

ESTABLISHING ALFALFA BY INTERCROPPING WITH SUNFLOWER OR SORGHUM

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New research on establishing alfalfa in intercroppings with sunflower or sorghum could lead to increased alfalfa acreage and profitability in North Dakota and South Dakota. Northwestern Minnesota farmers may also find such systems viable. Funding for the project, totaling \$587,671, was recently awarded through the 2022 Alfalfa Seed and Alfalfa Forage Systems Research Program administered by USDA's National Institute for Food and Agriculture (NIFA).



Marisol Berti

Planting alfalfa with sunflower has “great potential,” says North Dakota State University’s (NDSU) Marisol Berti, the project’s lead researcher who has also studied corn-alfalfa intercropping systems. “We’re using the cash crops as a nurse crop; we’re trying to get alfalfa started while we’re growing something else,” she points out.



At right, during a Sept. 21 NDSU field day, Mikayla Tabert shows plots intercropped with alfalfa and sunflower while discussing the research involved. Tabert is an M.S. student at NDSU conducting thesis research on alfalfa-sunflower intercropping. Photos: Marisol Berti

The alfalfa-sunflower pairing intrigued Berti after she realized alfalfa and sunflower are grown in many of the same counties within the Dakotas, which lead the nation in sunflower production. Intercropping systems can reduce cash crop yields, she warns. However, farmers can avoid low alfalfa seeding-year yields and offset cash crop losses by potentially producing 5-6 tons/acre of alfalfa from four cuttings the next year.

North Dakota farmers have recently begun growing more forage sorghum after drought affected their forage supplies, and those plantings have been successful, says Berti, who will also conduct alfalfa-forage sorghum trials. South Dakota farmers grow grain sorghum, and Christopher Graham, South Dakota State University Extension agronomist, will oversee alfalfa-grain sorghum intercropping studies in that state.

Berti started preliminary alfalfa-sunflower trials this year. Last week, she showed North Dakota farmers sunflower plots planted at 30” and 60” row spacings, with alfalfa established between, at the NDSU Cover Crops, Intercropping, and Soil Health Field Day.

“Sunflower is a broadleaf and shades a lot more than corn; that’s why the experiment is in 30” and 60” rows,” she says. “We think it’s going to work out better on 60” rows than 30”.” Besides shading from sunflower, alfalfa in 30” rows may



NDSU’s Cover Crops, Intercropping, and Soil Health Field Day last week gave farmers a chance to see new research on alfalfa-sunflower intercropping, which allows the legume to be established with a cash crop.

decrease in population. “We have to test to see if we can grow in 30” rows, but if we’re seeing too much reduction on population of alfalfa, we may have to do 60”. Farmers are going to say they’ll be getting less yield from sunflower, but we’re trying to get them to look longer term than one year. It’s true you lose some yield for the cash crop of that year, but we are calculating the loss compared with the gain we’re getting on yield in the next year in alfalfa.”

For weed control, alfalfa in an intercropping system will help suppress weeds along with a herbicide program, the researcher says. The project utilizes Clearfield sunflower, a hybrid resistant to the herbicide Beyond, which provides broadleaf weed control. Beyond contains the active ingredient imazamox, also used with alfalfa.

The profitability of the intercropping systems will be calculated by Erik Hanson, with NDSU’s Agribusiness and Applied Economics Department. Other benefits that alfalfa offers in such a system include its ability to fix nitrogen to be used by other crops and its role as a cover crop to protect soil.

“Alfalfa is a fantastic crop for scavenging soil nutrients,” Berti adds. “It is a legume that fixes nitrogen but before it does that it uses the nitrate in the soil. So you lose fewer nitrates in the water or nitrous oxide, which is a greenhouse gas, to the air.”

“We’re also evaluating soil carbon; we know that alfalfa sequesters more carbon than annuals because it’s a deep-rooted perennial. We don’t know if intercropping alfalfa will actually enhance the carbon in the soil.”

In addition, Berti’s team will work to determine how much nitrogen alfalfa can provide another crop. “We get a lot of questions now that fertilizer prices are really high,” she says. “Can we reduce nitrogen needs to the cash crop by having alfalfa in the intercropping? Using radioisotopes, the percentages of nitrogen fixed by alfalfa and that from the soil can be calculated, she says.

Molecular studies are also in the works by USDA-Agricultural Research Service scientists, evaluating modifications in plant growth within intercropping systems, Berti says. “One thing that has been demonstrated in other studies – we haven’t demonstrated it yet but are going to try to do that – is that alfalfa fixes a lot more nitrogen when you have it in an intercropping than when you grow it alone.”

“By intercropping, we’re causing a change in gene expression; plants under competition react different to be more efficient, because they have to live with that other crop,” she says.

One more benefit Berti believes will come from intercropping alfalfa with other crops: diversity. “We moved from diverse cropping systems in the past to very low-diversity monocultures; in the Midwest we’re down to mainly corn and soybeans. Our efforts hope to give back some diversity by proposing these systems, and then we’re studying all the changes that happen because of these systems – to the environment and to the plants. We will have the economic part, too.”



Alfalfa established in sunflower as shown at the Sept. 21 NDSU Field Day.

Berti and her colleagues, as part of the project, are tracking the diversity of insects that exist on intercropping systems, which bring in not only pollinators, but also predators of insect pests. She is looking at how intercropping, and adding a flowering plant such as alfalfa, can potentially reduce the need for insecticides.

Berti was also awarded nearly \$750,000 funding as part of a \$10 million grant by the Agriculture and Food Research Initiative’s Sustainable Agricultural Systems Coordinated Agricultural Program. That program is studying diverse perennial forage systems and ties in with her intercropping work.

“We get a lot of calls from people who have never grown alfalfa who are starting to think of it just because of the nitrogen,” Berti says. “The other thing that helps is alfalfa prices have gone up a lot because so many states are in drought and need hay. A lot of people do not grow alfalfa because they don’t think it is a profitable crop.” By intercropping and “skipping” the seeding year, alfalfa should increase in value to farmers, she believes.

“Intercropping is a new system to see if we can get farmers to plant alfalfa,” Berti concludes. “If they integrate it in their crop rotations, that’s fine, too, because that’s the goal: to get alfalfa back into the agricultural landscape.”