This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

SolACE - Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use

D6.4
First collection of SolACE Practice Abstracts

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CO Confidential, only for members of the consortium (including the Commission Services)	

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Table of Contents

1. Introduction

The SolACE project will produce several practice abstracts in the EIP-AGRI common format. The goal of the practice abstracts is to enable wide uptake among practitioners, make research visible to the target groups, and facilitate information sharing in the EU agricultural knowledge and information system (AKIS). At this stage, the project has produced the first set of practice abstracts and will continue to produce more as project results become available.

2. About the practice abstracts

2.1 Practice abstract template

All practice abstracts will be produced in the EIP-AGRI common format and uploaded on the EIP-AGRI website: https://ec.europa.eu/eip/agriculture/en/find-connect/projects/solace-solutions-improving-agroecosystem-and-crop

However, to facilitate production and dissemination, the project also developed its own template (see figure 1). It follows the logic of the EIP common format in terms of number of characters and general structure, but presents the information in a more user-friendly way, and is easier to disseminate.

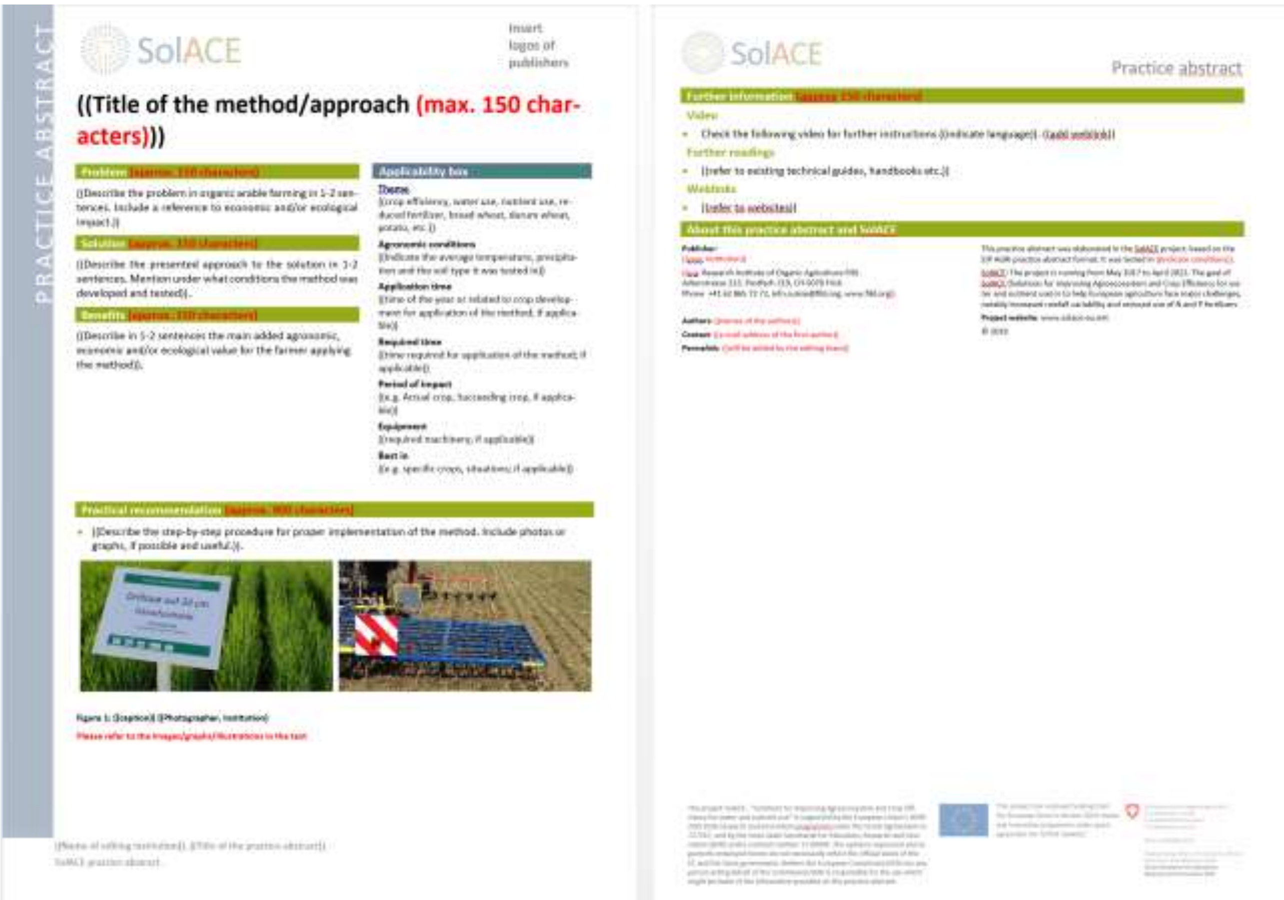

Figure 1:SolACE practice abstract template

2.2 Practice abstract review process

Once a practice abstract has been written, it is reviewed by selected experts within the project as well as WP6 members, who revise the content regarding clarity and perform a language check. Feedback is then communicated to the author and integrated in the practice abstract.

Once all feedback and changes have been integrated into a practice abstract, design and layout changes are finalised and uploaded on the shared workspace for 30 days, where all project partners have the opportunity to raise concerns. After this, it is published on the SolACE Zenodo community, the project website and the EIP AGRI website.

3. First set of practice abstracts

So far, two practice abstracts have been finalized (see annex 1):

- Mycorrhizal fungi – How to produce your own bio-fertilizer: https://zenodo.org/record/3385633
- Undersowing leys in cereals: https://zenodo.org/record/3402892

In addition to these, four practice abstracts are in the final stages of being reviewed:

