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## Cover Crops- Keeping Soil in Productive Condition

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Cover crops help to increase the productivity of future row crops by enhancing the physical, chemical, and biological qualities of the soil. The goal of this essay is to analyze current advancements in cover crop practice in terms of potential benefits and drawbacks for annual crop yield and long-term soil quality. A cover crop's desirable characteristics include its ability to establish quickly under less-than-ideal conditions, provide adequate dry matter or soil cover, fix atmospheric nitrogen (N), establish a deep root system to facilitate nutrient uptake from lower soil depths, and produce organic matter with a low carbon/nitrogen (C/N) ratio. Cover crops can be leguminous or non-leguminous. Leguminous cover crops supply a significant quantity of biologically fixed nitrogen to the primary crop, as well as a low C/N ratio that facilitates decomposition. Legume cover crops can also assist increase the concentration of plant nutrients in the soil's surface layers by absorbing low accessible nutrients in the soil profile. Because some non-leguminous cover crops have a higher N scavenging capability than leguminous crops, and because the growth of these scavenging grass cover crops is often limited by N deficit, planting grass/legume mixes appears to be the ideal method for maximizing cover crop advantages.

### INTRODUCTION

A cover crop is a type of plant planted primarily for the benefit of the soil rather than the production of the crop. Cover crops are widely employed to reduce weeds, regulate soil erosion, aid in the development and improvement of soil fertility and quality, control diseases and pests, and enhance biodiversity. Cover crops are usually grasses or legumes, although they can also be various types of green vegetation. A cover crop is grown in the off-season before the field is required for growing the cash crop.

In essence, a cover crop prepares the ground for a cash crop that has been received. Cover crops are plants that are cultivated outside to improve the soil's condition. They aid in the enrichment of soil, the prevention of erosion, the regulation of water, the reduction of weeds, the increase of biodiversity, and the overall development of farming. These crops are used in landscaping to improve the appearance of a property. Cover crops remain low to the ground, are inexpensive to grow, and require little upkeep. Buckwheat, clover, rye, field peas, and sudan grass are all popular cover crops. Instead of raised beds, cover crops are typically utilized in vast fields or in-ground gardens.

### **ORGANIC GARDENING WITH COVER CROPS**

Cover crops are an important part of a sustainable agricultural strategy. These crops use biological nitrogen fixation to give fertility to the soil without needing chemical fertilizers. A cover crop may minimize soil compaction, regulate soil moisture, reduce total energy consumption, and provide additional fodder for livestock in a natural way. Small farmers adopt certain cover crops based on their needs and aspirations, as well as the land's overall requirements. Summer cover crops are commonly used to fill in gaps in crop rotations, assist enrich the soil, and control weeds. Winter cover crops keep soil in place and provide ground cover during the winter. These plants have the ability to repair nitrogen levels in the soil.

### **ADVANTAGES OF COVER CROPS**

Cover crops provide many soil health & environmental benefits. Some examples are;

#### **REDUCE SOIL COMPACTION**

Small farmers adopt certain cover crops based on their needs and aspirations, as well as the land's overall requirements. Summer cover crops are commonly used to fill in gaps in crop rotations, assist enrich the soil, and control weeds. Winter cover crops keep soil in place and provide ground cover during the winter. These plants have the ability to repair nitrogen levels in the soil.

#### **MANAGE NITROGEN & NUTRIENTS**

When there are no growing plants to preserve nitrogen, it is most commonly seen in huge concentrations. Keep live roots in your soil to scavenge nutrients and return nitrogen to the soil,

allowing cash crops to benefit. Legume cover crops are excellent at returning nitrogen to the soil.

#### **GREATER WATER INFILTRATION & IMPROVES WATER-HOLDING CAPACITY**

Cover crop waste helps to reduce evaporation, which helps to keep moisture in the soil during droughts. Increased living matter in the soil enhances the soil's capacity to absorb water down to the root zone, which promotes water infiltration.

