in-furrow fungicide treatment was the most effective at reducing disease pressure. **NBGA**

Key Takeaway: Drainage spacing

It doesn't appear to matter how far apart drain tile is in reducing stress on dry beans.



Research looks at management of rust, soybean cyst nematodes and common bacterial blight in dry beans

By Jenny Schlecht | Agweek

Support from Northharvest Bean Growers Association and U.S. Department of Agriculture Specialty Crop Block Grants has allowed researchers at North Dakota State University to look at ways to manage three common diseases in dry edible beans: rust, soybean cyst nematodes and common bacterial blight.

Northharvest has supported an ongoing project dealing with the three diseases with a \$131,292.60 grant. Another \$150,048 has gone into another project directed as pathogen prevalence, host resistance, and economics of bean rust resistance via genetics and fungicide efficacy.

Sam Markell, plant pathologist at NDSU, shared what researchers have learned over the years and what dry bean farmers should consider during a session of the Getting It Right Dry Bean Series put on by NBSGA and NDSU.

Rust

While there are other “rust” pathogens that impact other crops, the rust fungal pathogen that infects dry beans is unique to the crop, Markell said. Rust causes cinnamon brown pustules with yellow halos. It causes defoliation and can reduce yields significantly.

Rust needs free moisture – which does not have to be from rain, Markell said. It could be from fog or long dew periods.



Rust is a major problem in dry beans. Sam Markell / North Dakota State University

Hot spots of rust in the field often form in the middle of the canopy, which can be attributed to more dew.

Research has shown that crop rotation helps control rust in dry beans, but not as much as in other crops or for other dry bean diseases. Genetic resistance can be helpful, Markell said, noting that the ND Falcon variety of pinto beans has shown moderate resistance to rust.

“And I expect more will come,” he said.

The management tactic that works the best right now is proper fungicide timing, Markell said. It’s important to scout for rust often because it can “explode” after a wet

period. But if sprayed in the first week or two “you’re going to knock it down.”

In research, Markell said spraying five to seven days after the appearance of rust was effective, and a variety of fungicides showed similar results.

“If you have rust in your field, there’s a lot of products that can work if you get it on at the right time,” Markell said.

Soybean cyst nematode

Soybean cyst nematodes are microscopic worms that feast on roots of plants as juveniles. Females form “cysts” on roots

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Key Takeaway: Rust management

Spraying fungicide for rust five to seven days after its appearance seems to be effective in protecting dry beans.



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Three Diseases

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that are visible to the naked eye and stand out for their lemon shape and cream color. The females eventually will die and turn brown, filled with eggs that will get knocked into the soil. SCN can go through several life cycles in the course of a growing season. The eggs can overwinter, leaving future susceptible crops grown in the soil at risk of infection. The cysts also are easily moved when soil is moved, on equipment, in water and by people.

While SCN are devastating to soybeans, which show no resistance to the nematodes, Markell said most varieties of dry edible beans have been shown to

be moderately resistant or moderately susceptible to SCN. But SCN still can hit yields and also are highly invasive, so it's important to work on controlling SCN.

Markell explained that SCN favor heat, high pH, sandy soil and dry conditions. In soil sampling done since 2013, nematodes have mostly been shown in the eastern portions of North Dakota, with a steady movement to the north. Markell expects SCN to continue moving, expanding and increasing in the next decade.

Sampling soil remains an important tool in SCN management, with focus on places like field entrances and shelter belts. Try to go 6-8 inches deep and aim for roots,

Markell said. The North Dakota Soybean Council and Northharvest Bean Growers Association have been involved in funding efforts to sample soil.

Markell said crop rotation is "very helpful" in reducing SCN. Since SCN only impacts soybeans and dry beans, rotating to other crops is vital. He said seed treatments for dry beans will be evaluated in the coming years.

But choosing less susceptible varieties of dry beans to plant on fields with SCN problems is a viable management option. Markell explained that Guiping Yan,

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Key Takeaway: Soybean cyst nematode management

Crop rotation and using less susceptible varieties of dry beans are helpful in combating soybean cyst nematodes. Continuing to test soil for SCN also is vital so farmers can make effective management decisions.



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Three Diseases

CONTINUED FROM PAGE 14

nematologist at NDSU, has studied the susceptibility of dry bean varieties to SCN. While some varieties are “bonafide susceptible,” there are options with better outcomes on ground infected with SCN. Markell said ND Falcon has been shown to be moderately resistant — the best performance in Yan’s trials — and many others have been shown to be only “moderately susceptible.”

While “pure-susceptible” soybeans can take a 30-40% yield hit in the right conditions from SCN, Markell said the outcome is generally better for most dry bean varieties.

“Probably we’re not going to see that level with dry beans, even in the worst environments,” he said.

Common bacterial blight

Of the three diseases Markell discussed, common bacterial blight was the one with the least good news in terms of management options.

“This is really a beast,” he said.

Research through NBGA and USDA block grants have looked at a series of experiments, which includes other susceptible crops, like peas and sunflowers. One series of experiments has included using a backpack blower to damage beans to replicate storm

damage, followed by inoculation with CBB. Then, researchers have tried different treatments on the infected beans.

“There is no statistical differences” between treating and not treating, Markell said.

However, a glimmer of good news on CBB management is that some dry bean varieties are showing some resistance to CBB, including Rodeo and Falcon in pintos, Twilight in black beans, and Polar, Blizzard and T9905 in navies. Resistance may be the key, and Markell said NDSU bean breeder Juan Osorno and his team continue to look at it.

