



## GREEN MANURES & COVER CROPS: ADVANTAGES & DISADVANTAGES



This factsheet contains complementary information to the Best4Soil video on Green manures & cover crops: Advantages & disadvantages.

### INTRODUCTION

In general, cover crops have positive effects on soil structure, soil erosion, reducing nutrient leaching, weed suppression and feeding the soil microbiome. Some species used as cover crops can also fix nutrients (nitrogen by legumes) or make nutrient more available (phosphorus by buckwheat). Used as green manures, they also help to sequester carbon. As cover crops belong to different plant groups (families) their impact as promoters or inhibitors for soilborne diseases and nematodes has to be specifically chosen. Water availability and climatic conditions are also criteria that determine the use of specific plants.

### WHICH GOALS?

Critical for the choice of the correct cover crop for the specific location is the cultivation target you want to improve with cover crop growing.

For nematode control and interruption of disease cycles the old concept of changing (rotating) plant families is a good general concept, such as, Brassica and legume cover crops before cereals, grass and legumes before Brassicas and so on. Special bred varieties may help to intensify this effect.

For additional biomass production to improve soil fertility, increase soil organic matter content and for the cultivation in less favorable areas, species mixtures offer better security for good establishment of the cover crops and for achieving a high biomass.

### SPECIES MIXTURES

The concept of a multi-service cover crop (MSCC) describes very well the different possible positive functions of a cover crop (Justes & Richard, 2017). One possibility to

achieve the most positive effects of a MSCC is the use of plant mixtures. An interesting combination seems to be mixtures of cruciferous species with leguminous species (Couëdel et al., 2019). This would combine the disease suppressive effect of crucifers with the nutrient service of legumes. However, such mixtures are relatively new and knowledge on all the potential advantages and disadvantages still has to be acquired through field studies. For example, most legume species are host plants of *Pratylenchus* spp., so how far this can be counterbalanced by the cruciferous species in the mixture needs to be demonstrated.

A well-studied group of species mixtures are the grass-legume mixtures (fig. 1). Such mixtures result in an excellent root distribution in the soil (fig. 2). Furthermore, mixtures with a proportion of 40-60% legumes can increase the nitrogen fixation by legumes compared to pure legume stands (Nyfeler et al. 2011). Another advantage of grass-legume mixtures is that they can also be used for grazing, which makes them interesting for regions with mixed farming systems, such as field crops and dairy farming. Especially during years with more extreme weather conditions, such "reserve" grassland has a high value.



Fig. 1: Grass-legume mixture, can also be used for grazing



Fig. 2: Root colonization of the soil below a grass-legume mixture.

Mixtures for cover crops and green manures are commercially available; often they are adapted to specific purposes. Making mixtures on-farm is complicated, the proportion of the seeds does not reflect the proportion of the plants once the crop is fully developed. The size of the seeds of the different species used for a mixture should also not vary too much, otherwise the depth of the seeding will not be adapted to all species of the mixture. For places where no commercial mixtures are available, developing mixtures could be the topic for a community of practice i.e., a group of persons who share knowledge on a specific topic. The setup of such a community of practice is supported by the Best4Soil network by organizing a workshop dealing with the concerned topic. If you are interested, then contact Best4Soil (contact form is on [www.best4soil.eu](http://www.best4soil.eu)).

### TIMING IS IMPORTANT

Timing for sowing is most important, especially in Northern Europe, where the temperatures drop in the autumn season. When cover crops and green manures are sown too late, they will not fulfill the functions they are meant to, especially covering the soil rapidly to suppress weeds and reduce erosion.

As a cover crop is not properly harvested, the termination can also be a problem as there is no “need” to harvest the crop. When terminated too late, problems such as a C/N ratio which is too high, which indicates slow decomposition and nitrogen immobilization in the soil, and viable seeds, which can become a weed in the following crop, can occur.

### SPECIAL BENEFITS

As mentioned above, some cover crops can be used to feed livestock. Another important group of animals that can be fed with cover crops are honey bees and pollinators in general (fig. 3). Most agricultural crops are flowering in spring – early summer. Cover crops are an excellent way to provide bees with pollen and nectar during the summer and fall season. Legumes, cruciferous species, buckwheat and phacelia are excellent plants to feed bees, particularly phacelia (fig. 4) is often grown with the special goal to nourish bees.



Fig. 3: White clover is an excellent fodder plant for honey bees.



Fig. 4: Phacelia is a melliferous cover crop, most attractive for honey bees.

**Additional information on green manures and cover crops are published as an EIP-AGRI minipaper:**

[https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/6\\_eip\\_sbd\\_mp\\_green\\_manure\\_final\\_0.pdf](https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/6_eip_sbd_mp_green_manure_final_0.pdf)

#### References

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