- Hybrid Potato Breeding
- Mulch sowing in organic agriculture
- Utilising demonstration events for knowledge exchange
- Results of the organic on-farm potato variety tests in Hungary

4. Planned practice abstracts

In addition to the practice abstracts already produced, a list of 11 tentative topics has been produced. Proposed titles are included below but are subject to change with research outcomes, etc.:

- Breed it or buy it: Participatory breeding of durum wheat
- Automatically measuring characteristics of hidden parts of your future crops
- Tweet to exist
- Formulation of microbial inoculants using DCM Minigran technology
- How to evaluate the performance of microbial inoculants
- Conservation agriculture for water conservation and nutrient use efficiency
- How to select pre crop for your wheat
- Microbial inoculants: A key for improving crops under changing climate
- Bread wheat: Conservation agriculture for water conservation and nutrient use efficiency
- Potato: UK farmer network
- Understanding and optimising nutrient supply from organic wastes

5. Long-term access to the practice abstracts

All completed practice abstracts will be published on:

1. The SolACE community on Zenodo: https://zenodo.org/communities/solace/?page=1&size=20

2. The SolACE page on the EIP AGRI website: https://ec.europa.eu/eip/agriculture/en/find-connect/projects/solace-solutions-improving-agroecosystem-and-crop

3. The SolACE website: https://www.solace-eu.net/

They will also be disseminated via the SolACE social media accounts as well as at several workshops, conferences and other events.

6. Annex 1: Finalized practice abstracts

6.1 Mycorrhizal fungi – How to produce your own bio-fertilizer

PRACTICE ABSTRACT

SolACE FiBL

Mycorrhizal fungi – How to produce your own bio-fertilizer

Problem

Mycorrhizal products offered as bio-fertilizers and plant strengtheners by many companies are rather expensive and often lack quality control.

Solution

This practice abstract provides an easy-to-follow guide describing the process on how to produce home-made mycorrhizal inoculants and how they can be applied as bio-fertilizers in the nursery and during field transplantation of crop plants.

Outcome

Application of mycorrhizal fungi is a simple technique for improving the growth as well as tolerance against biotic and abiotic stresses of a wide range of crop plants. In addition, they can help to improve the soil structure and to prevent nutrient leaching.