“Over time, I think this is going to make a big difference,” Markell said. 

Key Takeaway: Common bacterial blight management

While researchers haven’t found many ways yet to manage common bacterial blight, there is hope that bean varieties will be developed with stronger resistance to CBB.



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Prioritize Quality



Fungicide timing matters when controlling white mold

By Jenny Schlecht | Agweek

White mold continues to plague dry beans, and part of the problem remains that figuring out how to optimize fungicide timing, a plant pathologist who has studied white mold management for years says.

Michael Wunsch, research plant pathologist at the North Dakota State University Carrington Research Extension Center, has worked on figuring out the best row spacing and droplet size of fungicide for managing white mold. But on the Getting It Right Dry Bean Series put on by NBGA and North Dakota State University, Wunsch said figuring out the proper timing for fungicide application is difficult in part because not every day is a good day for spraying or field entry.

When determining fungicide timing, Wunsch said it's important first to consider whether conditions are favorable for formation of white mold — typically hot and wet conditions.

"If conditions do not favor white mold as dry beans enter bloom, applications should be delayed until weather becomes favorable for white mold," he said.

But then the question becomes when to spray when the conditions are favorable for white mold — and how many times to spray.

Wunsch and his fellow researchers have looked at timing and interval spacing of fungicide spraying in pinto, kidney, navy and black beans and formed some hypotheses about what combination of spray intervals yields the best results.

An important thing to remember with white mold is that spraying early, before a plant



While white mold can affect yield in soybeans, it can be a major quality issue in dry edible beans, along with causing a yield hit. The white mold can cause fuzzy or flaky beans, as in these pinto beans grown at the Carrington Research Extension Center. Photo taken Aug. 27, 2024. Jenny Schlecht / Agweek

has many pin pods, will not do much to prevent the spread of white mold, because the fungicide does not transfer to new growth. However, waiting too long risks the white mold infecting too much of the plant.

"There are trade offs in your timing," Wunsch said.

Spraying more than once can help alleviate some of that, with earlier applications taking care of early infection and later applications protecting new growth. But the timing of those sprays still is hard to determine, and farmers will need to determine whether the cost of application is worth the yield bump with multiple applications. Wunsch said it's important to read labels; some less expensive fungicides do allow for use in

more than one application, which can make the return on investment of multiple applications work out more easily.

Early results suggest that spraying pinto beans 12 days apart when doing two applications or 10 days apart when applying three applications provides better protection and thus a bigger yield bump. Similarly, spraying two applications seven days apart in kidney beans and three applications 10 days apart are recommended.

Wunsch said more years of study are needed to confirm the results, but the preliminary results, combined with anecdotal evidence from farmers, suggest that three fungicide applications might be the best way to combat white mold with fungicide. **NBGA**

Key Takeaway: White mold

Preliminary results of white mold research in dry beans, combined with anecdotal evidence, suggest that three fungicide applications might be the best way to combat white mold with fungicide.



Nutrient Management

Guidelines for some dry bean fertilizer management appear to be unchanged

By Michael Johnson | Agweek

Optimizing nutrient management to improve dry bean profitability is at the heart of a research project led by Daniel Kaiser, associate professor at the University of Minnesota's Department of Soil, Water and Climate.

Kaiser said this funding gave an added boost to fund continued research that was already taking place for nitrogen management. This research looks specifically at sulfur, potassium and phosphorus.

Kaiser said such research hasn't been completed in the last 20 years in dry beans. The results so far are showing that there are no new recommendations.

"I really don't have anything, any strong data to change what recommendations we have right now," Kaiser said. The research will continue to the end of 2025.

One wrinkle in data that Kaiser has been exploring is that in some cases high rates of

potassium chloride fertilizer or potash have reduced soybean yield.

"So I kind of wanted to also put some rates, some higher rates on dry beans to see if we see some of the same issues, which, right now we aren't," Kaiser said. He added that they also are not seeing any benefit of higher rates on the beans.

The three-year study was funded by a \$124,533 USDA Specialty Crop Block Grant. This award was part of \$1.2 million in 2023 USDA Specialty Crop Block Grants to 11 projects aiming to boost the competitiveness of Minnesota-grown specialty crops in domestic and foreign markets. The Specialty Crop Block Grant Program funds projects focused on marketing and promotion, research and development, expanding availability and access, and addressing challenges confronting producers of specialty crops.

Kaiser said he likes to have three-year trials

that can often offer a broad array of weather conditions to study alongside the results.

"It's nice to kind of average all the data together and just see if we see anything significant that would make me change the guidelines," Kaiser said. "And again, right now, there really isn't any, any information for (potassium, phosphorus and sulfur) that I would really have any growers really look at doing anything different at this point in time."

The studies involved a broad spectrum of sites including Crookston, in northwest Minnesota; Lamberton, in southwest Minnesota; Staples, in central Minnesota; Becker, in east central Minnesota and on-farm locations in Renville and Norman counties. The research involved fertilizer trial rate sampling throughout the growing season for navy, black and medium red kidney beans. It observes fertilizer uptake in the plants through tissue sampling and measuring yields at harvest. **NBGA**

Key Takeaway: Nutrient needs

Guidelines for potassium, phosphorus and sulfur in dry beans have not been updated in many years. Current University of Minnesota research seeks to determine if changes are needed.



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The National Agricultural Genotyping Center in Fargo, on the campus on North Dakota State University has been in place since 2016. In 2018, the lab started verifying Palmer amaranth seeds and in 2021 and 2022 started testing for herbicide resistance.