#### **PREVENT EROSION**

Wind and water runoff are more likely to erode ground that is exposed to the elements. This might involve removing the rich topsoil and compacting the soil underneath it, making planting considerably more difficult. Cover crops assist to stabilize the soil, reduce run-off, and improve the structure of the soil by binding it together.

#### **WATER MANAGEMENT**

In the face of more unpredictable weather, cover crops assist to stabilize yields and increase moisture availability. Cover crops absorb water and allow you to enter the field sooner than if you didn't have a cover crop in place. In the event of a drought or if dryland farming is practiced, cover crops can still assist improve yields while being highly water efficient. The cover crop mulch enhances water penetration and conserves moisture in the summer if you employ no-till farming. Increased soil pore space, as well as added carbon and root pathways, can improve soil water retention capacity in any tillage scheme.

#### **WEED MANAGEMENT**

During the cover crop growth stage, cover crop stands frequently outcompete weeds. Most germinated weed seeds are unable to complete their life cycle and reproduce. The cover crop can create a practically impenetrable mat if it is flattened on the soil surface rather than absorbed into the soil as green manure once its development is completed. Weed seed germination rates are often reduced as a result of this dramatic reduction in light penetration to weed seeds. Even when weed seeds germinate, they frequently run out of stored energy before developing the structural ability necessary to break through the cover crop mulch layer. This is known as the cover crop smothering effect.

**LESS WORK**

Cover crops save time and energy for permaculturists. There is no need for composting or mulching because they provide so many nutrients to the soil. Cover crops are a fantastic choice for improving the soil quality over a broad region because of this.

**TYPES OF COVER CROPS****GRASSES**

Grasses have fine, fibrous root systems that are ideal for retaining soil and enhancing soil structure. Cover crop grasses should be rapid growing and relatively easy to destroy, either chemically, mechanically, or via cold weather. Grasses cannot fix nitrogen from the air, but they can collect a significant quantity from the soil.

**Commonly used Grass cover crops:** Rye, Winter wheat, Oats, Ryegrass, Pearl millet, and Barley.

**LEGUMES**

Leguminous plants are excellent cover crops. Soybeans, peas, and beans are examples of summer annual legumes that are typically cultivated exclusively during the summer. Crimson clover, hairy vetch, and underground clover are winter annual legumes that are often sown in the fall and depended on to overwinter. Crimson clover and field peas, for example, can only overwinter in light frost areas. Hairy vetch can withstand relatively harsh winter conditions. Red clover, white clover, sweet clover, and alfalfa are all biennials and perennials. In chilly, short-season climates, crops that are typically produced as winter annuals can also be grown as summer annuals. The capacity of legumes to fix nitrogen from the atmosphere and contribute it to the soil is one of the major reasons for their use as cover crops. Hairy vetch and red clover, which create a lot of growth, can provide over 100 pounds of nitrogen per acre to the next crop. Legumes including field peas, large flower vetch, and red clover provide just 30 to 80 pounds of nitrogen per acre. Other advantages of legumes include attracting beneficial insects, reducing erosion, and providing organic matter to soils.

**Commonly used legume cover crops:** red clover, Field peas, Hairy vetch, White clover, berseem clover, sweet clover, and alfalfa.

**NON-LEGUME BROADLEAVES**

These broadleaf crops might be used as green manure crops or to provide a diverse plant species and root system for soil improvement. They are unable to fix nitrogen from the air, but they can absorb massive amounts from the soil. Because the majority of these crops aren't winter-hardy, extra management methods aren't usually necessary. Allowing them to go to seed, on the other hand, can result in a serious weed issue.

**SEEDING METHODS IN COVER CROPS**

Some methods & equipment might includes

**BROADCASTING BY AIR**

A broadcast seeder placed on an airplane can be used to plant cover crops. This method works well for bigger seeds such as rye and wheat, but not for tiny clover or grass seeds. When soils are too moist for ground seeding, air broadcasting allows for over sowing of an existing crop or planting. Despite the fact that seed germination may be delayed and a larger sowing rate may be required.

