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SOIL COVERAGE

Many Idaho soils are prone to erosion from wind or water. One of the most effective ways to reduce erosion is by using soil cover, also known as “soil armor.” Producers can increase soil coverage outside of times when crops are growing by leaving crop residue on the field or planting cover crops after harvest of cash crops to protect soil over winter. Coverage improves soil health above ground by protecting soils from the elements (primarily sun and wind) and below ground by improving soil structure and fertility. Farms can achieve many benefits from covering their soils including:

- Improved soil organic matter and biological diversity that provide nutrients and reduce the need for additional fertilizers.
- Reduced evaporation rates from sun exposure and ability to maintain a more optimum and consistent soil temperature.
- Reduced erosion from wind and rain events.
- Improved soil structure and water infiltration.
- Suppression of weed growth by limiting sunlight and creating competition.

WHERE TO START

RESIDUE MANAGEMENT

While harvesting all plant matter on a field, such as corn stalks, presents economic opportunities in the short-term, leaving crop residue on the field has soil health value that can lead to economic benefits in the long-term through reduced fertilizer costs.

Considerations for residue management include:

- Residue should provide greater than 50% coverage of soil surfaces across the field.
- When distributing residue, avoid heavy bands or mats that are slow to breakdown or make planting difficult.
- Residue coverage keeps spring soils cool and retains moisture. This may require adjustments in planting dates but will also maintain soil moisture through the season longer.
- Bacteria may tie-up nitrogen fertilizer while breaking down residue in the beginning, but as soil organic matter increases, fertilizer needs will decrease.
- Residue management maximizes benefits when paired with no-till or minimum tillage systems.



Figure 1. Field site pre-planting with residue.



Figure 2. Field site with residue and cover crop emergence/Brad Johnson.

COVER CROPS

Besides providing soil coverage, planting cover crops after harvest improves nutrient cycling and nutrient scavenging by having living roots in the soil for a longer period of time. Similar to residue management, planting cover crops may require an initial investment but will reduce costs and may even provide additional revenue from selling the crops or grazing livestock.

There are four main categories of cover crops, each with their own benefits:

Legumes – Make atmospheric nitrogen available to plants and tend to be lower in carbon, resulting in faster breakdown.

Brassicas – Provide rapid fall growth, produce biomass, break up compacted soil and produce glucosinolates, chemicals that inhibit some weed species.

Grasses – Produce a large amount of residue that tends to last longer and are good for using excess nitrogen located lower in the soil profile and making it available for future crops.

Forbs – Provide deeper roots than grasses, often with higher mineral content, and also attract pollinators.

Considerations for planting cover crops for soil armoring:

- Plant cover crop mixes that can provide greater benefits than single species and can increase the likelihood of successful emergence.
- Select species based on desired goals beyond soil armoring (e.g., reduced soil compaction, increased fertility and/or nitrogen fixing).
- Select species and mixes appropriate to your context, including the amount of remaining growing days, available irrigation or soil moisture, and plans for the following year's cash crop.
- Select species that won't compete with cash crops or have the potential to become a persistent problem, such as hairy vetch or Italian rye.
- Consider termination methods that support soil health, such as minimized-tillage, mowing, roller-crimping or livestock grazing.

IN THE FIELD

Justin Place farms in Hamer, Idaho, where he grows wheat, barley, alfalfa and mustard. With extremely sandy soils and high winds, farmers in this area are challenged by continual wind erosion that degrades the soil. After implementing residue management and no-till to address erosion, Justin partnered with The Nature Conservancy to further advance his soil coverage and pursue more soil health benefits. Through the partnership, Justin planted 60 acres with a cover crop mix that included legumes to build nitrogen (Austrian winter peas, common vetch and red clover); brassicas to help with soil compaction (radish and purple top turnips); and safflower, rapeseed and black oil sunflower for extra diversity and nutrient cycling. The mix was also chosen for its low carbon-to-nitrogen ratio, which will allow residue to break down faster and provide feed for sheep grazing in the late fall/early winter.

The cover crop mix was planted at the beginning of September post-harvest directly into residue with a no-till drill. After several weeks and irrigation applications, the cover crop mixture showed successful emergence and growth with all species of the mix present. Figure 1 shows the coverage provided by residue. As figure 2 illustrates, the cover crops increase the amount of coverage and will provide the added benefits of more days of living roots, nutrient cycling and improve soil structure.

"After watching a documentary about the Dust Bowl, I realized my farm looked just like the photos from that era every spring and fall. Soil erosion was a constant issue and we needed to do something different. The top soil was leaving the field and piling up along the fences. We were using water just to try to hold the soil and crops in place every spring. Once we started leaving standing stubble and no-tilling, we used less water, fuel, and kept the soil. We did have a learning curve with how to handle crop residue and weed control at first but now feel we have a pretty good handle on things. Our yields are now just as good if not better than before we started down this no-till road." - Justin Place



Photo courtesy Justin Place

ADDITIONAL RESOURCES

Hunter, L., Falen, C., & Moore, A. (2014). *Cover Crops for High-Desert Farming Systems in Idaho*. University of Idaho Extension Bulletin 889. <https://www.lib.uidaho.edu/digital/uiext/items/uiext33163.html>

Myers, R., Weber, A., & Tellatin, S. (2019). *Cover Crop Economics: Opportunities to Improve Your Bottom Line in Row Crops*. Sustainable Agriculture Research & Education (SARE) Outreach Technical Bulletin. <https://www.sare.org/resources/cover-crop-economics/>

St. John, L., Tilley, D., & Pickett, T. (2017). *Cover Crops for the Intermountain West*. USDA-Natural Resources Conservation Service, Boise, Idaho. Plant Materials Technical Note No. 67. January 2017. <https://www.nrcs.usda.gov/plantmaterials/idpmctn13084.pdf>

USDA-Natural Resources Conservation Service, Idaho. (n.d.). *Idaho Soil Health*. Retrieved March 2023, from <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/idaho/idaho-soil-health>

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The Nature Conservancy is a global conservation organization dedicated to conserving the lands and waters on which all life depends. In Idaho, we're bringing people together to drive transformational change and tackle our biggest conservation challenges. Visit us at nature.org/idaho.