Mikkel Pates / Agweek

Funding propels detection of bacterial blight pathogens, herbicide resistant kochia

By Noah Fish | Agweek

Research funding for kochia and bacterial blight in dry edible beans are "absolutely critical" to explore new technologies in the space, said Zack Bateson, research scientist at the National Agricultural Genotyping Center. The NAGC is a private diagnostic lab that received funding for the two projects from USDA's specialty crop block grants for both projects.

"Whether it's traits in weeds or diagnosing diseases, where there might be several distinct pathogens that lead to the same symptoms — all of these types of projects are benefited by the funds through the specialty crop block grants and through the Northharvest Bean Growers Association," Bateson said.

One of those grants was for \$271,945 to increase the availability of a diagnostic panel to survey for herbicide resistance in kochia populations.

Bateson said the diagnostic panel refers to a set of genotyping tests where the NAGC look for target site mechanisms related to herbicide resistance. While a lot of herbicide resistance testing is done in a greenhouse, NAGC is able to test inside of a lab.

"We have a statewide survey where we have agronomists, growers, Extension send us leaf samples from the field, that then we can apply our genetic test to look for this indirect association with herbicide resistance," Bateson said.

After about a year and a half of conducting the genetic tests, Bateson said the lab is able to churn out results in about a week.

"When samples arrive to the lab, we are reporting results in about five to seven days," he said. "Much quicker than from a greenhouse."

Group 14-resistant kochia is a much more widespread issue than what was first thought, Bateson said, according to the samples they tested from across the state of North Dakota.

"It is one of those weeds that drives a lot of weed management on the farm," he said.

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One of the main focuses in herbicide resistance testing in kochia is because of its "relatively new appearance of group 14-resistance," Bateson said.

"There's a strong genetic test, or a strong association with one of the tests that we provide for this group 14-resistance in Kochia," Bateson said. "We established a statewide survey where folks were sending us samples, and we found in about 65% of the counties that we tested had this group 14-resistant kochia."

Bateson said free testing will be running throughout this whole year, with new funding secured.

"We'll be distributing these envelopes across the state, at county Extension offices, so anyone can grab these kits and collect weeds for us to test," he said.

Bacterial blight pathogens

Another testing program funded through specialty crop block grants was for \$154,818, to evaluate molecular tests to supplement North Dakota's seed certification program and field detection of bacterial blight pathogens in dry edible beans. The program is a collaboration between the NAGC and the North Dakota State Seed Department.

Bateson said when it comes to pathogens and disease in dry edible beans, bacterial blight is at the top of the list.

"It's one of the top disease issues that lead to yield loss," Bateson said "There's a strong recommendation to avoid planting any stored or bin seeds from previous years."

The North Dakota State Seed Department provides a test where they take seeds from various sources and try to elicit disease in the lab.

"If there's bacterial blight that's found in the seed, the pathogen that causes that, they will see in these plants," Bateson said.

He said there's some gaps to the testing, which NAGC can assist with due to the funding, by providing a diagnostic test to supplement the state department's dome testing.

"There are going to be some isolates that just won't grow in the laboratory, so this project really helps with that by creating a genetic diagnostic test for bacterial blight, so we're able to specifically identify whether one or a few of those bacterial blight pathogens are in a seed source."

Bateson said the NAGC has been working with the North Dakota State Seed Department since 2019, and the state department is just starting to get into similar technologies used by the NAGC. 



Key Takeaway: New technologies for kochia and bacterial blight

The National Agricultural Genotyping Center has created a diagnostic paneling survey for herbicide resistance in kochia populations and evaluated molecular tests to supplement North Dakota's seed certification program and field detection of bacterial blight pathogens in dry edible beans.

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NDSU's dry edible bean development matches state's top performance

By Noah Fish and Jenny Schlecht | Agweek

North Dakota State University's dry edible bean variety development has kept pace with the state's top performance, and support from Northarvest Bean Growers Association and a specialty crop grant for \$67,067 has gone towards the ongoing variety development.

A recent webinar in the Getting it Right Dry Bean Production Series recapping NDSU's dry edible bean variety trials and how to use them was led by Ana Carcedo, NDSU Extension agronomist.

North Dakota ranks No. 1 in production and acreage in United States for dry edible beans, according to USDA's National Agricultural Statistics Service. In 2022, the percentage of the different crops were 50.2% pinto beans, 19.3% black beans, 14.4% navy beans, 13.3% kidney beans, and 2.8% other.

Carcedo said it's important for NDSU research to use repetition and experimental design to ensure data reliability for variety development.

"The university is completely unbiased, and it's not trying to sell any product, it's just trying to provide information," Carcedo said. "I'm highlighting the experimental design, but it's not the experimental design itself – it's the people behind it, making the decision. We have specialists, and we have agronomists that really know what they're doing. That ensures the quality of the data."

Carcedo said it's crucial to consider data from multiple years and locations when selecting varieties. Some varieties perform consistently well across different years and locations, while others may not.

"We know that the weather is different every year, and this is really challenging because of how different each site behaves with different weather," Carcedo said.



Ana Carcedo, NDSU's Extension Agronomist specializing in broadleaf crops and Greg Lardy, vice president of Agricultural Affairs at NDSU. Contributed / NDSU

She said for that reason, data is examined in four year periods for each variety.

"We have some varieties that are always down, that probably we shouldn't choose, and we have some varieties that behave better in most of the years," Carcedo said. "Check your site, and then the second thing, check if you have more than one year of data."

