

UTILISING plant diversity



Associating certain species, such as legumes and non-legumes, avoids “putting all the eggs in one basket” and increases areas of ecological interest.

There are many cover crop species available. Some are better suited than others to a farm’s specific challenges, whether those are linked to the soil and weather conditions, to the cropping system or to cropping practices.

Mustard is the most widely used species, and is present on 55% of the overall cover crop area in France (source: 2011 *Statistics & Prospective Services – SSP - survey*). Grasses are well represented, with 20% of the cover crop area, 15% of which are oats. Many other species account for small areas (less than 1%), while phacelia represents 3% of the total. Cover crop mixes occupy 12% of the total cover crop area, half of which include legumes. The latter, on their own or used in combination with other species, only covered 7% of the overall area in 2011. The plant diversity available is therefore poorly utilised. Farmers favour cover crops that are easy to manage and cheap. Many species are seldom used in practice. Cover crops are still often perceived as a regulatory constraint, underestimating the benefits they carry.

Choosing a green cover in a few clicks

ARVALIS has developed a new tool, freely accessible on www.choix-des-couvertures.arvalis-infos.fr (in French), which helps choose between 125 catalogued green covers. Once the parameters have been entered (location, cropping techniques, target market, etc.), the tool proposes a selection of different covers best suited to each situation, ranked according to their overall score. “Single species” and “combined species” data sheets are also available on www.fiches.arvalis-infos.fr

Choosing species carefully to maximise their benefits

Successful covers produce an acceptable amount of biomass, with the functions the latter fulfils such as ground cover, nitrate trapping, nitrogen fixing in the case of legumes, harvestable forage production, etc. One of the challenges they bring is to avoid increasing certain safety quality risks by choosing species that discourage bio-aggressors. Cover crop management must fit in with the farm’s cultural practices (sowing, destruction). Finally, cost effectiveness must be assessed against all the parameters: seed, sowing and destruction costs, savings in nitrogen, and biomass harvest if relevant.

Crop yields are rarely impacted by the presence of cover crops. Incomplete or late destruction of the cover crop may make it more difficult to manage the following crop (volunteers, depressed water or nitrogen availability). There are two types of situations where a cover crop improves crop yields: legume covers improve nitrogen availability, with a variable impact on yield depending on nitrogen fertilisation practices, and chalky soils seem to respond particularly well to the presence of cover crops.

In 2011, legumes covered only 7% of the total area sown with cover crops.

Choosing cover crops that integrate well into the crop rotation

Some crops are sensitive to cover crops returning too often in the rotation (flax, oilseed rape, sunflowers...): in short rotations, cover crop species belonging to the same botanical family should be avoided. For peas, often affected by *Aphanomyces*, the choice may be guided by the multiplication potential of this fungus, which does not affect some other legumes. In order to limit the risk of *Sclerotinia*, as a precautionary measure all dicotyledonous species are prohibited before legumes grown for the food industry, and should be avoided before arable crops that are susceptible to this pathogen.

A wide choice of nematicide fodder radish and white mustard varieties is available to reduce *Heterodera schachtii* populations (this principle is widely used in beet rotations) whereas traditional brassicas tend to encourage them to spread. Brassicas have also been identified as a means of controlling some soil-borne fungi. Their glucosinolate content may inhibit the development of pathogens through "biofumigation" (release of a toxic gas into the soil). However, this technique can be difficult to implement in an arable context (yield increases have been reported as being between 0 and 500kg/ha). Many unknowns need to be investigated in relation to crop protection through green covers. It is one of the aims of the research work carried out in the field of agro-ecology.

The cover crop species must be compatible with the farm's sowing equipment and planned destruction process.



Choosing species suited to the sowing and destruction parameters

Species must be chosen according to the date and type of sowing (or sowing must be adapted to suit the chosen species). This is crucial for legumes, in order to improve the amount of nitrogen made available to the crops. Most of those species require careful sowing, compared to brassicas, and early emergence (very sensitive to temperature and radiation levels).

In addition, different cover crops will be chosen depending on whether the farmer wants a frost sensitive species that can be mechanically destroyed using a method like stubble cultivation, or, on the contrary, if the purpose is to provide ground cover over a long period.



In spite of the wide choice of cover species available, only a small number of them are utilised by farmers.

Very varied benefits

Depending on the farm's specific context and its production objectives, priority might be given to nitrate trapping, with species such as brassicas, or to improving the amount of nitrogen made available to the following crop. In that case, legumes, individually or combined, are particularly suitable.

If they are well developed, covers constitute a source of quality forage, for grazing or harvesting. There are various catch crop type forage mixes available.

Cover crops also have an impact on the fauna. Their appetite for slugs, for example, varies, and so does therefore the quantity of cover those nematodes graze in wet summers, as well as their size and prolificacy (multiplication of the population). Another possibility is to favour early sown and flowering species to provide pollinators with pollen at a time when it is in short supply (bee forage cover crop). The "Agrifaune Interculture" accreditation scheme sets out some species combinations as a source of food and shelter for small game. Those are moderately dense mixtures characterised by plant strata of different heights.

Cover crops therefore have a variable impact, including on soil fertility (organic matter content, soil structure, etc.). A compromise between all the different choice criteria must be found. Species combinations deliver the widest possible range of benefits. They have proved particularly useful when they mix legumes and non-legumes. The strengths of non-legumes (brassicas, grasses, phacelia...) are to trap nitrates, to produce biomass and to provide rapid ground cover. As for legumes, their air nitrogen fixing capacity means that they tend to improve the biomass content of the mixed cover, and even more so, the amount of nitrogen made available for the crops. In order to make the choice easier, ARVALIS is offering a new decision support tool, for both single and combined species (*insert*).

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