

Organic mulching in potato fields to control insect pests and provide ecosystem services

The overall objective of EcoStack is to develop and support ecologically, economically and socially sustainable crop production via enhancement of ecosystem services provision and protection of functional biodiversity.



Practice principles

The agroecological practice of organic mulching aims to maximise early soil coverage in potato fields to provide soil protection and controls weeds. By covering the soil in fields, this practice can also have an effect on insect pests management, supporting biodiversity such as natural enemies, and provide yield stability. Organic mulching affects many agronomic parameters, and it is important to understand the positive impact to implement it at larger scale.



Research context

During the EcoStack research project, three research teams from Germany, Bulgaria and Bosnia and Herzegovina tested this practice in potato fields in order to measure the impact on insect pests (aphids and Colorado potato beetle), functional biodiversity and agronomic performance. These experimentations took place in different pedoclimatic contexts from 2019 to 2022. Different types of organic mulches were tested during this project, like straw mulch, triticale/vetch mulch or grass/alfalfa mulch.



Main results

- Organic mulching improves insect pests control by reducing landing of winged aphids in potato fields, aphids colonisation on plants, and leaf damage from Colorado potato beetle, especially in years with high pest pressures.
- It increases the abundance of ground-dwelling carabids and spiders.
- It saves one weed treatment by covering the soil at an early stage.
- Potato fields with organic mulch had at least the same yield or higher yield, depending on the pedoclimatic regions and year.

Information on crop production protocol

To be successful, we provide some guidelines for timing, machinery and type of mulch to implement organic mulching strategies in potato fields.



Machinery and type of organic mulch

To implement this practice on a large scale, the spreading of a huge amount of organic mulch needs to be done with the help of machinery.

In large scale trials in Germany, a manure spreader, adapted with a spreading width of about 1.5 m was used to apply mulch material on two potato rows.

Adapting the farm equipment takes some time but allows the practice to be implemented on a large scale without huge investment.



Picture 1 : Application of mulch material in potato field with a manure spreader (EcoStack 2023)

The EcoStack project trials used different types of organic mulch and applied different amounts of mulch. Table 1 shows the type and amount of mulch used in the different trials in the countries.

Type of mulch	Bosnia and Herzegovina	Germany	Bulgaria
Triticale/vetch (Fresh weight)	/	60 t/ha	/
Grass/legume (Fresh weight)	35 t/ha	60 t/ha	30 t/ha
Straw (Dry weight)	2 t/ha	4 t/ha	2 t/ha

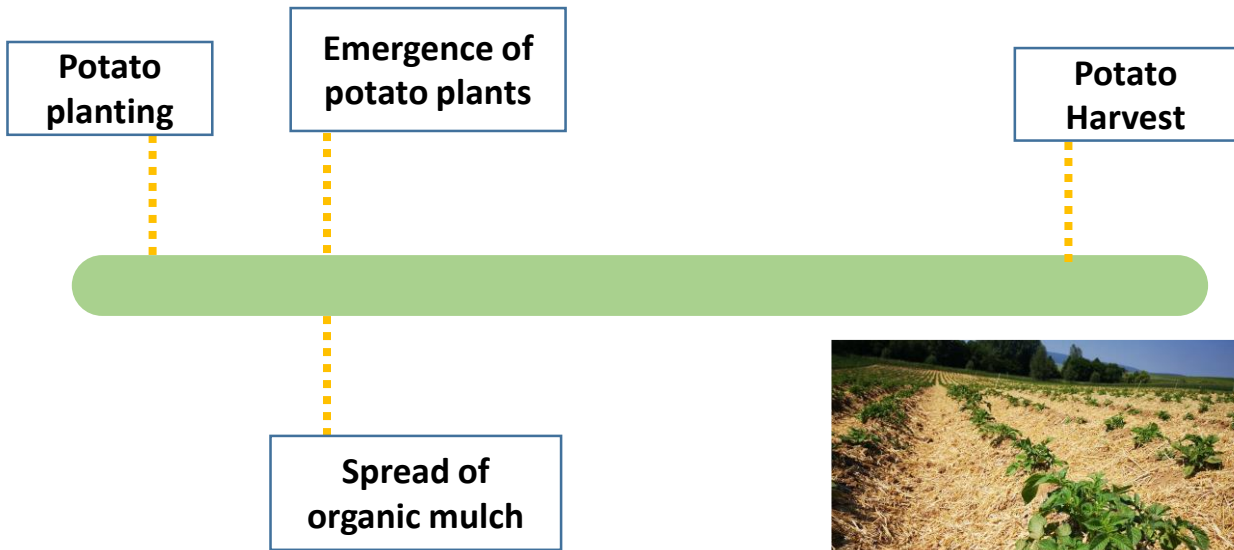
Table 1 : Quantity of mulch applied in EcoStack experiments

All types of mulch material showed positive effects on agronomic performance in the trials conducted. However as the amount of mulch applied in potato fields is important, the sourcing of mulch material must be organized. In fact, it could be produced on the farm or exchanged with other farmers. Straw mulch can come from the last cereal harvest, but it needs to be stored during winter. The plant material such as triticale/vetch or grass/legume can come from a winter cover crop, but it needs acreage and must be harvested at the right time.





Crop management



Picture 2 : Potato field with straw mulch in Germany, from EcoStack 2023



Points to pay attention to

Sufficient amount of organic mulch material must be available. This can be straw or plant material produced on the farm or exchanged with local farmers.






Time and machinery to collect and spread the mulch material in potato fields at the right potato growing stage.





Overview of the practice

Researchers at the Julius Kuehn Institute (Germany) gathered information to systematically identify the socioeconomic impacts and potential costs and benefits of EcoStack strategies. The description of expected impacts is based on a literature and data review, as well as interviews with EcoStack researchers about their field trials and expected outcomes. Here are the outcomes of organic mulching analysis :

-  At the field scale, many strong positive effects of organic mulching are expected on agronomic performance in terms of yield, pest control, soil fertility, water regulation, and soil erosion. At the farm scale, there are strong positive effects on fertilizer and pesticide use, which are reduced by the use of organic mulching.
-  Reducing fertilizer and pesticide use through the use of organic mulch in potato fields lowers input costs for farmers and also reduces health risks from pesticide use. On a larger scale, it also promotes water conservation by reducing nitrogen leaching from farmland and supports biodiversity by improving habitats for natural enemies.
-  No impact on pollinators is expected from organic mulching. The impact on labor could be neutral because applying organic mulch saves a weed removal operation, so the time spent applying the mulch is offset by the time saved on weed removal.
-  Some aspects may be negatively impacted by organic mulching. The cost of organic mulch, depending on whether it is produced on the farm or not, can increase the use of inputs. Work organization must be adjusted to achieve harvesting and application of organic mulch at the right time.
-  This practice is not expected to have a strong negative impact.

The overall ranking of organic mulching is very positive due to the agronomic benefits it can provide. However, the change in labor organization and the cost of organic mulching must be considered in order to use it with the least negative impact.

Reference: EcoStack Deliverable WP4.2 "Impact of organic mulching on ESP", 2023

Questions? Please contact us info@ecostack-h2020.eu

Visit our web site to be informed : www.ecostack-h2020.eu