ND Galaxy

Carcedo introduced NDSU's newest black bean variety, ND Galaxy, during the webinar.

"It's not easy to release a variety, and it's a lot of work until you find the right line that you want to promote, and then once you find it, it's not okay, just release it," she said. "It's been tested from 2017 to 2024 across 24 environments."

She said in terms of yields, Galaxy is close to other NDSU black bean varieties Eclipse and Blacktails.

"Comparing with the previous NDSU black bean varieties, it no longer has that purpling problem," she said. "And then

when we're talking about canning quality, it will be similar to Eclipse."

However there is one thing that separates the new NDSU black bean variety compared to any other variety on the market, Carcedo said.

"It has way better behavior when we're talking about common bacteria blight," she said.

Dry bean improvement

Dr. Juan Osorno, Jim Kirkeide Dry Bean Breeding Faculty Fellow, spoke about ND Galaxy and about efforts to improve dry bean varieties during the 2025 Northarvest Bean Growers Association Bean Day. Northarvest Bean Growers Association has put an ongoing \$655,003 project into dry bean improvement at North Dakota State University. Over the past 35 years, the NDSU breeding program has seen yields increase on black beans by 5.8 pounds per acre, on kidney beans by 13.8 pounds per acre and on pintos by 8.7 pounds per acre. Navy beans only have increased by 1.1 pounds per acre.

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Dry Bean Variety Trials

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"Navies are tough," he said.

Part of that improvement in overall yield has been working at developing beans with important agronomic traits – like ND Galaxy's resistance to common bacterial blight – without hurting yield. In pinto beans, much effort has been placed on developing slow-darkening pinto beans, an important trait for buyers.

Slow-darkening pintos have been popular with buyers and the dry packing industry. Osorno explained they cook faster and have higher iron bioavailability. Varieties developed in recent years also have comparable or superior

agronomic performance to non-slow darkening varieties.

However, plant breeding is a trade-off game, he said. Slow-darkening varieties tend to have higher seed damage and are highly influenced by seed moisture. They are more susceptible to root rot. Osorno and other researchers are investigating whether the flavonoid profile in slow-darkening pintos affects their seed coat structure. That is a work in progress that will continue, he said.

Developing varieties with resistance to white mold – a big problem for dry beans – also is a focus, and Osorno said there is promise in some pinto bean lines that are showing high levels of tolerance. That work is ongoing as well, he said.

Osorno also stressed that North Dakota Foundation Seed Program seed is available for all publicly developed varieties.

"This is all for you," he said. "We are a public program." **NBGA**



Dr. Juan Osorno discusses dry bean variety improvement during Bean Day 2025 in Fargo, North Dakota.
Jenny Schlecht / Agweek

Key Takeaway: Variety trials and dry bean improvement

Researchers continue to work on improving varieties of dry beans to provide better products for farmers, including by working toward disease resistance, yield improvement, and other agronomic and consumer-focused traits.



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Preliminary Life Cycle Assessment data look positive for Northharvest region beans

By Jenny Schlecht | Agweek

FARGO, N.D. — David Ripplinger, bioenergy and bioproduct economics specialist for North Dakota State University Extension, has completed his preliminary analysis on a Life Cycle Assessment of dry beans grown in North Dakota and Minnesota, and so far, it looks like the region's beans may have a marketable carbon intensity compared to national averages.

Life Cycle Assessments involve determining the greenhouse gas emissions involved in producing a given unit of a product. Compared to a big, national LCA on dry beans in 2020, Ripplinger said it appears the Northharvest region produces beans with higher yields and lower inputs, leading to better carbon intensity scores.

That matters — or it will matter in the future — for farmers who want to sell their crops.

"What we're used to is focusing on producing our crop, delivering our crop, getting paid by the weight," Ripplinger said. "And now we're in this place where the story matters. And it's really helpful if you help tell that story, particularly because dry beans grown in North Dakota and Minnesota have a great story to tell."

And that story might get better as more field-level, precise data becomes available, he said. Eventually, farmers may be able to market their carbon footprints as they sell their products, getting a premium for performing better than others.

"It's one of those reasons to know your own farms and your own products carbon footprint," Ripplinger said.

Northharvest Bean Growers Association has contracted North Dakota State University to complete the Life Cycle

Assessment. Ripplinger explained that there is a pretty standard process for the assessments, which involve looking for the best data available about activities that go growing a crop and getting it to market, then presenting it in a transparent way so that they can be compared to other LCAs. Different methods of production — including tillage and irrigation practices — can be compared.

"We're pretty unbiased," Ripplinger said about the need for transparency and openness in developing LCAs. "We want to have a good estimate."

The LCA Ripplinger is working on will be a baseline for the region's dry beans. As research and industry improve, leading to less input usage or higher yields, "we're going to shrink that carbon footprint," he said.

The information from an LCA can be used by buyers who want to hit a specific carbon intensity target. That isn't something that has hit the bean

industry yet, but it could, and with the information from the LCA, growers will be ready.

"There are companies that are requiring this data," Ripplinger said. "In the dry bean space, I don't know of any."

But if consumers are looking for that information, eventually companies will want to get that information and tell that story.

And as time goes on, more countries may expect carbon intensity information to allow products in. The European Union already has some sustainability reporting requirements, for instance.

Ripplinger used data from the U.S. Department of Agriculture and NDSU's annual survey of dry bean producers in his analysis. But someday, field-level data on yield, inputs and production practices will make LCAs more accurate and more useful. It will take time to get to that point, he said, but eventually he expects it will be seamless. NBGA



A preliminary analysis of data in a Life Cycle Assessment of dry edible beans from North Dakota and Minnesota shows the region may be less carbon intensive than the national industry as a whole.

