PRACTICE ABSTRACT

Establishing summer cover crops before winter cereals in low tillage systems on sandy soils

Problem

Periods without plant cover between cash crops increase the risk of N-leaching, weed development and soil erosion. This is especially true on sandy soils, where these effects can cause significant environmental and economic problems. In addition to this, these periods often provide low or no organic matter availability on the soil surface, resulting in a lack of nutrition for soil life, leading to the degradation of soil quality.

Solution

To avoid erosion during the summer period as well as guaranteeing the nutrition to soil life, the implementation of fast-growing cover crops is recommended.

Benefits

Fast growing cover crops, even in the available short period, stabilise cash crop yields by adding organic matter to the rooted zone of the soil, increasing soil water infiltration. The crop cover also protects the soil from direct sun radiation, reducing surface temperatures drastically.

At the same time, we can secure left-over nitrogen from the previous crop in different rooting-zones by using mixtures of cover crops with diverse rooting systems, as well as gaining the protective value of plant vegetative and residue cover for controlling soil erosion [CLARK, 2008].

Practical recommendation

Seedbed preparation:

- To save important time for cover crop growth, the sowing of the cover crop needs to be done as close as possible to the harvest of the previous main crop (ideally within 6 hours). It is also intended that the remaining soil-humidity will increase seedling-emergence of the cover crop and uses the dormancy of unwanted seed, allowing for faster growth of the cover crop compared to other plants.
- Conventional seedbed preparation consumes too much time and so minimal/no soil preparation is best.

Applicability box

Theme
Multiple Cropping, field, cropping system

Agronomic conditions
Sufficient soil water available or rain forecasted (20-40mm), at least 8 weeks of time for the growth of cover crops between the harvest of the previous main crop and the sowing the following winter crop, sandy soils

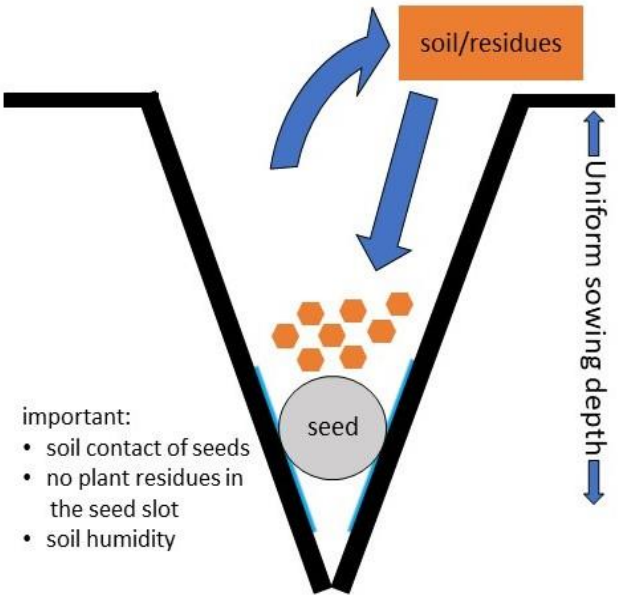
Application time
Sowing the warm season cover crop within a few hours after harvest of the previous main crop

Required time
0.5 h/ha

Period of impact
Following main crop with increasing benefits over the years

Equipment
Minimal or no-till sower

Best in
Conservation tillage or no-tillage cropping systems, between early harvested and late sown crop (for example: between winter oilseed rape and winter wheat)



Picture 1: Scheme of successful no till sowing

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- The cover crop should be sown directly into the harvested field, using sowing machines with disc (or double-disc) openers, harrow-openers and sufficient tools to close the slot, without tools for soil preparation (Picture 1).
- Residues of the previous crop may cause problems since too much straw hinders sowing. Residues can also be pressed into the seed-slot, which prohibits the soil contact of the seed. If residues may be used off-field (such as using cereal straw as litter in animal production), it is recommended to remove the residues from the field to avoid these problems. If residues cannot be removed after harvest, mowing at a higher height as well as limiting crossing harvest direction while driving on the field before sowing can reduce the amount of residues laying across the future seed-slots.

Table 1: Examples of cover crops, their root systems and effects on crop rotations [Kanders & Berendonk, 2013]

Cover crop	Root system (fibrous root (F) /taproot (T))	Max root depth	Effects on diseases and pests within the crop rotation
Oil radish	T	150	Multi-resistant varieties can reduce nematode prevalence in potatoes and sugar beet
White mustard	TF	120	Stimulates build-up of the clubroot pathogen in oilseed rape crop rotations, resistant varieties against *Heterodera schachtii*
Phacelia	F	80	Do not use in crop rotations with potatoes
Sunflower	TF	120	Host for sclerotinia
Bristle oat	F		Host for barley yellow dwarf virus
Buckwheat	F	80	
Oil linseed	TF	80	Positive effects against *Heterodera schachtii*
Niger seed	F		Host for sclerotinia

Preferable cover crop mixture:

- The cover crop mixture selected should depend on the planned crop rotation in order to minimize the risk of diseases and ensure that the available period is long enough for the selected crops to grow (6-8 weeks for Buckwheat, Niger seed and Bristle oat, 8-10 weeks for Oil radish, Mustard and Sunflowers).
- Fast growing cover crops as Buckwheat, Niger seed and Bristle oat produce the most biomass in the given time and are able to outgrow volunteer cereals and weeds. High biomass production guarantees the best carbon sequestration and addition of carbon to the soil (mostly due to the rooting system). Lower soil temperatures and higher humidity under the cover crops provides optimal conditions for soil life after the main crop's harvest.
- To increase the impact of cover crops, species with different rooting systems (fibrous roots/taproots) should be combined. This way different rooting zones are reached in the soil, providing a greater zone of impact.
- Table 1 shows examples for suitable cover crops, taking into account the different rooting systems as well as possible crop rotation diseases. To avoid regrowth of the cover crop in the following main crop, avoid frost tolerant species in the mixture.

Cover crop management:

- The next cash crop can be sown directly into the cover crop, using no-tillage machinery
- If no-tillage machinery is not available, mechanical destruction of the cover crop by using a roller (preferred) or a mulcher (less preferable due to a potentially denser and less aerated mulch-cover) should be done before sowing the cash crop with conventional machinery.
- Ideal timing for the destruction of the cover crop is during the flowering period of most of plants in the mixture, since biomass-gain is low after this point and plants are very sensitive to destruction.

Further information

Further readings

- Clark, A. (2008) *Managing Cover Crops Profitably (3rd Ed.)* DIANE Publishing
- Kanders, M. J., Berendonk, C. (2013) *Zwischenfruchtpass Landwirtschaftskammer NRW (3rd Ed.)* Chamber of Agriculture North Rhine-Westphalia

Practice Abstract

About this practice abstract and DiverIMPACTS

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DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

Project website: www.diverimpacts.net

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