Applicability box

Theme
Nutrient management; soil quality and fertility; biotic and abiotic stress tolerance

Geographical coverage
Global

Application time
Sowing, field transplantation

Period of impact
Current and succeeding crop

Equipment
Material to build propagation unit, sand and co-substrate, mycorrhizal starter inocula, urea/compost

See 'practical recommendations' section

Best in
Nurseries, under stressful climatic conditions, in low fertile soils

Practical recommendations

- Propagation unit: Depending on the required amount of mycorrhizal inocula, different types of propagation units can be established: container, pot or concrete units. Container units consist of a plastic beaker with holes at the bottom (to allow water passage) (figure 1a), concrete units consists of a tank made e.g. from cement or PVC tubes (figure 1b), and pot units of two pots with a garden fleece in between (to prevent inoculate leakage) (figure 1c). Beaker and pot units should be placed on a hard surface (e.g. stone, wood or a saucer) to prevent roots growing through. Units should be placed in a wind and rain protected place.
- Propagation substrate: The propagation substrate consists of 1 part sand mixed with 9 parts co-substrate such as Perlite or Vermiculite. Light co-substrate are recommended in order to facilitate the handling and transport. For fertilization urea (100 mg nitrogen per kg substrate) and/or mature, pathogen-free compost (1% of the substrate) is mixed into the substrate.
- Host plants: A mixture of at least two plant species is recommended such as sorghum-barley, sorghum-flax, maize-barley or leek-flax. Seeds can be soaked in water for several hours before sowing.
- Starter inocula: Is added at a rate of 2% of the propagation substrate. It should be purchased from a reliable company.

Figure 1: Different types of mycorrhizal propagation units: container (a), concrete (b) and pot (c) unit.
(Photos: Sarah Symanczik, FiBL)

Research institute of Organic Agriculture (FiBL). Mycorrhizal fungi – How to produce your own bio-fertilizer. SolACE practice abstract.

Figure 2: Steps to set up a container type mycorrhizal propagation units. (Photos: Sarah Symanczik, FiBL)

- Set-up and harvest: Units are filled with pre-mixed substrate and irrigated (figure 2a). Starter inocula is added as a layer 5-8 cm below the substrate surface (figure 2b) and covered with another layer of substrate (figure 2c). Host plant seeds (amount dependent on host plant species) are distributed onto the surface (figure 2d), covered with a layer of substrate (figure 2e) and irrigated. Ninety days after sowing, irrigation is stopped to dry the substrate completely. Shoots are removed and roots are cut inside the propagation unit into small pieces of 1- 1.5 cm using scissors and mixed with the substrate. Then the mycorrhizal inoculate is ready. For quality check, root samples can be taken before drying the substrate to measure mycorrhizal colonization (%RLC) and subsamples of the dried inoculants to assess spore abundance and purity (see practice abstract "Mycorrhizal assessments").
- Application: Mycorrhizal inocula can be used for applications at the nursery stage by adding 100 ml inocula to the root system and during field transplantation by spreading 200 ml inocula into the planting hole below the root system.

Use the comment section on the SolACE discussion forum to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the first author of the practice abstract by e-mail.

Further information

Further reading

- Symanczik et al. (2018): Mycorrhizal fungi as natural bio-fertilizers: How to produce and use. Technical handbook.

Weblinks

- www.fertiledatepalm.net

About this practice abstract and SolACE

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This practice abstract was elaborated in the SolACE project, based on the EIP AGRI practice abstract format.

SolACE: The project is running from May 2017 to April 2022. The goal of SolACE (Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use) is to help European agriculture face major challenges, notably increased rainfall variability and reduced use of N and P fertilizers

Project website: www.solace-eu.net

The project SolACE - "Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use" is supported by the European Union's HORIZON 2020 research and innovation programme under the Grant Agreement no 727247, and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00094. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the EC and the Swiss government. Neither the European Commission/SERI nor any person acting behalf of the Commission/SERI is responsible for the use which might be made of the information provided on this practice abstract.