Ann Bailey / Agweek file photo

Key Takeaway: Life Cycle Assessment

Preliminary analysis of a Life Cycle Assessment on dry beans grown in North Dakota and Minnesota shows that the beans grown in the region may have a lower carbon intensity compared to a national LCA conducted in 2020.



Osorno, Hoffman honored in inaugural Kirkeide family fellowships By Michael Johnson | Agweek

NDSU Extension 4-H youth development specialist Meagan Hoffman and NDSU professor of plant sciences Juan Osorno are inaugural honorees of NDSU fellowships in the name of an influential agricultural family in the region.

For generations, members of the Kirkeide family have helped advance North Dakota agriculture, Extension and 4-H, and the land-grant mission of North Dakota State University. In 2024, siblings Tom Kirkeide, Paul Kirkeide, Catherine (Kirkeide) Larson '85, and Karen (Kirkeide) Schindler '86 established the Kirkeide Extension Fellowship and Jim Kirkeide Dry Bean Breeding Faculty Fellow in loving memory of their parents, LeVon '54 and Pat Kirkeide, and brother, Jim Kirkeide '92, according to an NDSU news release.



Keith, left, and Karen Schindler, Paul and Delise Kirkeide, Dr. Megan Hoffman, Dr. Juan Osorno, Craig and Catherine Larson, Kim and Tom Kirkeide during a gathering to celebrate the inaugural fellowships.
Kensie Wallner / NDSU

LeVon served as the NDSU Extension agent in Wells County from 1959 to 1986. He often sought the expertise of NDSU professors and Extension staff to bring continuing education and research to Wells County. He was also a proponent of youth development and 4-H.

LeVon and his wife, Pat, were both active in their children's lives and helped their sons embark on farming careers. Their youngest son, Jim, farmed and owned and operated Kirkeide's Northland Seed and Bean until his passing in 2019.

In addition to his bean plant and farming operation, Jim was a strong supporter of 4-H, FFA, and Bison football.

Named faculty and staff positions help NDSU recruit and retain skilled educators and researchers whose guidance and discoveries advance knowledge for NDSU students and the citizens of North Dakota.

Kirkeide Extension Fellowship

Hoffman was named the inaugural Kirkeide Extension Fellow. The Kirkeide Extension Fellowship supports Extension initiatives that will contribute to a resilient, diverse, and capable workforce.

Through the fellowship, Hoffman will enhance Careers in a Box and LaunchSkills Virtual Career Camp. Both initiatives are

designed to raise awareness of career opportunities in food, agriculture, natural resources, and human sciences, according to the NDSU release.

In alignment with the fellowship's goals, these projects will focus on engaging parents and role models and fostering experiential learning and innovative teaching practices.

Jim Kirkeide Dry Bean Breeding Faculty Fellowship

Osorno was named the inaugural Jim Kirkeide Dry Bean Breeding Faculty Fellow. The Jim Kirkeide Dry Bean Breeding Faculty Fellowship supports innovation in dry bean breeding, ensuring the continued success of the agriculture industry.

Osorno utilizes advanced genotyping and phenotyping technologies to develop high-performing dry bean varieties to meet the needs of farmers and consumers. His use of a winter nursery allows for two growing seasons in a single year, accelerating the delivery of improved varieties and bolstering the region's status as a leading producer of dry edible beans — an affordable, high-protein food source critical to global nutrition.

Osorno and Hoffman were recognized as fellows alongside the Kirkeide family on Friday, Nov. 15, 2024. NBGA

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Looking at the properties of beans for processing

By Ann Bailey | Agweek

A North Dakota State University food scientist is looking at the physical and chemical properties of dry beans that are used in processed foods.

Fatemeh Zare, technical manager of the Northern Crops Institute at NDSU in Fargo, North Dakota, is researching the physical and chemical properties of pinto beans, black beans, navy beans and dark red kidney beans, all of which are grown in North Dakota.

Zare collaborated with Juan Osorno, NDSU plant breeder, on the \$11,720 study funded by Northharvest Bean Growers Association. Osorno provided eight random samples of the four dry bean classes, which he harvested from two locations.

Northharvest Bean Growers Association is seeing a lot of interest in incorporating dry bean ingredients into processed foods to increase their nutritional value, NBGA executive director Mitch Coulter said. Dry bean flour, protein, starch and fiber offer functional properties to improve the texture, flavor and overall quality of food products, he said.

It is critical for the dry bean growers' organization to invest in foundational research that helps its members understand if the production environment, which is made up of weather, soil, biotic stressors and abiotic stressors, can change the physical and chemical properties of the dry bean classes, Coulter said.

"We are looking for consistency as the food industry gravitates towards more implementation of bean ingredients. Foundational research data that is published is what our food industry partners are hungry for," Coulter said. "This is how we get added to USDA's preferred ingredient list that so many of the food industry scientists rely on when developing their food products."

Studying the physical and chemical properties of dry beans will help to determine their best use, Zare said.

"Knowing the functional properties leads us to the products we can make with dry beans. Not all of the beans are good to be used for canning. Some are better for milling and

flour because they have different functional properties," Zare said.

The study analyzed beans from two different locations to determine whether where the crops were grown had an effect on their properties, Zare said. The research is still being analyzed, but so far it indicates that the location of the beans does not make a difference in their properties.

The physical properties of the beans are being analyzed for size, length and hardness.

