Factsheet: Seed-On-Yellow-Spreading

Spreading cover crop seeds a day before winter wheat harvest

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August 2025

Summary

Cover crops are planted to cover the soil and produce a range of services that improve soil structure and its fertility. By spreading cover crop seeds before wheat grain harvest, *Seed-On-Yellow-Spreading (SOYS)* technique accelerates and produces those services in greater quantities compared to sowing a cover crop postharvest. Those services include enhanced soil fertility, increased biomass production, carbon sequestration, and reduced labour and fuel use. While SOYS provides a wide range of benefits, there are also some limitations. This technique requires more cover crop seeds than usual, limits the choice of cover crop type and post-harvest weed management methods, and may require specific equipment (see Table 1).

What is SOYS?

With the SOYS technique, cover crop seeds are spread into the wheat field with an agricultural spreader about a day before wheat grain harvest. Cover crop seeds fall onto the ground and are covered by the wheat residues. Moisture levels at wheat harvest are usually sufficient to enable the small seeds to germinate and establish themselves (Fig. 1). Later rain will help them grow further.

About this factsheet

This factsheet is aimed at farmers who aim to improve soil structure and fertility.

Experimentation with this technique has just started in the Netherlands this year and results are not published yet. All data used in this factsheet originates from foreign countries, mostly the North-west of France. This technique is regarded as an innovation that has not thoroughly been tested in the Netherlands. Applying it is at your own discretion.

Timing within this factsheet is adapted to regions with an Oceanic Climate.

Table 1 Pros and cons compared to a tilled seedbed

Pros	Cons
• High seeding operation efficiency • Requires less time and fuel • Lower sowing cost • Early cover crop establishment • More time for other activities on the farm and/or with friends and family • Stubble covers and protects the soil from extreme weather events • Higher biomass production • Longer nitrogen catching period • Less soil organic matter mineralization • Supports a positive carbon balance and carbon sequestration • Respects and maintains existing soil life • Limits erosion risk in hilly fields	• Limited germination and emergence rate • Higher seeding rate • Higher seed cost • Limited choice in cover crop species • Limited options for post-harvest weed management • Wheat herbicide, such as soil herbicide, ought to be ineffective from cover crop seeding onwards • Requires specific equipment


Figure 1 Cover crop growing in the stubble (Source: Agro-Transfert)

Biomass production

With SOYS, the cover crop starts growing at harvest time, which is several weeks earlier than its tillage counterpart (Fig. 2). As it starts to grow mid-summer, it gets more sunlight and warmth for its development. The biomass production is higher, which is generally positive for soil health as the cover crop biomass becomes available to soil organisms.

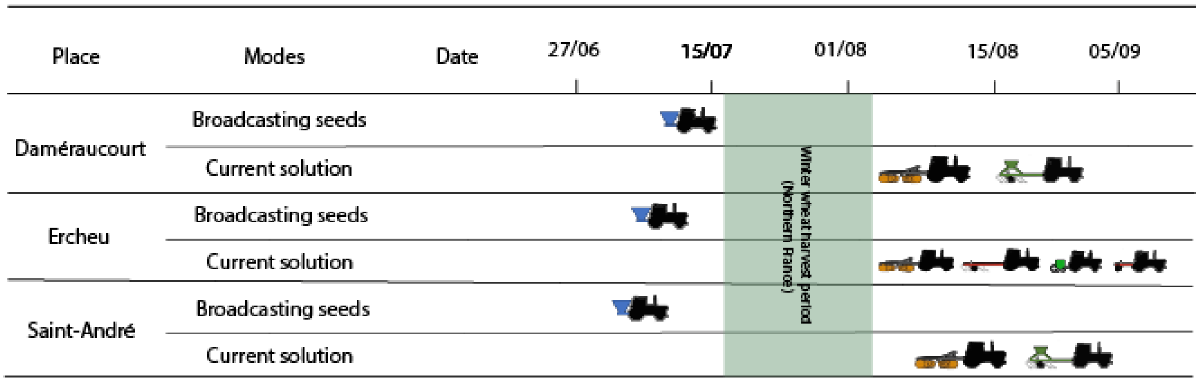

Figure 2 Timing and workload of the seed spreading technique versus its tilled counterpart in several French trials (Adapted from Agro-Transfert)

Seeds

Seeding type

It is possible to use seedballs as well as bare seed with SOYS. Bare seeds are typically used of which phacelia and radishes are the most common species. Less moisture is needed to hydrate bare seeds compared to a seedball made with clay and/or humus. Small seeds are preferred for the same reason. Since small seeds require less moisture than medium or large seeds, for example, they generate greater results in dry conditions. So far, different trials have found that phacelia and radishes successfully germinated and emerged when sown just before the winter wheat harvest.

However, the germination and emergence rate are lower than with a tillage-based establishment. With SOYS, weather has a greater impact on crop establishment. So far, agronomists have measured emergence rates from 30%, in dry conditions, up to 60%, in favourable conditions. The percentage also depends on cover crop species.

Seed preparation and equipment

A fertilizer spreader is the easiest equipment to use for SOYS. However, it should be noted that bare seeds do not fly as far as granular fertilizers. A simple spreading test (i.e., spreading over egg boxes) can already indicate how far the current spreader set-up will spread the selected seeds.

Figure 3 A seeder drone loaded with cover crop seeds sowing in wheat fields (Source: Thierry Stokkermans)

In case that the seeds do not spread far enough to use existing crop care tramline, an alternative solution should be prepared. Main feedback from French farmers is that tramlines spaced out at 18m or more requires specific equipment or seed preparation. Enhancing spreader set-up is the obvious first step, but in case this is not sufficient, the equipment could be changed or seed could be prepared. Advanced equipment can, for instance, be a specific spreader mounted on the tractor (such as the Maxi-Couv) or a spreader mounted on a drone (Fig. 3). Seed preparation can involve glueing them together to obtain a heavier projectile, which is able to fly further, or creating seedballs by placing the seed in a ball of clay.

Management

Logistics

Seeds need to be ready by July. As such, farmers ought to plan and organize themselves in June and execute the plans in July.

Weeds

This technique is better suited for clean fields as there are limited solutions to weed a seeded or growing cover crop.

Once the cover crop is growing, it can be very difficult to manage the weeds. There is no time for tillage as the cover crop is sown before the winter wheat is harvested and, depending on the situation, herbicides can sometimes not be applied or be too expensive. Therefore, this technique is not suited for winter wheat fields where growing weed plants are present, especially if there are perennials weeds that survive the wheat harvest.

Herbicides

Soil herbicides used in wheat crops, especially those that are effective until harvest, theoretically have a negative effect on the cover crop germination and emergence. Although no such prior incidents have been found, it would be wise to adapt your herbicide program for this seeding technique. The solution to this potential issue would be to eliminate soil herbicides, which are active up until wheat harvest.

Straw and chaff management

Straw and chaff management is important as they cover the seeds after harvest. The ideal situation is to use both straw and chaff to maximise coverage. This means that the combine harvester should chop the straw and evenly spread both straw and chaff across the working width of the machine. For small machines, it is often easy while, for larger ones, it might require specific equipment such as a chaff spreader. If desired, it is still possible to bale the straw while applying SOYS. Although some farmers are doing it, agronomists have found that this has resulted in some seed losses due to the export of straw and significantly reduced the number of seedlings by 27%.

Costs

Costs are lower than its tilled counterpart due to improved efficiency. As spreading has a wider working width and working speed, seeding operation is often quick and efficient. This is likely to result in some savings in labour, money, and time.

However, there may be a trade-off. Seed costs may be increased by a lower germination and emergence rate, and increased seeding rate. As spread seeds are not placed in ideal conditions, they have a lower germination and emergence rate than its tilled counterpart. To compensate for this loss, the seeding rate has to be increased. Consequently, more seeds will be used which is likely to increase the seeds costs. For a first-year try-out, it is advisable to seed at twice the normal seed rate and therefore to order twice the normal seed quantity.

Organization

Timewise there will be more time for other activities. As seeding goes faster and is positioned at a quieter period of the summer, there is more time for the farmer to focus on other activities or spending time with family and friends.

