

Hemp in Slovenia: challenges and opportunities

Laetitia Marrot

InnoRenew Center of Excellence, Slovenia, E-mail: Laetitia.marrot@innorenew.eu

Hemp as a sustainable solution

Hemp is an ideal crop to answer some environmental issues thanks to its capabilities of absorbing heavy metals and nitrates as it grows, storing CO₂ in its shives when used in hempcrete, or reducing CO₂ emissions as a composite with low density fibres in the transportation industry.

The different parts of hemp (fibres, shives, seeds) can be used in various industries (food, clothes, building, transportation, etc.). For the composite industry, hemp fibres show interesting mechanical properties.



Fig. 1 Hemp field in Slovenia, Fedora 17 variety*

Mechanical properties of hemp fibres

- Vegetable fibers like hemp or flax fibres are interesting for the reinforcement of composites because they combine high mechanical properties with low density (40% lower than glass fibers). Their specific tensile strength and specific Young modulus are comparable to glass fibers.
- The literature reveals a hierarchy of the mechanical performances of vegetable fibres as presented in Figure 2. The mechanical properties of hemp fibres are significantly lower than flax fibres. These differences are explained by several factors:
 - The biochemical composition of the fibres
 - Harvest timing is not optimized (incomplete filling of the fibres)
 - Aggressive defibring processes damages the fibres (creates defects which initiate rupture during loading)
 - Retting is not used, which does not facilitate the defibring process