Besides visually and physically assessing those properties, the beans are cut and looked at in fine detail under an electron microscope which shows the distribution of the starch and fiber inside of the legumes.

The study also analyzed the soaking properties of the dry beans. Before dry beans are cooked, they typically are soaked for a period of time before they are prepared for bean dishes.

"When we soak it overnight, some beans absorb more, some less," Fare said.

The chemical properties that were studied during the research project include the moisture of the dry beans, the starch content and fiber content.

The study of the physical and chemical properties of dry beans, the first of its kind, will provide a base for subsequent studies. The results are expected to be available by the end of May 2025 to NBGA, which can share it with farmers and food processors.

The information will provide those groups with information about the four classes of dry beans studied, which are used in canning, packaging and dry bean bakery processing. 



Research at Northern Crops Institute is taking a closer look at the properties of dry beans. Trevor Peterson / Agweek file photo

Key Takeaway: Processing properties

Research at the Northern Crops Institute at NDSU is looking at the physical and chemical properties of pinto beans, black beans, navy beans and dark red kidney beans to help determine future uses.



Research looks at hammer and stone milling for dry bean flour

By Ann Bailey | Agweek

A U.S. Department of Agriculture specialty crop block grant project in North Dakota is studying the characteristics of dry bean flour produced by hammer milling and stone milling.

Fatemeh Zare, a food scientist and technical manager of the North Dakota State University Northern Crops Institute, is leading the study

The project, funded by the \$22,330 block grant, also analyzes the amount of dry bean flour, which would be mixed with wheat flour, that should be used in baked dry bean products such as tortillas, chips and crackers.

Pinto, navy, black and red kidney beans were milled, using a stone mill, for the project, and a hammer mill was used as a control. It was the first time that dry beans were processed with a stone mill, Zare said.

Amrita Ray, Northern Crops Institute milling specialist, ran the stone mill. Ray coordinates and conducts stone milling projects for public and private organizations, providing technical consulting for both Canada and the United States.

"She knows how to adjust the stone mill for each grain. Dry beans, this was not done anywhere," Zare said. "She has expertise in milling seeds from scratch."

The dry beans were not hulled so all of the legume's nutritional qualities would remain intact.

Each of the four classes of dry beans required a different milling technique. That information will be included in the final study report so food manufacturers will have it, Zare said.

Wheat flour must be added to the dry bean flour used to make the tortillas, crackers and chips, because the latter flour doesn't have gluten, which is a binding agent.

Besides analyzing the physical and chemical properties of the baked products, a sensory analysis also was conducted. A panel made up of NDSU, staff, professors and students tasted the tortillas, chips and crackers and rated them for flavor, texture and overall acceptance.

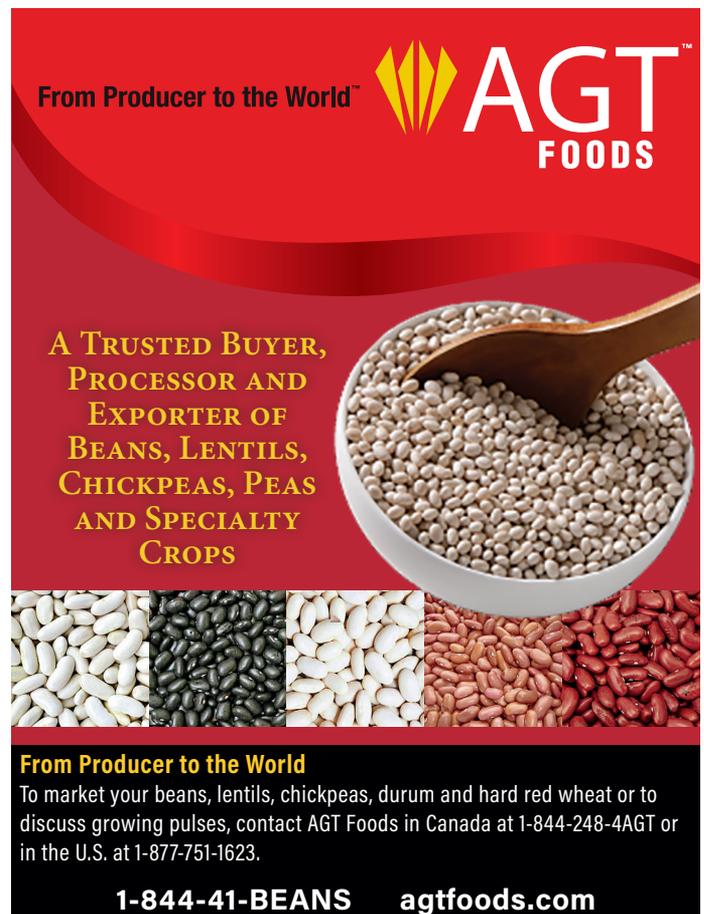
The initial goal was to add from 5% to 30% of dry bean flour to the wheat flour to make the products. However, during the study the researchers determined that for some dry bean classes as much as 50% of dry bean flour could be added to the product.

"The results were very satisfactory. Even with 50% acceptability was not significantly different from the control sample," Zare said. The control sample was 100% wheat flour.

A report on the study will be released by September 2025. 

Key Takeaway: Stone milling

Research on dry bean flour produced by hammer milling and stone milling and how much of the flour can be mixed with wheat flour in making baked dry bean products such as tortillas, chips and crackers, has shown that for some dry bean classes, as much as 50% of dry bean flour can be added to products.



