The A-B-C's of COVER CROPS

Cover crops are defined as any crop grown to provide soil cover, regardless of whether it is later incorporated into the soil for the purpose of soil improvement.

Potential benefits of cover crops:

1. Suppress weeds
2. Suppress disease
3. Suppress Nematodes
4. Erosion Control
5. Increase Water infiltration
6. Recycle Nutrients
7. Attract beneficial insects
8. Reduce Soil Compaction
9. Add Organic Material
10. Increase Soil Organic matter
11. Adds Nitrogen when using a legume
12. Reduce Nutrient Leaching
13. Increased seed yields for crops following the cover crop – for up to 2-3 growing seasons!

Green manuring involves the soil incorporation of any field or forage crop while green or soon after flowering for the purpose of soil improvement.

A major benefit obtained from green manures is the addition of organic matter to the soil. During the breakdown of organic matter by micro organisms, compounds are formed that are resistant to decomposition – such as gums, waxes and resins. These compounds and the mycelia, mucus and slime produced by the micro organisms – help bind together soil particles as granules, or aggregates. A well-aggregated soil tills easily, is well aerated and has a high water infiltration rate. Increased levels of organic matter also influences soil humus, Humus – the substance that results as the end product of the decay of plant and animal material in the soil – provides a wide range of benefits to crop production.

As a rule of thumb the portion of green manure N available to a following crop is about 40% to 60% of the total amount contained in the legume. Dr. Greg Hoyt, an agronomist at North Carolina State University has estimated that 40% of plant tissue nitrogen becomes available the first year following a cover crop that is chemically killed and used as a no-till mulch. He estimates that 60% of the tissue N is released when the cover crop is incorporated as a green manure rather than left on the surface as a mulch. Lesser amounts are available for the second or third crop following a legume, but increased yields are apparent for two to three growing seasons.

Plant residue produces glucosinolates. Glucosinolates (produced mainly by the brassica family) are not toxic, but their breakdown products are. Myrosinase enzymes are responsible for the degradation of glucosinolates, but myrosinases and glucosinolates are

located in different compartments of the cell. Tissue damage triggers the “brassica bomb”. Isothicyanate is the most important breakdown product of glucosinolates. Isothicyanate is used in the commercial fumigant Vapan. Isothiocyanate activity has shown effectiveness on disease, insects, nematodes and weeds.

Brassica species reduce compaction, recycle nutrients, control weeds and suppress disease. **Brassica Cover Crops** are called Biofumigants because they release isothiocyanate upon damage of their tissue. The process of incorporating fresh residues of brassica species in the soil is called Biofumigation.

<u>To maximize biomass production and glucosinolates content:</u>
1. Select the right species – GroundHog Radish, Pasja Forage Turnip, Appin Forage Turnip, Bonar Forage Rape
2. Appropriate seeding rate
3. Seeding time (tolerate freezing temperatures down to 28 F)
4. Initial Fertilizer if soil is poor
5. Allow cover crop to grow up to flowering stage (do not allow seed set)

Legume Cover Crops are commonly used for nitrogen contribution because of their inherent capacity to fix atmospheric N into usable form to be used by succeeding crops.

Nitrogen accumulations by leguminous cover crops range from 40 to 200 lbs. of N per acre. The amount of N available from legumes depends on the species of legume grown, the total biomass produced and the percentage of nitrogen in the plant tissue. Cultural and environmental conditions that limit legume growth – such as delayed planting date, poor stand establishment and drought – will reduce the amount of N produced. Conditions that encourage good N production include getting a good stand, optimum soil nutrient levels and soil pH, good nodulation and adequate soil moisture.

In general, legumes need P for N fixation but are poorer scavengers of P in the soil. Since legumes acidify the soil, they tend to make P more available when P is limiting. In general, grass cover crops store and supply more P than legumes because they have a finer root system and more surface area than legumes with a tap root. In mixed legume-grass pastures, the legume cycles N to the grass and the grass cycles P to the legume.

(*The C:N ratio of plant tissue reflects the kind and age of the plants from which it was derived. As plants mature, fibrous (carbon) plant material increases and protein (nitrogen) content decreases. The optimum C:N ratio for rapid decomposition of organic matter is between 15:1 and 25:1.)

Grass Cover Crops are widely used for soil erosion control, forages, improving soil structure and reducing compaction, carbon sequestration, recycling nutrients and weed control. They do not produce Nitrogen. If using annual ryegrass as your cover crop, be aware that not all annual ryegrass is

winter hardy, so be sure to choose Bruiser Annual Ryegrass for maximum benefit. Bruiser was selected through a six cycle breeding program for disease resistance and cold tolerance.