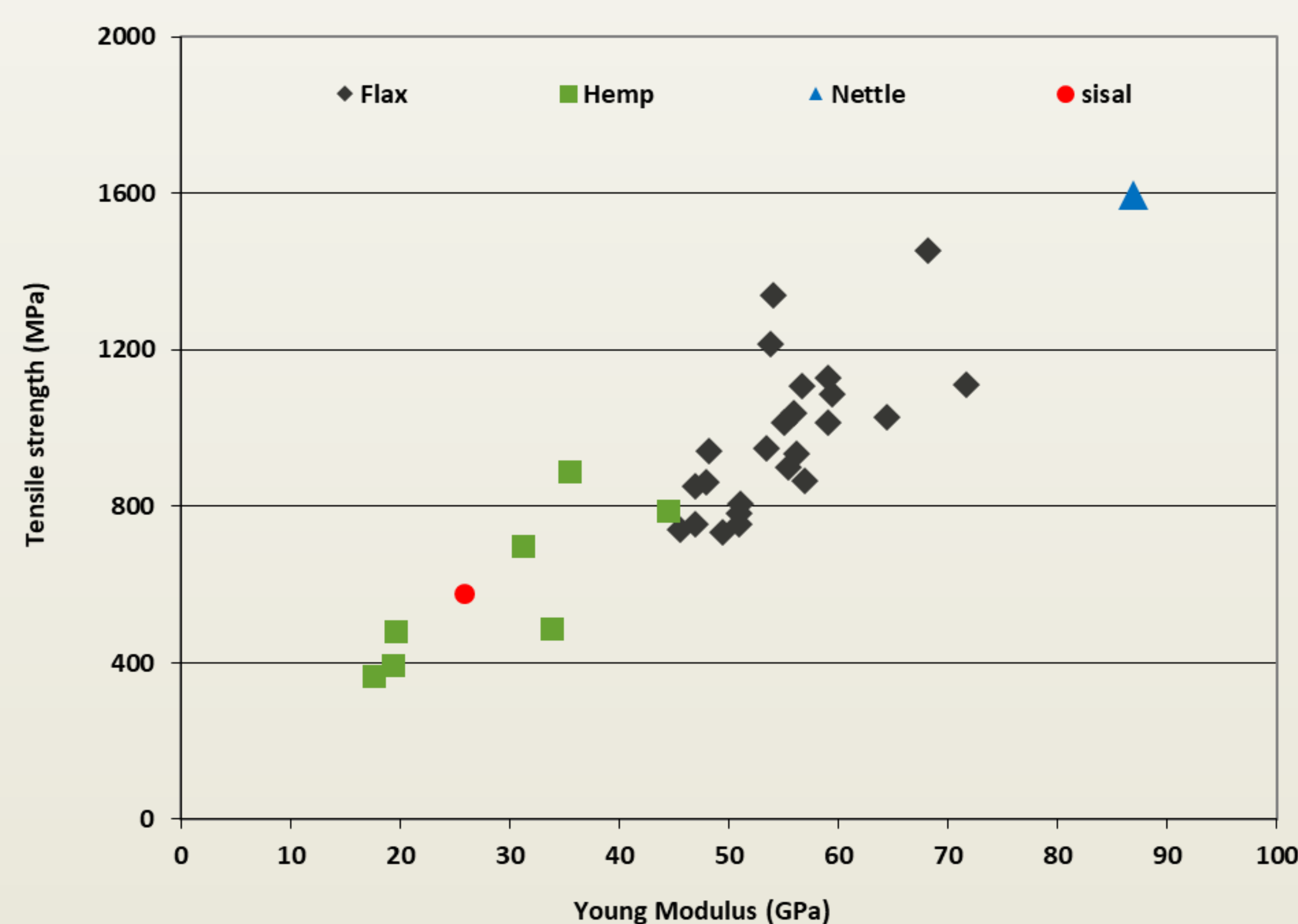


Fig. 2 Hierarchy of the performances of vegetable fibres (flax, hemp, nettle, and sisal) [1]

Fig. 3 Hemp fibres in-situ observed with a scanning confocal microscope [2]



Hemp possess 2 different types of fibres (primary and secondary fibres) which cannot be differentiated. Their properties are significantly different, which contributes to the high variance in the mechanical properties

References

- [1] L. Marrot, A. Lefevre, B. Pontoire, A. Bourmaud, and C. Baley, "Analysis of the hemp fiber mechanical properties and their scattering (Fedora 17)," *Ind. Crops Prod.*, vol. 51, pp. 317–327, Nov. 2013.
- [2] L. Marrot, "Contribution au développement de matériaux composites à matrices thermodurcissables biosourcées et renforcées par des fibres végétales," thesis, Lorient, 2014.
- [3] "Interchanvre - InterChanvre." [Online]. Available: <https://interchanvre.org/interchanvre>. [Accessed: 14-Oct-2018].

Hemp culture in Slovenia

- Slovenia's hemp production was 310 ha in 2017 and over 37 000 ha in Europe
- Hemp is cultivated in Slovenia mainly for the seeds to extract hemp oil and proteins, and for the flowers to make CBD oil
- The seeds represent only 21% of the economical value of the whole plant (50% for the fibres, 27% for the shives and 2% for the dust)[3]
- The most cultivated varieties are Fedora 17, Uso 31, KC Dóra, Finola, Santhica 27

