

# International Conference on BREEDING AND SEED SECTOR INNOVATIONS FOR ORGANIC FOOD SYSTEMS

By EUCARPIA Section Organic and Low Input Agriculture jointly  
with LIVESEED, BRESOV, ECOBREED, FLPP projects and ECO-PB

Online from  
Latvia

08-10 March 2021

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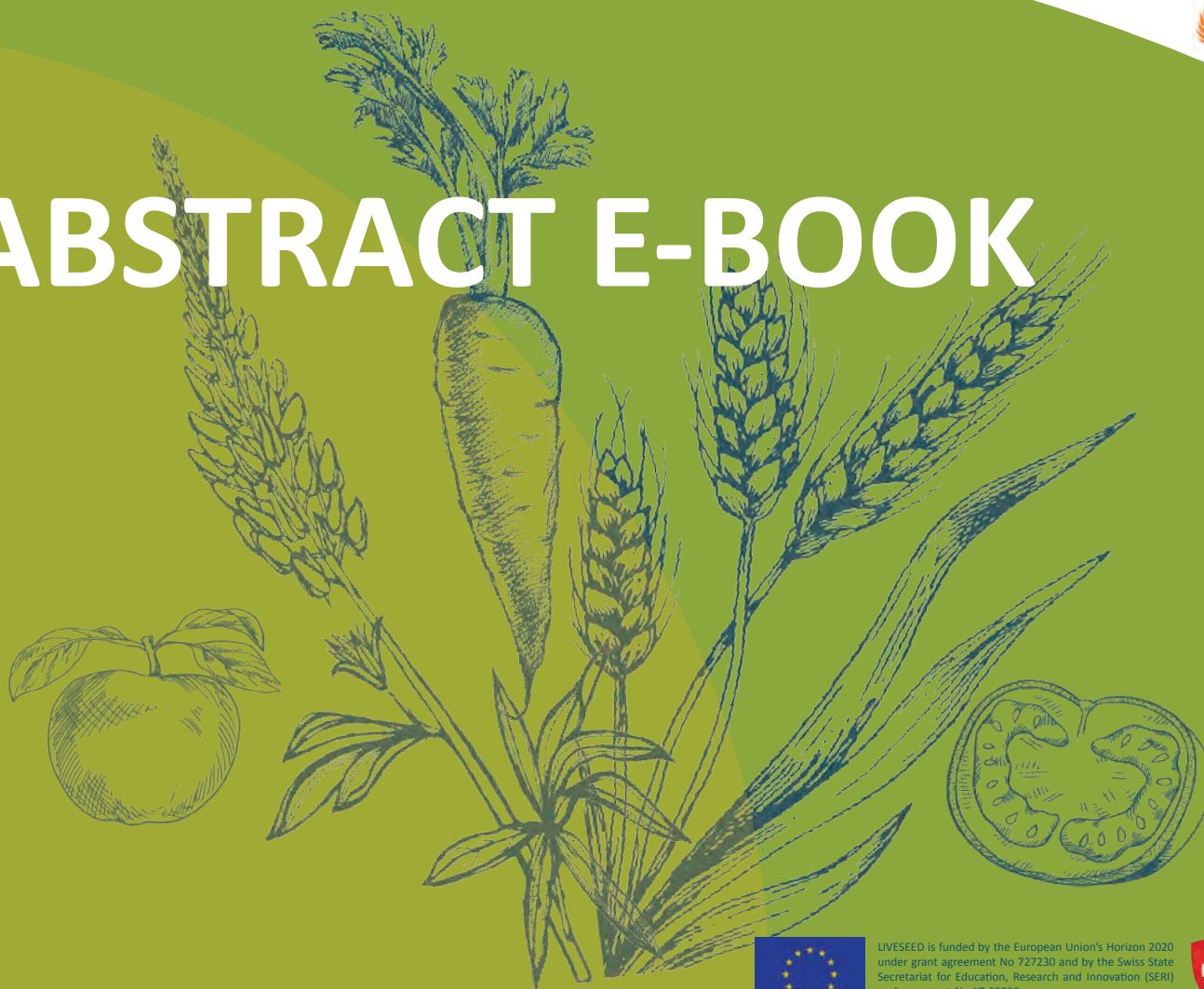
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## ABSTRACT E-BOOK



LIVSEED is funded by the European Union's Horizon 2020 under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract No 17.00090.





Abstract e-book

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**ISBN 978-9934-513-50-3**

**UDK 63(062)**

**In746**

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Compiled by: Marta Devīte, Lāsma Rābante, Līga Dzedule, Māra Bleidere, Ilze Skrabule

Authors are responsible for the content of Abstracts.

