



DEVELOPMENT | RESEARCH | SPECIALITY



# GREEN MANURE COVER CROPS

SEEDS GUIDE

# SEMICAN

A part of the Quebec agricultural landscape for over 37 years and now extending its influence in to Ontario and the Maritime Provinces, Semican has become an indispensable source of products intended to meet producer's ever growing needs.

Committed to being at the forefront of the seed industry and supporting innovative business, Semican is proud to present its **Green Manure Cover Crop Guide**. We are pleased to be an active partner in improving the long-term profitability of your farm and promoting good environmental practices.

As the use of green manure crops is rapidly expanding and constantly evolving, we are pleased to have the opportunity to guide you in this process. Please feel free to contact our staff with any questions or comments you might have.



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# WHY USE COVER CROPS?

The decision to invest in cover crop seed is motivated by many factors. Whether to introduce a new crop in your rotations or to meet the requirements of organic farming, you are sure to benefit from this practice. Here are some of the advantages that should convince you of their worth:

## Add organic matter to your soil

If this is your aim, then mature fibrous crop residues, in particular mature cereal straw, are your best choice. The higher the carbon to nitrogen (C/N) ratio, the greater the effect. These residues have a high lignin content and decompose slowly to produce stable organic matter. Decomposition is a long process that takes place gradually over many years; hence it is important to remember that although your soil analyses may not show a marked increase in organic matter content, that content would be decreasing even more rapidly if nothing was done to maintain it. The table below presents the C/N ratios of some of the different soil amendments.

Reference C/N ratios for different amendments	
Amendments	C/N Ratio
Sawdust	200/1
Straw	60/1
Animal manure including straw	30/1
Fresh ryegrass	25/1
Alfalfa hay	20/1

## Protect the soil from wind and water erosion

The best way to avoid having exposed soil in the fall and the spring is to use fall-seeded crops that survive the winter. Some of the plants mentioned in the following pages also grow well in the fall because they are more tolerant to cooler temperatures, thus providing soil coverage for a longer period of time.

### **Improve soil structure and aeration and reduce compaction**

The root mass of these plants has a mechanical effect that enhances soil structure by increasing aeration and permeability as well as improving soil aggregation. Roots and crop residues that are plowed under also benefit a flora of macroscopic and microbial organisms that improve the physical characteristics of the soil.

### **Recycle nutrients that are less available to the main crop and retain potentially leachable nutrients**

Some green manure crops have well-developed root systems allowing them to draw nutrients from deep in the soil and return them to the soil surface. Used in intercropping systems, cover crops are able to absorb excess nutrients that the main crop is unable to use. In fields left without a crop cover, organic fertilizers applied in the fall could lead to nutrient losses through leaching. In these cases, cover crops would absorb those nutrients and make them available to the succeeding crop as the green manure decomposes.

### **Diversify crop rotation to break the cycle of disease, insects and weeds**

While grain prices often influence producers' cropping decisions, some growing regions offer limited options, which restricts the variety of crops used in rotations. While the benefits of crop rotations have long been proven, green manures can come to the rescue of depleted soils. Diversifying your crop rotations helps disrupt the life cycles of numerous insects, nematodes and fungi. Certain fast-growing cover crops can also reduce the negative impact of weeds by smothering them and competing for water, light and nutrients.

# CRIMSON CLOVER



Like all legumes, clover is capable of fixing atmospheric nitrogen and making it available to subsequent crops. It has the capacity to absorb 80 per cent more residual nitrogen from soil and manure than non-legumes.

A good source of organic matter, clover also offers protection from soil erosion. Because clover is not very competitive, it is best seeded in a mix with a grass to ensure a competitive advantage over weeds. For best results, clover should be seeded at least 6 weeks before the first frost.

Because clover prefers cool, moist growing conditions, it is not recommended for hot, dry summers. It performs best in well-drained, loamy soils and requires a firm, moist seed bed for proper establishment.

# PEAS



Like clover, peas are a legume that is able to fix atmospheric nitrogen and make it available to subsequent crops.

Peas also absorb 80 per cent more residual nitrogen from soil and manure than non-legumes. Their rapid growth rate, comparable to that of cereals, makes them a good choice for a shortened growing season. With a superficial root system, field peas are susceptible to drought and better suited to cool conditions.

They continue to grow late in the season, producing a substantial amount of biomass and protect the soil from erosion over a longer period of time. Peas perform better in clay and loamy soils. Note that peas must be seeded in association with another species as their climbing stems require support.