**BROADCASTING BY GROUND**

This is the most common and precise seeding method, which can be accomplished with spinners, drop tubes, or air pressure. The most important element is correctly measuring seed before spreading it. Ascertain that the seeding pattern is suitable for complete and even ground cover. Seeds spread in different ways depending on their weight, with heavier ones spreading further than lighter seeds. When heavier and lighter seed mixes are applied, this might cause problems. Broadcast seeders can be attached to tractors, tillage equipment, and other machinery.

**INCORPORATION**

With shallow soil integration, cover crop seeds produce superior stands. Combining broadcast planting with a tiller or other integrating tillage instrument can yield excellent results. The mix chosen is determined by the timing of sowing and the management techniques in place. Because most cover crop seeds are tiny, they don't require much soil cover and only require good seed-to-soil contact..

**DRILLING**

Because most drills have a legume or grass seed box, this is another ideal way to get a cover crop started.

Drilling is a good way to metering tiny seeds (bigger seeds should be drilled using the conventional drill box) and ensures proper placement and seed-to-soil contact. Drilling is highly effective in no-till farming methods.

### **THE SEASON FOR PLANTING FROST-SEEDING**

Seeding a cover crop into a recognized crop in late winter to very early spring. Example: Seeding red clover into wheat in March month.

### **INTER-SEEDING**

It is occasionally feasible to sow a cover crop within a growing cash crop to extend the growth period of the cover crop. The stage of the cash crop, cover crop species selection, and environmental conditions must all be carefully considered. To avoid concerns like cash crop yield loss (due to competition), lower harvest efficiency, and unsuccessful cover crop establishment, consult an experienced cover crop user.

### **PRE OR POST SEASON SEEDING**

Cover crops must be planted early in the growing season before late-season vegetables or field crops or after cash crop harvest. Example: Cereal rye following potato harvest.

### **PLANTING**

Cover crop seed is just as essential as commercial seed, and the manner of administration has an impact on seed germination rate and stand quality. Saving money and ensuring adequate coverage may both be achieved by using equipment that permits precise application at the proper pace. Because cover crop seed sizes and weights vary, matching equipment to the seed and management technique is critical.

### **PEST MANAGEMENT**

The impact of cover crops on agricultural pests is complex. Cover crops can help to decrease insect,

disease, worm, and weed infestations by paying close attention to cultivar selection, location, and timing. Buckwheat, clovers, and brassicas are examples of cover crops that attract and keep beneficial insects when allowed to blossom. Some cover crops, such as sudan grass, brassicas, and mustards, control weeds and minimize splashing of soil-borne diseases onto leaves, while others, such as sudan grass, brassicas, and mustards, reduce verticillium wilt and other soil pathogen populations. Other mulches have been tested for nematode suppression.

### **INSECTS MANAGEMENT**

This diversification is crucial for attracting a diverse range of insects to the plot. You will attract more bug species to the location by growing cover crops rather than leaving barren ground. Some insects will prey on others, preventing populations from exploding, which might reduce your crop output. In addition to increasing the number of pollinators on your property, attracting insects aids in the propagation of garden plants.

### **CONCLUSION**

The primary purpose of cover crops is to prevent and regulate soil erosion. The speed of running water is decreased as the quantity and density of cover crops grow, and the soil remains intact. Cover crops keep the soil in place by increasing porosity and therefore enriching it for a few more years. Cover crops, often known as green manure, improve the fertility of the soil. They're great for boosting the amount of nitrogen in the soil, which is a crucial ingredient for plants. More crops grown in the soil implies more organic matter, which improves the soil's quality and results in healthier and better food. Cover crops also aid in the management of soil water and moisture levels, as well as providing stiff competition for weeds that develop in the soil. Some low-value cover crops can be used as baits to fool and divert pests away from the better, more valued crops. Cover crops must be considered companion plants when utilized in this manner.