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'Bean there, cooked that' webinar gives ground-up view of beans

By Ann Bailey | Agweek

North Dakota State University Extension researchers are collaborating on a webinar that will give information about dry edible beans from the ground up.

The webinar, "Bean there, cooked that: Unpacking the Nutritional Power of Dry Beans," will be held May 5, 2025. The webinar will be recorded over Zoom and available online afterward.

Ana Carcedo, NDSU Extension broadleaf agronomist, developed the webinar at the request of Mitch Coulter, Northharvest Bean Growers Association executive director, who was impressed with her work on another webinar.

"She was instrumental in partnering with Jeff Stachler to organize this year's 'Getting It Right Dry Bean' webinar," Coulter said. When Carcedo was preparing for that webinar, she had asked Coulter if there were any other dry bean educational topics that Northharvest Bean Growers Association would like to see highlighted.

Coulter told Carcedo that Julie Garden-Robinson, NDSU Extension food and nutrition specialist, had worked closely with the Northharvest Bean Growers Association on dry bean nutrition education that kept Extension staff knowledgeable about dry beans.

"It made a lot of sense to take that education curve a step further to the consumer, nutritionists, and anyone interested in learning more about the science of bean nutrition," Coulter said.

In her 20-minute presentation called "The Epic of Your Meal" Carcedo will tell the story



North Dakota State University is putting on a webinar series about dry beans from the ground up, including how they're grown and how to use them.

Courtesy / NDSU Extension

of food from the field to table, highlighting the implications for consumers.

The webinar is focused on reaching a consumer audience, so Carcedo will focus on giving them an understanding of the work that dry bean farmers do to produce their dry bean crops, she said.

"The risks they have to face, all the decisions they have to make during the growing season. I just really want to highlight all of the work the farmers do for us," she said.

Not only the general public, but also NDSU Extension colleagues who don't work in agriculture will learn from Carcedo's presentation on how farmers produce dry beans, she believes. Meanwhile, she expects to learn from other presenters who will talk about the nutritional value of dry beans.

"I am also a consumer," Carcedo said.

The webinar will feature four other 20-minute topics. The topics are:

- **One cup a Day keeps the Doctor Away:** Shaundra Ziemann-Bolinskie, NDSU Extension food systems program coordinator, will talk about the longevity benefits of dry beans and their impact on blue zone populations. Blue zones are geographic areas with lower rates of chronic diseases and longer life expectancy. Diet, fasting and exercises are factors associated with blue zones. Italy, Greece, Japan, Costa Rica and the United States are Blue Zones.
- **Bean it to Win It:** Nutritious Swaps for Every Dish: Garden-Robinson, and Ziemann-Bolinskie will talk about how dry beans can replace allergenic ingredients in recipes, including the use of aquafaba and options in baking.
- **Beans of Steel:** Boosting your iron taking deliciously: Juan Orsono, NDSU dry bean breeder, will talk about new slow-darkening pinto beans with enhanced iron content developed in North Dakota, and their market debut.
- **Safe and Sound:** Mastering the Art of Dry Bean Cooking: Garden-Robinson will talk about important cooking safety tips, addressing kidney bean risk, trypsin indicators and how to minimize flatulence.

"I am excited for Dr. Carcedo to develop this program and I hope it generates a lot of interest so we can consider broadcasting the message in additional platforms," Coulter said. NBGA

For more information about the webinar, contact Carcedo at a.carcedo@ndsu.edu or 701-835-5736.

Key Takeaway: Bean There, Cooked That

The webinar, "Bean there, cooked that: Unpacking the Nutritional Power of Dry Beans," will be held May 5, 2025. Visit <https://www.ndsu.edu/agriculture/academics/events/bean-there-cooked-unpacking-nutritional-power-dry-beans> for more information.



Minnesota researchers look into using navy beans as a protein ingredient

By Ariana Schumacher and Ann Bailey | Agweek

Nearly two years ago, Pam Ismail, professor at the University of Minnesota and the founder and director of the Plant Protein Innovation Center, and her team obtained funding from the Northarvest Bean Growers Association to study the possibility of turning kidney beans into a source of functional protein ingredients.

According to the PPIC's website, the mission of the Plant Protein Innovation Center is to bring together interdisciplinary researchers and industry partners, including farmers, to deliver to the supply chain new nutritious and functional plant protein ingredients

and products, starting from agricultural practices to ingredient development and application.

Turning kidney beans into a source of functional protein ingredients would open up an additional market for the beans outside of the traditional canned and dry beans that would still be appealing to the consumer.

"The flavor is familiar," Ismail said. "They are pulses, so we are also excited to look into their nutritional value. I have high hopes that they have good nutritional quality as a source of complete protein."

However, kidney beans are difficult to dehull, an upstream process that is necessary to produce protein ingredients. Because of this, the group decided to run the same study, just with navy beans instead of kidney beans. Minnesota also is a major grower of navy beans.

The navy beans were processed at the Agricultural Utilization Research Institute in Crookston, Minnesota. Navy beans, which are a different size, shape and color than chickpeas and dry peas — two legumes (pulses) that already are used

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Beans as protein ingredients

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as sources of protein food ingredients — require a different dehulling and milling process, Ismail noted.

Ismail's study used two varieties of navy beans — Polar and Polar II — grown at two locations in Minnesota.

Their goal is to develop the method that would produce the purest form of protein, which can be used in different food products. They have successfully produced a high-quality protein ingredient.

The protein content of the navy bean flour was 25%, and more than 80% in the isolate form, Ismail said.