Soil

Subsoiling

Sub-soiling in the cover crop: if you see or are aware of any structural soil damage, you can break it by sub-soiling through the cover crop in the summer or early fall. By using a no-tillage or a grassland subsoiler, negative impact on the cover crop can be limited (Fig. 4).

Organic fertilizer and feeding cover crop seedlings

Fertilizing a cover crop is not always allowed by the regulations. In case it is allowed, different technical solutions exist. Organic fertilizer can be either liquid, slurry or solid. Manure slurry is a common organic fertilizer in the Netherlands. In the field, it can be applied to the cover crop using a grassland manure slurry injector. In case of solid organic fertilizers, such as compost, injection may be tricky and leaving it above the ground might be limited by local or national regulations. In this case, it is important to obtain up-to-date information for the solid fertilizer you plan to use.

The SOYS technique might not require nitrogen fertilization to obtain a good cover crop. Further research is needed to understand it better. One explanation could be that the early start of the cover crop allows for it to have passed critical stages before the straw starts decaying and, in the process, consumes nitrogen.

Nitrogen, carbon and organic matter balances

The technique allows a cover crop to be established at wheat harvest and avoids mechanical disturbance of the soil. This has several benefits for the nitrogen, carbon and Soil Organic Matter (SOM) balances.

Figure 4 A subsoiler equipped with Michel blades working in a standing crop (Source: WUR Open Teelten)

The tillage reduction limits the mineralization of SOM, emission of carbon dioxide from the soil and reduces the production of nitrate which can leach in the fall. These have positive effects on the soil, water quality and atmosphere composition.

The early establishment of the cover crop allows sunlight to be used more effectively, more CO_2 to be extracted from the atmosphere and for it to be converted into organic matter and, finally, to reduce the quantity of freely available nitrate and convert it into a stabler organic form.

Main tillage in fall, winter or spring

first time experience: to observe the full effects of SOYS, it is best to limit change to other variables until you have mastered this technique. If it is the first time that you establish a cover crop this way, there is no need to simplify your post-cover-crop tillage plan. It is safer, in the first years, to apply a mastered tillage plan. In other words, if you are used to plough under the cover crop early winter, it is best to maintain this practice on the field where you are trying and learning about this cover crop seeding technique until you master it sufficiently to safely change other aspect of your cropping system.

Known adoption

In the Netherlands

First trials in the summer of 2025 but no results published yet.

Outside of the Netherlands

This technique is used in the North-West of France and encouraged by at least one water council *(FR: Agence de l'eau)*, multiple drinking water supply organizations and several public extension services (see Box 1).

The area covered in France by farmers that use SOYS runs from Britany to the Belgian border passing through Normandy and Hauts-de-France. These areas are known for their high productivity and oceanic climate. They have substantial similarities with the Netherlands.

Box 1 – Organisations and utility companies that encourage SOYS

The regional waterboard supporting the method is Agence de l'eau Loire Bretagne.
The five drinking water supply organizations are:

- *Syndicat mixte Arguenon-Penthièvre (SMAP)*
- *Syndicat mixte des bassins de l'Ille, l'Illet et de la Flume*
- *Syndicat mixte du bassin versant du Meu*
- *Syndicat Mixte de production et de transport de l'eau de l'Horn*
- *Syndicat des rivières de la Vilaine Amont*

Further reading

Agence de l'eau Loire-Bretagne, "Implantation de couverts végétaux sous céréales avant moisson sur l'Arguenon." https://aides-redevances.eau-loire-bretagne.fr/home/retours-dexperiences/implantation-de-couverts-vegetaux-sous-cereales-avant-moisson-su.html

"Démonstration de l'outil MAXI COUV," *SM Horn*. https://smhorn.fr/demonstration-de-loutils-maxi-couv/

Agro-Transfert, "DOSSIER TECHNIQUE : SYNTHESE DES ESSAIS DE SEMIS a LA VOLEE 2018-2020." https://cultivons-les-couverts.agro-transfert-rt.org/synthese-volee/

Agro-Transfert, "FICHE PRATIQUES INNOVANTES : Semer le couvert dans le précédent." https://cultivons-les-couverts.agro-transfert-rt.org/volee/index.html

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DOI: 10.18174/699524