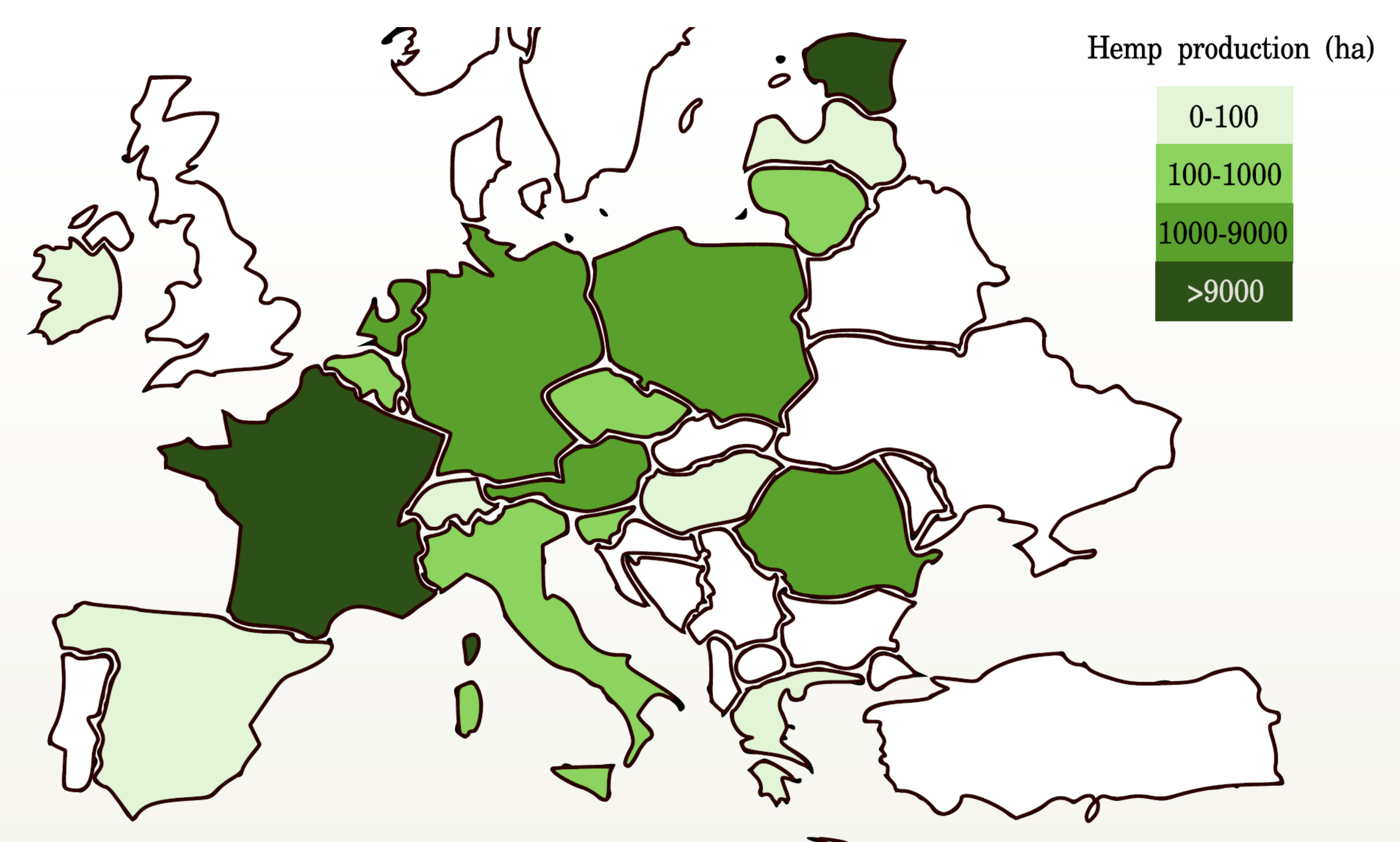


Fig. 4 Hemp production in Europe in 2018 [Eurostat]

Hurdles:

- Because there is no Slovenian variety of hemp, there is a need to define the most suitable varieties for seeds and fibre production respectively, regarding climate and soil characteristics
- Lack of infrastructure, difficulties to harvest hemp due to its uneven height (lack of knowledge about the varieties) and absence of defibring processes
- This results in a decrease of the hemp production over the past 3 years, after a huge promotion campaign for hemp in 2015