The protein isolate was produced through wet fractionation, Ismail explained. Possibilities to produce a protein concentrate (50-55% protein) by dry fractionation is currently under investigation.

Through the dry fractionation process, there would be two products produced: the light fraction would be the protein concentrate fraction, and the heavy fraction would be the starch concentrated fraction. There could be uses for both of these products.

"But we need the ability to do this dry fractionation on a small scale to test the feasibility since the process might need optimization for dry beans, with is a pulse with different size and characteristics compared to peas and chickpeas," Ismail said.

There is an equipment manufacturing company that wants to partner with PPIC to give them a benchtop fractionator (air classifier). There are also other potential collaborators that may help to evaluate the dry fractionation of navy beans. If it does work out, Ismail will provide samples to companies interested in testing dry bean proteins in different food applications.

Based on research findings, the functionality of the navy bean protein outperformed pea and soy proteins.



Pam Ismail, director of the Plant Innovation Center at the University of Minnesota, speaks at Bean Day in Fargo, North Dakota, in January 2025. Jenny Schlecht / Agweek

The research specifically showed that the navy bean protein was more water soluble and formed stronger gels than several commercial plant protein ingredients which Ismail analyzed as a control.

"This was a pretty exciting finding," Ismail said

In the market right now, there are several uses for plant-based proteins, such as egg replacers, high-protein beverages, meat alternatives, high-protein cereals, high-protein bakery products and nutrition bars. Overall, it appears that dry bean protein could be used in a variety of ways in different high protein food applications.

"I am super excited to take it to the next level, produce enough quantity so we can test it in food applications," Ismail said.

Protein demand is increasing as the world population continues to grow. Ismail said there has already been some interest from consumer-packaged goods companies.

"One of the big CPG companies, they said, 'Pam, give us 50 pounds of that ingredient and we will try it in applications.' They were super excited," Ismail said. "So, I am excited for the possibilities."

However, they want to make sure this navy bean protein is not categorized as

ultra-processed. While there is some processing that has to go into making the protein safe to consume, the protein ingredients can be produced without excessive processing. The processes to produce bean protein concentrates can be minimal.

"I mean we have to process foods to make them safe, to enhance their nutrition, and to satisfy consumers palates. But if we reduce the processing upfront, upstream, then when we put them in products, they would have seen less processing in general," Ismail said.

Taking the research further

Currently, there is not a lot of research into dry beans being utilized as sources of protein ingredients, Ismail explained. After the preliminary research through the funding from NBSA, Ismail's team received a USDA specialty crops block grant to expand the research to include navy, pinto, and kidney beans. That research looks at optimizing upstream processes including dehulling, milling, and dry fractionation to produce protein concentrates that will be compared to protein isolates produced following the wet extraction process they are developing using the Northarvest funding.

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Beans as protein ingredients

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"AURI is trying to figure out the best way to dehull these beans since we have now a little bit more funding and a little bit more time. The idea is to also get flour from the kidney and pinto and compared to navy," Ismail said.

Once this dry bean protein hits the market, the demand for dry beans will increase.

"The sky's the limit in where we can put them," Ismail said.

Mitch Coulter, executive director of NBGA, said supporting Ismail's research is an attempt to venture into value-added processing. Along with the various sources

of funding the Plant Protein Innovation Center has received, he said thanks also go to Kelley Bean Company, ADM Edible Bean Specialties Inc., Dr. Juan Osorno and NDSU, "who have been great partners in providing bean classes for this work."

"We believe strongly that there is an opportunity for beans to play in the ingredient market. We see more and more interest and opportunity to blend bean ingredients into commercial products to take advantage of the nutrition, protein, and fiber content of dry beans," he said.

Coulter said the work will build a data set to determine the viability of different classes of beans as sources of functional protein

ingredients for different application. That can build value and demand.

"This will increase the value of bean classes as we identify high value end uses. The data set will provide the information that can be used by ingredient processors to adopt the production of bean protein concentrate and isolates," he said.

"Protein is in high demand so if we could say 'You can use kidney bean protein concentrate or navy bean protein concentrate, using minimal processing and it has good nutrition, good functionality and it performs well in food applications, then great, growers will have more value for their beans,'" Ismail said. **NBGA**

Key Takeaway: Protein source

Researchers in Minnesota are looking at ways to utilize dry edible beans as a protein ingredient for food products, and so far, the functionality of the navy bean protein outperformed pea and soy proteins.



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You'll also read about some industry research projects. Northern Crops

Institute, for instance, is conducting research into the physical and chemical properties of a variety of bean types for a better understanding of how to best

process beans. NCI also has another research project underway, looking into hammer and stone milling methods to turn dry beans into flour.



Norm Krause, Area 2 Director for the Minnesota Dry Bean Research and Promotion Council and a dry bean farmer near Staples, Minnesota, visited Argentina to learn more about the crop's production there. Contributed / Northarvest Bean Growers Association

In addition to projects for growers and the bean industry, NDSU Extension is putting together a comprehensive webinar for consumers coming up on May 5 called, "Bean There, Cooked That," which focuses on educating non-farmers not just on where beans come from, but to also the nutritional value beans bring to our table.

This is a packed issue, and we sure hope it is of interest and use for our fellow growers. We appreciate the significant efforts by all involved to provide it; it's no small feat.

On behalf of all the NBGA directors and Council members across Minnesota and North Dakota, have a safe and successful spring planting season.

Thanks for reading,

NORM KRAUSE
CHAIR, NBGA RESEARCH COMMITTEE
Minnesota Dry Bean Research and Promotion Council (District 2) 




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