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PRACTICE ABSTRACT

SolACE FiBL

Undersowing leys in cereals

Problem

Dry periods after harvesting cereals increase the difficulty of sowing a new ley. The tradition of sowing in July/August can therefore be risky.

Solution

Sowing a grass-clover ley into the cereal crop in March/April uses the residual soil moisture from winter for the establishment of the ley. In most cases, the sowing is successful. Under the shade of the cereal crop, the ley develops without becoming a competitor or interfering with the harvest. After removing the straw, the undersown ley quickly develops, forming a dense sward.

Advantages

- Higher yields in grass-clover leys due to earlier development
- Better establishment in dry summers
- Seamless transition from cereals to grass-clover ley without ploughing or other soil tillage.
- A few weeks after cereal harvest the fully-grown ley can be used for cutting or grazing.
- Rather good suppression of annual weeds

Applicability box

Theme
Weed management, soil quality and fertility

Geographical coverage
In areas of cereal cultivation with a continental climate (Central Europe)

Application time
Between tillering and bolting of the cereal crop

Required time
No additional work required if the sowing is combined with harrowing

Period of impact
Current crop and succeeding crop

Equipment
Grass-clover seeder on a harrow

Best in
Generally in all cereal varieties except oats (allelopathic effect on the catch crop). Varieties with medium height and average yield expectations.

Disadvantages

- Presence of perennial weeds, such as docks, is increased due to a lack of stubble cultivation.
- Mechanical weed control is no longer possible.
- It is not possible to restore the soil once it has been compacted by the harvester.
- Uneven establishment of grass-clover leys due to soil compaction from heavy harvesters

Practical recommendation

- The ley is undersown in spring (March/April), between tillering and bolting of the cereal (preferably before a wet period, as the crop cannot be rolled).
- The ley is best sown with a seeder for grass-clover, in combination with a harrow passage.
- Several clover mixtures are possible; farms without livestock may also use only white or red clover.

Row spacing of 24cm (or even 36cm) allows passage with an interrow hoe, but also provides more light to allow the grass clover to grow (Photo: Hansueli Dierauer, FiBL).

Research Institute of Organic Agriculture (FiBL). Undersowing catch crops in cereals. SolACE practice abstract.

Remarks and advice

- The denser and higher the cereal crop, the less likely the undersown ley will succeed (due to shading).
- The success of a ley depends greatly on the choice of cereal variety and the yield expectations: Varieties with a more planophile (horizontal) leaf position are better at suppressing weeds; however, this can suppress ley growth due to light limitations.
- Varieties with erectophile leaf positions are better suited (but they also promote weed growth).
- Long-stem plants create more shade for weeds and but also may suppress the ley compared to middle- or short-stem varieties.
- If weeds that spread by roots or rhizomes such as docks or common couch are present, undersowing is not recommended.
- Sow in early spring

Practical testing

If this method seems to be suitable for your farm, we recommend that you test it under your own farm conditions as follows:

1. When sowing the cereal, delimit a part of the field for testing.
2. Apply the new method on one of the two plots. The other plot can be cultivated as usual to compare.

Evaluation

Visual evaluation: Under favourable conditions, undersowing has hardly any effects on the growth of the cereal crop. Nonetheless, it might be interesting to compare the development of the cereal crop and weed density in both plots at different stages. After harvest, a visual assessment of the soil structure (with e.g. the spade test) can bring interesting insights. Photographs of the trial plots document possible differences and facilitate the analysis at a later time.

Quantitative evaluation: Optimally, the yield of the cereal crop should not be decreased. The temporary grassland can be used earlier than after reseeding and a stubble cultivation.

Further information

Weblinks

- In the OK-Net Arable tool database, further practical information on soil covering techniques in general is available.
- On bioaktuell.ch, you will find information on the undersowing technique as well as other possibilities for soil covers (German/French).
- General information on undersowing on oekolandbau.de (German).

About this practice abstract and SolACE

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