# DAIKON RADISH



Increasingly popular in the marketplace, Daikon Radish has already proven its worth in the field. Its impressive root system helps reduce soil compaction by increasing porosity, which improves soil aeration and stimulates aerobic microorganism activity.

The plants absorb nutrients lost by the main crop and then release the nitrogen as the residues rapidly decompose. If soil nitrogen is abundant, Daikon Radish produces lush growth late into the fall, making it a good choice to combine with fall organic fertilizer applications so as to reduce nutrient losses through leaching.

The aggressive growth of this crop also tends to choke out weeds. To maximize its potential, Daikon Radish should be seeded at least 6 weeks before the first frost, at a rate of 5 plants per square foot. Note that radish is not a good choice if cruciferous species are part of the rotation.

If Daikon Radish is seeded early in the season, it is best to destroy the crop before it sets seed, from 1 to 2 months after flowering. Daikon Radish is well suited to shallow broadcast seeding.

# OATS



Oats are a fast-growing grass that offers some weed and erosion control. Oats are more tolerant than other cereals to moist and acidic soil conditions. Once established, they produce a high biomass yield, which increases the organic matter content of the soil.

Oats also ensure good nutrient management with manure fertilization, particularly by sequestering any excess nutrients that would otherwise be lost through leaching. Since oats are an annual crop, those nutrients are released as the plants decompose.



## RYEGRASS

Ryegrass has a dense, shallow root system that is known to have a beneficial effect on soil structure.

With a good tolerance to compacted soils, ryegrass offers a number of advantages including reduced soil erosion due to its dense growth, improved aggregate stability, reduced soil compaction, and a good bearing capacity for farm equipment.

Ryegrass is a great complement to legumes in a mix as a cover crop. Known as a nitrogen-loving plant, ryegrass reduces nitrogen losses due to leaching and competes well with weeds that have similar requirements. Like clover, ryegrass thrives under cool, moist conditions; establishment during a hot, dry summer is therefore risky.

Although generally susceptible to winterkill, ryegrass may survive and need to be destroyed in the spring. Ryegrass tolerates many soil types but performs best in fertile, loamy soils.

## FALL RYE

As the name suggests, fall rye can be seeded late in the season and will survive the winter and begin growing again in the spring, providing extended soil coverage and protection from erosion.

Its dense root system helps stabilize the soil structure and reduce compaction. Fall rye also scavenges nutrients that are lost from the main crop or from fall-applied organic fertilizers and makes them available to the next crop. Destroying the fall rye later in the season will allow its stems to become more lignified and thus increase the organic matter content of the soil.

Avoid seeding to corn after fall rye, however, since the latter seems to have an allelopathic effect that could inhibit corn germination.



## YELLOW MUSTARD



From the brassica family, mustard is an excellent choice for a fall green manure. Having the capacity to take up nitrogen it will express its full potential in terms of biomass.

A fast growing plant in cooler conditions which resists first frosts but does not survive the winter. To ensure that it does not become a problematic weed be sure to prevent seed set by either topping or destroying the plant. Being a brassica, do not rotate with other brassicas.

## BUCKWHEAT



Buckwheat is a plant that adapts to all types of soil and climate. It is recommended to avoid soils that are too dry, wet or compact. Being very sensitive to frost, it is preferable to sow it a minimum of 4 weeks before the first risk of frost.

Generating an important root network, it promotes the formation of aggregates. Having rapid growth, it covers the soil quickly, which helps choke out annual weeds. Flowering occurs 4 to 6 weeks after sowing and can be spread over 10 weeks. In order to avoid seed set, it is best to destroy it 7 to 10 days after flowering.

Buckwheat has an ability to absorb a lot of phosphorus that is not assimilated by other plants and thus release it for the next crop when it decomposes. It leaves very little residue on the ground.