Some **other cover crops** are grown to suppress insects, disease, weeds or attract beneficial insects. In addition to nitrogen from legumes, cover crops help recycle other nutrients – Potassium, Calcium, Phosphorous, Magnesium, Sulfur to name the most common.

Buckwheat is neither a legume nor grass, but is a fast-growing summer cover crop and is excellent for nutrient recycling (e.g. phosphorus, honeybees and allelopathy --plants that inhibit or slow the growth of other nearby plants by releasing natural toxins or "allelochemicals.)

USES:

Cover crops can be planted in the alleyways between rows in orchards, vineyards, Christmas Trees, berries, windbreaks and field nursery trees to control erosion and provide traction.

Cover crops can be used to fill a niche in crop rotations, to improve the conditions of the soil or to prepare land for a perennial crop. Legumes may be grown as summer green manure crops to add nitrogen along with organic matter. Non-legumes such as ProMax sudangrass and buckwheat are grown to provide biomass, smother weeds and improve soil tilth.

Cover crops established after the harvest of the main crop are used primarily to reduce nutrient leaching from the soil. For example, planting Groundhog Radish following corn harvest helps scavenge residual nitrogen, thus reducing the possibility of ground water contamination and also functions as a winter cover crop.

If the desire is to also provide a forage crop, short rotation forage crops can function as both cover crops when they occupy the land for pasturage or haying, and as green manures when they are eventually incorporated or killed for a no-till mulch. Examples include legumes sods of alfalfa, sweet clover, trefoil, red clover and white clover, as well as grass-legume sods like fescue-clover pastures. For maximum soil-improving benefits, the forage should not be grazed or cut for hay during its last growth period, to allow time for biomass to accumulate prior to killing. Forage legumes are valuable in rotations because they generate income from grazing or haying and still contribute nitrogen from regrowth and root residues.

VEGETATION MANAGEMENT TO CREATE A COVER CROP MULCH:

Herbicides are the most commonly used tools for cover crop suppression in conservation tillage systems. Non-chemical methods include propane flamers, mowing, planned winter kill and mechanical tillage.

Many Government agencies are currently offering Cover Crop subsidies. Check your local extension agency, NRCS or USDA to see what is available in your area.

Remember Ampac when planting your cover crops this summer. Ampac has the varieties to take care of your cover crop needs.

The chart below suggests cover crops that can be utilized for a specific purpose and several like Ampac's Groundhog brand Radish, ProMax BMR Hybrid Sudangrass, Pasja and Appin Turnips have multiple attributes for soil improvement and enhancement.

COVER CROPS FOR A SPECIFIC PURPOSE											
FOR SPECIFIC PURPOSE:	ProMax Sudangrass	GroundHog Radish	Turnips: Pasja/Appin Purple Top	Teff	Buckwheat	Winter Peas	Cereal Rye	Annual Ryegrass: Common, BRUISER	Oats	Clover: Crimson, Red/White Sweet	Hairy Vetch
Organic Matter	X						X	X	X		
Nitrogen Fixation						X				X	X
Recapture excess Nutrients (N, P)	X	X	X		X	X	X	X	X	X	X
Requires NO herbicide to kill		X	X			X			X		
Reduce compaction	X	X	X					X			
Quick Forage/Grazed	X	X	X	X			X	X	X		
Droughty soils				X	X						
Hay crop	X			X			X		X		
Weed Control Disease Suppression		X			X		X				
Start up or Enhance no till		X	X								
Prevent Soil erosion					X	X	X	X	X		
Natural Herbicide ****	X	X			X		X	X	X		
Attracts beneficial insects					X					X	
Tolerate wet soils							X	X	X	X	
Tolerate Heat / drought	X			X	X					X	X
Cold Tolerant						X	X			X	
Nurse Crops							X		X		
Best for Broadcasting		X	X				X	X		X	
Low cost to establish	X	X					X		X	X	
Requires little management		X	X						X		
Most Winter Hardy							X	BRUISER ARG			X**
Requires High management***							X	X			X
Susceptible to attracts pests and/or disease							X	X	X		X

*when planted with manures

** Hairy Vetch provides little Fall ground cover because it puts on most of its above-ground growth in the Spring

*** Annual ryegrass and cereal rye may be hard to kill, seed heads need to be managed because they may become a weed in wheat, attract insect pests and may dry out the soil in the Spring. Hairy Vetch has hard seed which can become a weed.

**** ProMax Sudangrass, Annual Ryegrass and cereal rye may be used for controlling soybean cyst nematodes