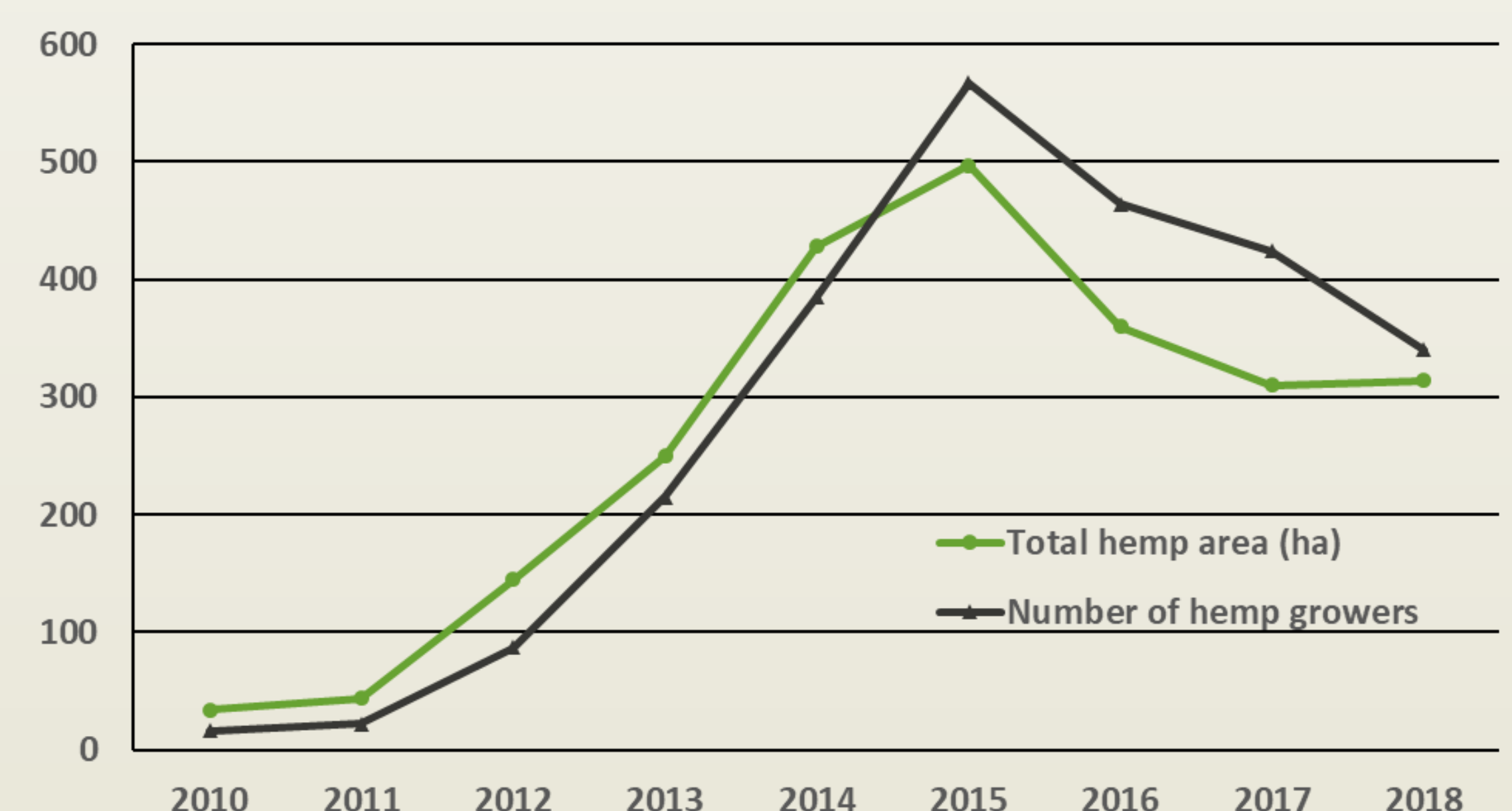


Fig. 5 Hemp production in Slovenia from 2010 to 2018 [Ministry of Agriculture, Forestry and Food of Slovenia]

Future work

- Promotion of hemp's advantages and use in constructional materials
- Fundamental research of hemp properties and modification techniques of the fibres to increase their performance and to develop new potential applications
- Development of a new insulation materials combining hemp and fungi
- Use of long hemp fibres for the reinforcement of high performance renewable biocomposites
- Carbonization of hemp fibres and shives to enhance the thermal performance and mechanical properties of composites



Find out more about InnoRenew through our social media profiles:
Twitter: @innorenewcoe Facebook: @innorenew LinkedIn: InnoRenew CoE

*The author would like to acknowledge the NATURAGOOD company for its collaboration and for providing the materials for future work.

Funding provided by Horizon 2020 Framework Programme of the European Union; H2020 WIDESPREAD-2-Teaming: #739574 and the Republic of Slovenia. Investment funding of the Republic of Slovenia and the European Union of the European regional Development Fund.