## SUMMARY OF THE CHARACTERISTICS OF PURE SPECIES AND MIXES

	Producer of organic matter	N production	Takes up N and surplus nutrients	Contributes to soil structure	Reduces soil compaction
Crimson Clover		✓		✓	
Field Peas	✓	✓			
Daikon Radish			✓	✓	✓
Oats	✓		✓	✓	
Ryegrass			✓	✓	
Fall Rye			✓	✓	
Yellow Mustard			✓	✓	
Buckwheat			✓	✓	
Hairy Vetch		✓			
Pearl Millet	✓		✓	✓	
Phacelia			✓	✓	
Brown Mustard			✓	✓	
Sunflower	✓		✓	✓	
Faba beans	✓	✓		✓	
Vitali-T 1000	☛	☛☛	☛☛	☛☛☛	☛
Vitali-T 2000	☛☛	☛☛	☛☛	☛☛	☛
Vitali-T 3000	☛☛	☛☛	☛☛☛	☛☛	☛
Vitali-T 4000	☛	☛☛☛	☛☛☛	☛☛	☛
Vitali-T 5000	☛	☛	☛☛☛	☛☛☛	☛
Vitali-T 6000	☛☛	☛	☛☛	☛☛☛	N/A
Vitali-T 7000	☛	☛☛☛	☛☛	☛☛☛	N/A
Vitali-T 7001	☛	☛☛☛	☛☛	☛☛☛	☛
Vitali-T 8000	☛☛	☛	☛☛	☛☛	N/A
Fall	☛☛	☛☛	☛☛	☛☛	N/A
All Soil types	☛☛	☛	☛☛	☛☛	N/A
For Honey Prod.	☛	N/A	☛☛	☛☛	☛
Belgian	☛☛☛	N/A	☛☛	☛☛☛	N/A

## OTHER SPECIES

Although we have chosen fourteen species to compose our thirteen mixes, many other species are available that are commonly used as green manure crops:

Controls weeds	Winterkill	Chemical burndown	Controls soil erosion	Small seed/ forage seeder	Broadcast	Seed drill
	✓		✓	✓	✓	
	✓					✓
✓	✓		✓	✓	✓	
✓	✓		✓		✓	✓
✓		✓	✓	✓	✓	
✓		✓	✓		✓	✓
	✓		✓	✓	✓	
✓	✓	✓	✓		✓	✓
✓			✓		✓	
✓	✓		✓	✓	✓	
	✓		✓	✓		✓
	✓		✓	✓	✓	
	✓		✓		✓	✓
	✓		✓		✓	✓
☘☘	☘☘	☘☘	☘☘☘			
☘	☘☘	☘☘	☘☘			
☘☘	☘☘	☘☘	☘☘☘			
☘	☘☘	☘☘	☘☘☘			
☘	☘☘☘	N/A	☘☘☘			
☘☘	☘	☘☘☘	☘☘☘			
☘	☘☘☘	N/A	☘☘☘			
☘	☘☘☘	☘☘	☘☘☘			
☘☘	☘☘	☘☘	☘☘			
☘☘	☘☘☘	N/A	☘☘			
☘☘☘	☘☘☘	N/A	☘☘☘			
☘☘☘	☘☘☘	N/A	☘☘☘			
☘☘☘	☘	☘☘☘	☘☘☘			

- Common vetch
- Hybrid sorghum
- Festulolium
- Triticale
- Siberian kale
- Forage radish
- Oilseed radish
- Single-cut red clover
- Berseem or Egyptian clover
- Huia white clover



## HAIRY VETCH.

Vetch is a biennial legume which has an ability to fix atmospheric nitrogen and assimilate the residual nitrogen of the soil in the same way as pea and clover, perhaps even higher. In addition, like pea, it is adapted to cold conditions and its growth will continue late in the season providing a longer period of protection against erosion.

Its implementation should be done in mid-August for better results. Under certain soil conditions, the vetch could give better results, as part of a cover crop mixture. Preferring sandy soils, it can tolerate drought once well established. Having the ability to survive the winter depending on conditions, it may have to be destroyed in the spring.

Note that the Roundup® alone will not destroy it, the addition of Dicamba® or 2.4 D to the latter may be necessary. In order to avoid having to destroy hairy vetch with an herbicide, it can be substituted at a lower cost by common vetch which is winter sensitive.

## PEARL MILLET



For about 15 years, pearl millet has been studied for its ability to reduce nematode populations in rotation with potatoes and strawberries, for example. Drastically reducing the incidence of potato verticillium, pearl millet is one of the few plants on which the nematode reproduces very little.

In a study conducted for six years in the early 2000s, for example, rye maintained and even multiplied the populations of soil nematodes in several regions. Not having a very quick start, millet is not competitive with weeds.

It prefers warm, well-drained soils and is also very sensitive to frost. Sow from 9-14 lb / acre to a depth of 1 to 2 cm.



## PHACELIA

A plant that establishes quickly, phacelia has long been used as a green manuring crop in Europe and is now starting to find its niche in Canada. Resembling buckwheat in many respects, phacelia is much more tolerant to drought and cold, able to survive temperatures as low as  $-5^{\circ}\text{C}$ .

As an alluring source of pollen and nectar, phacelia contributes to the diversification of the beneficial insect population. It flowers in the fall 6 to 8 weeks after seeding, at a time when there are not many other flowers left. Although its root system is neither very deep nor ramified, it is extremely well developed, contributing to good aggregation in the top few centimetres of soil. Its abundant top growth makes it a good source of food for microorganisms.

