

## Section Sciences et Ingénierie de l'environnement Design Project 2021 (semestre de printemps)

### Proposition n°29

#### Re-use of residual Hemp Biomass from textile production

##### Partenaire externe

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Cooperative Glaernisch Textile

Taille de l'entreprise (nbre de collaborateurs) : 3 - 6

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##### Descriptif du projet

The global hemp market is expected to grow from USD 4.6 billion (2019) to 26.6 billion by 2025. With several hundred varieties of the hemp species capable of growing in diverse geographies and climate, its agriculture has offered farmers the potential to secure a long term reliable source of revenue, enabling them to diversify from traditional products such as milk and meat. In addition to this, hemp has the capacity to grow 6x faster than wood resulting in a higher amount of CO<sub>2</sub> capture. The commercial desirability of hemp can be described as a "360 degrees" approach whereby all components such as the flower, fruit, leaves, stem and residue can be converted to food, textile, building, plastic, paper, furniture, medicinal applications and many more. However, at present a standardised product route for non-medicinal application does not fully exist commercially.

Glärnisch Textil exploits hemp straws to produce renewable precursors for application in some of the abovementioned industries with 3 focus areas depending on straw quality. The top quality straw is pure, fine and high in quality for conversion into textile fibres. The secondary type of straw is coarse and processed into insulation material. The third and lowest quality straw is very short and hard consisting of a mixture of the short crocheted, roasted stems, the fibres, shives, leaf and flower. Given the diverse composition, conventional mechanical processing such as beating, breaking, spinning or linking is not suitable. Nonetheless, the fibres produced from the tertiary quality straw has applications as synthetic fibres, plastic substitute, paper substitute, composite material, etc.

As such, the project entails the evaluation of possible routes and procedure to produce fibres from the third class of straw via an environmentally and economically sound route. The product produced should aim to use a standardised feedstock for the manufacture of synthetic fibres similar to "Tencel/Lyocel" and "Modal" product stream of Lenzing (Austria), or

aim toward fabrication of cellulose for the paper or plastic industry. Attaining success in realising a suitable course for the above products will support the use of large quantities of hemp biomass, consequently propelling growth in the Swiss hemp agriculture industry as well as enable production with sustainable and renewable components.

### **Objectif et buts**

The overall objective of the project is to perform a technical design and environmental feasibility study to utilise the third class straw and produce abovementioned products in Switzerland consistent with the principles of a circular economy. In particular the realised goal should include:

- Quantitative and Qualitative evaluation of synthetic fibres produced for the above process, including mass and energy balance.
- Economic study on the viability of using fibres from hemp and the environmentally degrading products/feedstocks that it will replace.
- Ecological and Economic benefit to Switzerland (quantitative and qualitative) achieved by replacing traditional fibres with hemp fibres.

### **Descriptif tâches**

As an initial step, primary and secondary resources (including [www.glaernischtexil.ch](http://www.glaernischtexil.ch) ) should be used to recognise and grasp the “360 hemp” philosophy and understand its corresponding details.

Design a suitable solution to obtain one or more products via the utility of third class straw with vectors encompassing environmental, ethical and economic aspects, for multitude of potential products and/or applications.

Provide technical description and understanding of the performance, qualities and environmental compatibility of the processes above.

Perform an environmental assessment (or a material flow analysis at the least) to quantify the environmental benefits from replacing conventional raw materials with regionally sourced renewable resources.

Support the design study with an economic evaluation.

### **Divers**

Further information to support research and knowledge queries can be found on [www.glaernischtexil.ch](http://www.glaernischtexil.ch). Glärnisch Textil is working in collaboration with organisations such as 360 HEMP, Stroba Naturbaustoffe AG, Schönthaler OHG, Alpen Pionier AG, CannSol Holding AG, Chiavi Raum- und Farbphysiologie, Landi and Pflanzenoel AG. Further support from Dr. Bhavish Patel (PSI) will also be available.