Recommended citation:

Colley, M., McCluskey, C., Lammerts van Bueren, E., Tracy, W. (2021). The ripple effect of participatory plant breeding: a case study in use of organic sweet corn. In: International Conference on BREEDING AND SEED SECTOR INNOVATIONS FOR ORGANIC FOOD SYSTEMS By EUCARPIA Sector Organic and Low Input Agriculture jointly with LIVESEED, BRESOV, ECOBREED, FLPP projects and ECO-PB, 8 – 10 March 2021, Institute of Agricultural Resources and Economics, Latvia.

## PERENNIAL CEREALS FOR ORGANIC AGRICULTURE

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**Keywords:** perennial cereals, perennial wheat, perennial rye

The cultivation of perennial wheat might represent an economically and ecologically interesting option for extensive cultivation, particularly in marginal land. In autumn 2017, five breeding lines of perennial wheat (*Triticum aestivum* × *Thinopyrum intermedium*) and for comparison two varieties of annual wheat were sown at three sites in Bavaria. The five breeding lines were selected from a bulk originating from Washington State University. Other plots were additionally sown with white clover and subterranean clover. Due to poor soil quality at the three sites, annual wheat can only be grown to a limited extent. In 2018, the yield of the perennial breeding lines was 49 to 96 % of the annual cv. 'Capo', which reached an average of 17.4 dt/ha. In 2019, the yield was 9 to 38 % of 'Capo', which reached an average of 10.8 dt/ha, showing large differences between the locations. The autumn re-emergence was significantly affected by the severe drought at all sites in 2018 and 2019 and showed differences between the lines up to a total failure at one site. In the third year, the yield of the breeding lines was very low, thus a third year of cultivation cannot be recommended under these climatic and soil conditions. The yields of the plots with under-sown clover were significantly higher in the third year. A mixture with a low growing clover species is recommended because of better weed suppression.

An important aspect for the production of perennial wheat is its intensive and deep root system that should increase organic soil matter, soil life and improve soil structure. Soil samples were taken each spring from annual wheat plots, perennial line mixture and perennial line mixture plus white clover. The three-year investigation already revealed some interesting tendencies. For example, in very sandy subsoil of one location, a significant increase of soil organic carbon in the order perennial with clover – perennial – annual was found. Moreover, two of the three locations showed a significant increase of microbial biomass in the same order both in top soil and subsoil. Number of earthworms was up to twice as high in perennial relative to annual wheat. Field trials with perennial rye cv. 'Perenne' derived from an interspecific cross between

*Secale cereale* and *S. montanum* were carried out from 2012 to 2015 at BOKU. Regular cuttings were done between stem elongation (beginning of May) and anthesis (mid-June) in order to determine biomass yield and regrowth capability. Biomass yield of 'Perenne' in the early cuttings was between 70 and 95% compared to cv. 'Elego', but decreased to 45% after heading/anthesis for the two- and three-year crop stand. This decrease was mainly due to the reduced plant height (-45 cm) of the perennial crop (2<sup>nd</sup> and 3<sup>rd</sup> year) compared to the first year crop. Root mass in the three-year crop was significantly higher compared to 'Elego' and the first and second year 'Perenne', but mainly only in the top 20 cm. Generally, significantly inferior grain yield was obtained for 'Perenne', reaching only 53%, 26% and 15% for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year crop, respectively, compared to annual 'Elego' (5670 kg/ha). Similarly, a significant decrease was also observed for thousand grain weight (-32%) from the first to the third year of cultivation. Moreover, a higher number of ergot sclerotia was observed for the interspecific perennial rye hybrid compared to 'Elego'. Weed infestation was constantly increasing in the perennial crop making a cultivation of more than three years not recommendable.

To introgress the perennial cytoplasm of *Thinopyrum intermedium* into modern germplasm of common wheat, RGA carried out in 2019 and 2020 several crosses between *T. intermedium* and common wheat. The aim of this work is to develop superior perennial amphidiploids in terms of fertility and other agronomic traits which are important for organic agriculture (e.g. disease resistance and improved nitrogen use efficiency).

Summarized, perennial cereals – best in mixture with clover species – are an interesting option for the production in organic agriculture especially on marginal sites in order to reduce erosion and improve soil fertility.

### Acknowledgements

The project was supported by the German Federal Ministry of Food and Agriculture (BÖLN), Landwirtschaftliche Rentenbank and European Union Horizon 2020 Grant Agreement 771367#

### References

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