Phacelia requires a fine seed bed, and rolling after seeding is recommended. For good establishment, a seed depth of 1 to 2 cm is recommended.

## BROWN MUSTARD



With the same agronomic traits as yellow mustard, brown mustard is used as a soil fumigant. Rich in glucosinolates, upon decomposition, this compound turns into isothiocyanates which are volatile and toxic to some soil organisms.

In order to succeed with this, it is necessary to respect certain rules. Incorporate when the plant is in full bloom; the glucosinolate content decreases greatly during seed set. Avoid hot and sunny days; favour morning or evening. The fumigating effect decreases if incorporation occurs when the temperature is less than 10 degrees C. Must be incorporated within the first 15 centimeters. For growers, irrigation may be necessary in dry soil conditions. Finally, in order to express its full potential, incorporation should occur when pests are present.



## SUNFLOWER

Belonging to the family Asteraceae, sunflower has a tap root and a secondary root system that is abundant in the first 30 centimeters.

In favorable conditions and for the duration of a full season, its taproot has the ability to descend to a good depth.

Very demanding in terms of soil structure, sunflower is more sensitive to soil quality and depth than to fertilization, although a deficiency in phosphorus or potassium may limit vegetative and/or root growth.

This plant also has an ability to assimilate the phosphorus soil to recirculate it during its decomposition.



## FABA BEAN

The bean is a legume of the family Fabaceae that excels in its nitrogen content. Its tap root system, well provided with nodules, makes it a champion of nitrogen fixation.

The two constraints to its use are the cost of the seed as well as its size which requires a particular attention to the sowing.

Left in the field in the fall, its hollow, blackened stem in spring attracts sunlight and acts like a straw to promote water infiltration.



## Vitali-T 1000

### COMPOSITION

- Ryegrass
- Crimson Clover
- Daikon Radish

### DESCRIPTION

- Fixes atmospheric nitrogen
- Sequesters nutrients throughout the fall
- Improves bearing capacity of the soil
- Avoid seeding during dry, hot summers; clover and ryegrass establishment may be at risk.

#### Seeding rate:

Seeder: 12 kg/ha – 11 lbs/acre

Broadcast: 16 kg/ha – 14 lbs/acre

- Seeding depth: 0.5 cm up to 1.25 cm
- Ideal seeding period: early August to mid-September, 6 to 10 weeks before the first killing frost

#### Management:

Winterkill

Fall plowdown

Chemical burndown

## Vitali-T 2000

### COMPOSITION

- Field Peas
- Ryegrass
- Phacelia
- Daikon Radish

### DESCRIPTION

- Promotes biodiversity with four varieties from four different families
- Good balance between species in the field
- Field peas fix atmospheric nitrogen

#### Seeding rate:

Seeder: 50 kg/ha – 45 lbs/acre

Broadcast: 65 kg/ha – 60 lbs/acre

- Seeding depth: 1 to 2 cm
- Ideal seeding period: early August to late September, 6 weeks before the first killing frost

#### Management:

Winterkill

Fall plowdown

Chemical burndown

Insure that the pea seed is incorporated likely at planting.

## Vitali-T 3000

### COMPOSITION

- Oats
- Crimson Clover
- Hairy Vetch
- Field Peas
- Daikon Radish

Insure that the pea seed is incorporated likely at planting.

### DESCRIPTION

- High proportion of legumes in the mix fixes atmospheric nitrogen
- Yields stable organic matter
- Promotes biodiversity in the field

#### Seeding rate:

Seeder: 67 kg/ha – 60 lbs/acre

Broadcast: 85 kg/ha – 76 lbs/acre

- Seeding depth: 1 to 2.5 cm
- Ideal seeding period: early August to mid-September, 6 weeks before the first killing frost

#### Management:

- Winterkill
- Fall plowdown
- Chemical burndown

## Vitali-T 4000

### COMPOSITION

- Crimson Clover
- Field Peas
- Hairy Vetch
- Daikon Radish

Insure that the pea seed is incorporated likely at planting.

### DESCRIPTION

- Identical to the previous mix but takes into account cereal residues left by the combine that should germinate and combine with the mix
- Good mix to use before a crop that requires nitrogen

#### Seeding rate:

Seeder: 50 kg/ha – 45 lbs/acre

Broadcast: 65 kg/ha - 58 lbs/acre

- Seeding depth: 1 to 2 cm
- Ideal seeding period: early August to mid-September, 6 to 10 weeks before the first killing frost

#### Management:

- Winterkill
- Fall plowdown
- Chemical burndown

## Vitali-T 6000

### COMPOSITION

- Ryegrass
- Fall Rye
- Crimson Clover
- Field Peas
- Hairy Vetch

Insure that the pea seed is incorporated likely at planting.

### DESCRIPTION

- Fall rye provides soil coverage from late fall until spring, thus reducing soil erosion.
- Combines three legume crops, so an excellent mix to use before a crop that requires nitrogen
- Improves bearing capacity of the soil
- Avoid seeding to corn after fall rye is plowed or burned down since the latter could have an inhibitory effect on corn germination.

#### Seeding rate:

Seeder: 68 kg/ha – 61 wlbs/acre

Broadcast: 88 kg/ha – 78 lbs/acre

- Seeding depth: 1 to 2.5 cm
- Ideal seeding period: early August to mid-September, 8 weeks before the first killing frost

#### Management:

Fall plowdown

Chemical burndown

## Vitali-T 7000/Vitali-T 7001

### COMPOSITION

- Vitali-T 7000
- Crimson Clover
  - Field Peas
  - Oats

### Vitali-T 7001

- Peas
- Oats
- Daikon Radish
- Clover

### DESCRIPTION

- Rapid growth of oats provides good weed control
- Contains a high percentage of legumes, making it an excellent choice before a crop that requires nitrogen

#### Seeding rate:

Seeder: 95 kg/ha – 85 lbs/acre

Broadcast: 120 kg/ha – 107 lbs/acre

- Seeding depth: 0.5 to 1.5 cm
- Ideal seeding period: early August up to mid-September, 6 to 10 weeks before the first killing frost

#### Management:

Winterkill

Fall plowdown

Chemical burndown

Insure that the pea seed is incorporated likely at planting.

## Vitali-T 9000 FALL

### COMPOSITION

- Oats
- **Crimson Clover**
- **Yellow Mustard**

### DESCRIPTION

- Beneficial as a fall green manure
- The rapid growth of the oats will ensure excellent late season weed control
- Suitable for cooler areas
- Do not allow to set seed

#### Seeding rate:

Seeder: 45 kg/ha – 40 lbs/acre

Broadcast: 60 kg/ha – 55 lbs/acre

- Seeding depth: 0.5 to 1.5 cm
- Ideal seeding period: 4-6 weeks before the first killing frost
- **Management:**  
Winterkill  
Incorporate in the fall or  
Chemical burndown

## Vitali-T 10000 ALL SOILS TYPES

### COMPOSITION

- Peas
- Oats
- **Buckwheat**

### DESCRIPTION

- Mixture adapts well to a variety of soils
- The rapid growth of buckwheat and oats will control weeds
- Buckwheat has the capacity to facilitate release of soil phosphorous
- Do not allow buckwheat to go to seed

#### Seeding rate:

Seeder: 121 kg/ha – 110 lbs/acre

Broadcast: 155 kg/ha – 140 lbs/acre

- Seeding depth: 2.5 to 4 cm
- Ideal seeding period: around 6 weeks before the first killing frost

#### Management:

Winterkill

Incorporate in the fall

Chemical burndown

# Vitali-T 12000 FOR HONEY PRODUCTION

## COMPOSITION

- Buckwheat
- Yellow Mustard
- Phacelia
- Daikon Radish

## DESCRIPTV

- Mixture of several species attracting pollinators
- Be careful to avoid buckwheat, radish and mustard going to seed
- Be careful to avoid rotating with other brassicas

### Seeding rate:

Seeder: 28 kg/ha – 25 lbs/acre

Broadcast: 35 kg/ha – 30 lbs/acre

- Seeding depth: 1.5 to 2 cm
- Ideal seeding period: around 6 weeks before the first killing frost

### Management:

Winterkill

Incorporating in the fall or

Chemical burndown

# Vitali-T BELGIAN

## COMPOSITION

- Oats
- Sunflower
- Phacelia

## DESCRIPTION

- So named in honor of its creator, this blend combines three species each with their distinct qualities.
- Phacelia, sunflower and oats respectively have a facility to recirculate potassium, phosphorus and trace elements.
- A deliberately lower seeding rate will allow phacelia to express itself well.

### Seeding rate:

Seeder: 25 kg/ha – 22 lbs/acre

Broadcast: 29 kg/ha – 26 lbs/acre

- Seeding depth: 1 to 2 cm
- Ideal seeding period: 6 to 8 weeks before the first killing frost

### Management:

Winterkill

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