



United States Department
of Agriculture
Northern Plains Climate Hub



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MP-131.3
Jan 2017



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Minimizing Extreme Weather Impacts: Cover Crops 101

Introduction

Agricultural producers are facing increased extreme weather events and variable weather patterns in western states. The Northern Plains region is not a stranger to these events; however, these events can still be a problem in the management of agricultural land. Farmers have identified several management practices to buffer the effects of variable weather or extreme weather events; one is planting cover crops.

What are Cover Crops?

Planting cover crops is a management practice utilized to support and improve soil quality, which is generally measured through the amount of organic matter present in the soil. Cover crops were traditionally planted for the sole purpose of preventing soil erosion through the use of living vegetation and living roots. They are now being planted for various benefits, which includes but isn't limited to: improving soil physical and biological properties, increasing soil fertility, increasing water infiltration, and increasing organic matter.

A cover crop can be a simple single-species crop or a mixed-species crop. The typical plants used in cover crops are legumes, grasses, and brassicas (mustard family), with each species contributing specific benefits to the cover crop. For example:

- Legumes are used for increasing nitrogen in the soil.
- Grasses are good for inhibiting soil erosion.
- Brassicas are used for breaking through compaction layers.

Because of their various contributions, the one species or mix planted in a cover crop should be selected according to the specific management objective. There's potential of no benefits or even negative impacts, such as reduction in soil nitrogen, if cover crops are not managed correctly.



1. The first driving factor in picking a cover crop is the purpose or objective for that cover crop, such as reducing soil erosion or increasing nitrogen.
2. Once the purpose is decided, other influencing factors need to be considered to pick the correct species or mix.

Factors that play a role in the feasibility and success of cover crops include, but are not limited to the following:

- farm location and elevation
- annual precipitation and timing of precipitation
- length of growing season
- irrigation abilities
- factors of the cropping system (e.g., types of crops grown, rotation, planting/harvest, pesticides used, etc.)
- timing for planting the cover crop
- equipment
- how the cover crop will be terminated
- how will the cover crop residue will be managed

Benefits of Cover Crops

The first and basic benefit to cover crops is holding the topsoil in place between main crops. Cover crops also increase organic matter, which increases water infiltration, increases soil microbial activity, increases soil moisture retention, reduces soil compaction, and retains soil nutrients. As a general rule of thumb, grasses are more likely to increase soil organic matter than legumes or brassicas. With that said, any plant species that creates large amounts of biomass (dry weight per acre) can contribute to increased organic matter. Hence, low-growing cover crops typically do not produce enough biomass to increase soil organic matter.

Besides increasing soil organic matter, legumes are planted in cover crops for their ability to fix nitrogen. For this to occur, legumes need to be inoculated at planting with a rhi-

Through these benefits, cover crops allow an agriculture operation to be more resilient to extreme weather events and variable weather patterns. For instance, cover crops hold the soil in place during strong wind storms, absorb rain during severe thundershowers that drop large amounts of water in a short period, and retain soil moisture for as long as possible during drought conditions. These qualities contribute to the productivity of a field before, during and after the main crop.

– Producer on economic benefit of cover crops

zobial bacteria, which actually does the fixation of nitrogen. The rhizobial bacteria creates nodules on the roots of the legume where the bacteria lives in a symbiotic relationship with the plant.

Other benefits attributed to cover crops include increasing or attracting certain insect populations, protecting and reducing soil compaction, suppressing weed germination and growth, improving soil microorganism populations, and providing habitat and food sources for birds, mammals, insects and other arthropods. Depending on the specific operation, cover crops, such as sorghum sudan grass, can also provide more forage for grazing livestock either standing or baled. Cover crops can also accumulate snow within their standing biomass, which can retain moisture in the field for the spring thaw.

Risks of Cover Crops

Cover crops are similar to other management practices – they aren't a guarantee or perfect fit for every situation or cropping system. The first concern with cover crops is the ability to establish the crop and gain enough growth to provide the desired benefits. This situation arises in areas with low precipitation and/or short growing seasons that do not allow the cover crop to germinate or attain proper biomass. This could also be a situation when the cover crop is double-cropped after the main crop. Failure to establish or receive the benefits from the crop would have some economic impact to the operation in terms of time, fuel, seed cost, etc.

Depleting reserves is another concern. All plants have basic requirements for growth, and cover crops are no different. These basic requirements include water and nutrients. If a cover crop is not implemented or managed correctly, it can impact the field's water and nutrient reserves. A lack in these reserves could affect the yield of the following main crop, especially in dryland situations, or cause an economic impact to the operation in the cost of more fertilizer or water.

Increased pest management is another potential economic effect of cover crops. If a cover crop is not terminated prior to maturing (setting seed), the cover crop can potentially become a weed problem for the next crop or crops. Cover crops can also provide habitat for insect pests and diseases, which can become a problem to future crops, resulting in increased costs for pest/disease management, a reduction in yield, and/or complete crop failure. An example is fusarium head blight in barley.

One indirect concern is the potential impact of cover crops on local commodities and markets, specifically in seed production. Seed production follows strict guidelines and regulations to ensure specific variety production and quality of seed, which is set specifically for each individual specie of plant grown for seed. An example would be radish seed production, which requires a 3-mile isolation radius around

the field, meaning no other varieties can be grown within this radius to ensure exact variety production. If radishes were planted in a cover crop in this isolation area, the entire radish seed crop could not be sold for seed, creating a significant economic loss to the producer.

Conclusion

Cover crops can be a great management practice; however, they are not for everyone or every operation. Prior to planting, be sure to consider the objective(s) for planting a cover crop, select the crop(s) that will best achieve the objective, consider the pros and cons to the cover crop, and weigh the economic risks and benefits. Cover crops are not a cookie cutter management practice and should be customized to the individual operation and objectives. This is one management practice that is worth doing a lot of homework on prior to implementing and then experimenting on a small acreage size prior to converting the entire operation. Contact your local Extension office for more information.

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