

Diversification of cereal-based rotations with soybean as a second crop

Problem

Cereal crop rotation in Hungary is usually very simple, given that the economic return of new crops in the rotation is not guaranteed.

Solution

Soybean could provide a good income for organic farmers, whilst improving the diversity of the arable crop rotation and providing additional benefits.

Outcome

Farmers can use super early soybean varieties to produce soybean as a second crop in their current cereal based cropping system, limiting their economic risks.

Practical recommendation

- In Hungary, the length of the vegetation period makes it possible to sow soybean after winter barley, fresh forage mixtures or other arable crops that are harvested by the end of June in cereal-crop rotations.
- Soil cultivation and sowing must be done as soon as possible after the cereal harvest. Tillage of the topsoil (to 5-10 cm) may be enough. In the case of no-till farming, heavy seed drills are ideal, because light ones cannot drill the seed to the optimal depth.
- Super early varieties are the best to use as a second crop. The row space, in this case, can be wider (36-48 cm) or narrower (12-15 cm). If the distance between the rows is less than 25 cm, only the tine weeder and rotatory hoe wheel are suitable for weeding the crop. If the chosen row spacing is wider (36-48 cm), the inter-row weeder can be used as well.
- Mechanical weeding with a tine weeder may be used several times but only 3-5 days after seeding (before the emergence of the soybean), or later after the cotyledon stage. Although the main purpose of a tine weeder is to decrease competition with weeds, it also breaks up the capped soil surface and improves the water uptake capacity of the soil.

Applicability box

Theme

Multiple cropping, rotation, cropping system, field

Agronomic conditions

Average temperature (June-October): 18-20 °C

Precipitation required (June-September): 240-260 mm

Type of soil: luvisol, chernozem, clay loam

Seeding time

End of June, beginning of July

Equipment

Seed drill, tine weeder, rotatory hoe or inter-row weeder

Best in

Cereal dominant crop rotations



Picture 1: Second-crop soybean, end of July. (Photos: Éva Hunyadi, ÖMKi)



Picture 2: Second-crop soybean, end of September (Photos: Éva Hunyadi, ÖMKi)

- A rotatory hoe can be applied before the crop is 20-25 cm tall. Choosing the right method of mechanical weeding with the right timing, especially in the case of moderate-high weed pressure (see Picture 1), can reduce competition with weeds and allow the crop to reach an economically suitable yield level (Picture 2).
- Competition with large-sized summer weeds, such as goosefoot (*Chenopodium* spp.), jimsonweed (*Datura* spp.) and pigweed (*Amaranthus* spp.) is lower when soybean is a second crop than when soybean is used as a main crop. However, when used as a second crop, competition with wild grasses such as cockspur grass (*Echinochloa crus-galli*) and damage by wild animals and caterpillars (*Helicoverpa armigera*, *Vanessa cardui*) can be more significant.
- In late sowing of super early varieties such as those used in second cropping, the lowest pods on the plants are closer to the soil compared the pods of soybean plants grown as main crops, therefore a flexible cutter bar is required to minimise loss during the harvest.
- The second-crop soybean is expected to be suitable for harvesting from the end of October until the middle of November when the grain moisture content reaches 15-16%. The yield is strongly dependent on rainfall or the opportunity for irrigation during the flowering period, usually in August. In the case of a wet summer (2018) on our research sites the yield was around 1.5-1.7 t/ha, but in the case of drought in August we could not reach 1 t/ha. The protein content ranged between 32 and 40%. Although these yields are not outstanding, having two different crops in the same year, one of them being a leguminous species, increases the biodiversity and Nitrogen delivery to the organic cropping system and, therefore, intensifies it.

Further information

Weblinks

- <https://biokutatas.hu/szoja-fajta-talaj-es-magkezelesi-tesztek/>
- https://www.researchgate.net/publication/347144999_Organic_soybean_production_in_Switzerland
- <https://northeastcovercrops.com/wp-content/uploads/2021/11/Organic-No-Till-Soybean-Production.pdf>
- Mechanical weed management in soybeans

About this practice abstract and DiverIMPACTS

Publisher:

ÖMKi-Research Institute of Organic Agriculture

HU-1033 Budapest, Miklóstér 1

Authors: Éva Hunyadi Borbélyné - Dóra Mészáros - Bence Trugly

Contact: eva.hunyadi@biokutatas.hu, bence.trugly@biokutatas.hu

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This factsheet was elaborated in the DiverIMPACTS project, based on the EIP AGRI practice abstract format. It was tested in Hungarian organic on-farm trials, in luvisol, chernozem, clay loam soils.

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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