



THE PROJECT "SWEEDHART"

The Sweedhart project (Separation of weeds during harvesting and hygienisation to enhance crop productivity in the long term) aims at studying concepts to reduce the weed pollution of fields with a concurrent benefit via biomass utilization. The spread of herbicide resistant weeds is a growing problem. New chaff treatment techniques were investigated in 3 pillars to tackle this issue by:

PILLAR 1: Hygienisation

The Sweedhart project explored whether the engine's exhaust gases could be used to kill the weed seeds contained in the chaff.

PILLAR 2: Total harvest

One potential possibility to prevent harvested weed seeds to be returned to the field is to harvest and collect everything and to separate it beneath the field. This was investigated theoretically.

PILLAR 3: Integrated harvest measures

This pillar is based on a targeted handling of chaff and was evaluated by various field tests.

- Collection of chaff (on accompanying trailers e. g.) during harvesting (e. g. for thermal use or other applications)
- Placing chaff on the straw swath with subsequent baling

www.sweedhart.eu

Project Partners

Coordinator

Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT, Germany

Partner

- CLAAS Selbstfahrende Erntemaschinen GmbH, Germany
- University of Copenhagen,
Department of Plant and Environmental Sciences, Denmark
- Norwegian University of Science and Technology,
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Funding notice

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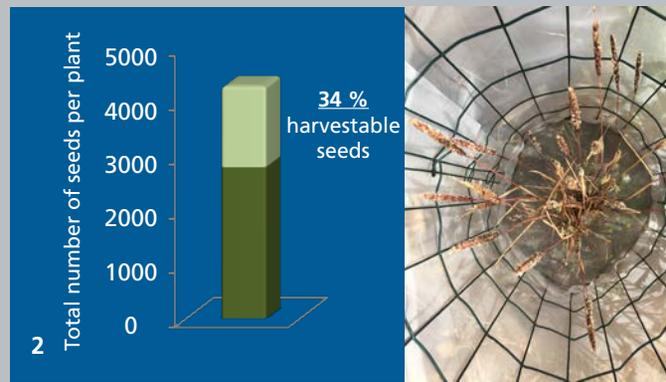
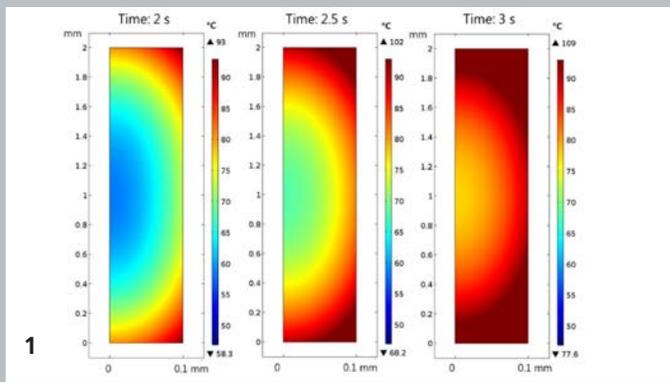
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RECOMMENDATIONS TO FARMERS

NON-CHEMICAL WEED CONTROL ALTERNATIVES





- 1 Time- and temperature-based simulation of heat distribution in seeds.
- 2 *Alopecurus myosuroides* (Blackgrass) [in autumn sown fields].

CONCLUSIONS AND CATALOGUE OF WEED REDUCTION MEASURES

The project Sweedhart evaluated the measures proposed in pillars 1-3 theoretically and practically. The lessons learned from the investigations are presented hereafter:

PILLAR 1: Hygienisation

Simulations with model seeds have been analyzed to determine optimal hygienisation conditions (Fig.1). The determined parameters were investigated under laboratory conditions.

- The hygienization of weed seeds is theoretically possible.
- The process technical realization within a combine harvester is challenging under the current time and cost constraints of usual harvesting practices.
- This concept could be an option in the next decade.

PILLAR 2: Total harvest

The total harvest has the potential to remove the harvested weed seeds while being an economic interesting concept. However, applicable combine harvesters and necessary central processing sites do not exist currently.

PILLAR 3: Integrated harvest measures

It was successfully proven that a targeted deposition of the harvested seed bearing chaff fraction is possible.

Detailed conclusions are:

- Transferring chaff into bags or trailers removes all harvested seeds
- Deposition of chaff on the swaths with subsequent baling leads to seed collection losses of around 50 % because of trickling and wind distribution during swath drying
- Chaff deposition in driving lanes: validated in Australia

Weed seed shattering behaviour

Seed production and seed shattering pattern of 20 common weed species were investigated during the growing seasons in 2017 and 2018. The purpose was to estimate the potential collectable weed seed fraction with a combine harvester (Fig. 2). The results range from 0-100 % collectable seeds. In average, 10-40 % can be collected by a combine harvester.

FURTHER Recommendations to farmers

- Only **multiple measures** will lead to successful weed reduction
 - Sweedhart measures in relation with a combine harvester can have an average impact of 10-40 % weed seed removal depending on the weed species (the other weed seeds already have been shattered and are on the ground)
 - The remaining 60-90 % of weed seeds on the ground need to be eliminated by other agricultural measures!
- Farmers should harvest as early as possible to collect weed seeds before they fall to the ground
- More intensive tillage – stimulates germination
- Farmers should apply crop and herbicide rotation
- The more crop plants per m², the better their competition ability against weeds
- Besides collecting weed seeds with the harvester, a destruction of weed seeds should be taken into account → mechanical treatment of chaff
- Collection of chaff can bring additional income by using it thermally (e.g. pellets) or materially (e.g. as insulation)

Joint achievement of: