

What would a hemp-stalk processing plant make?

A product catalogue with a farmers' share

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The stalk has something for everyone.

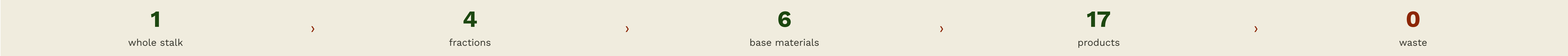
Farmers receive a share of the sale of every product made from their crop.
One stalk, four fractions, six base materials and a catalogue of finished products, with no synthetic adhesive and no added formaldehyde.

PT

Os agricultores participam na venda de cada produto feito com a sua colheita.

EN

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1

INTRODUCTION · ZERO WASTE

The stalk splits into four fractions

No fraction is discarded. The sector raised the need for a regional plant; first we must know what it would make.

Bast fibre → Micro-rods, yarns and textiles

Leaves and trimmings → Fuel for the process itself

Hurd (pith) → Densified blocks

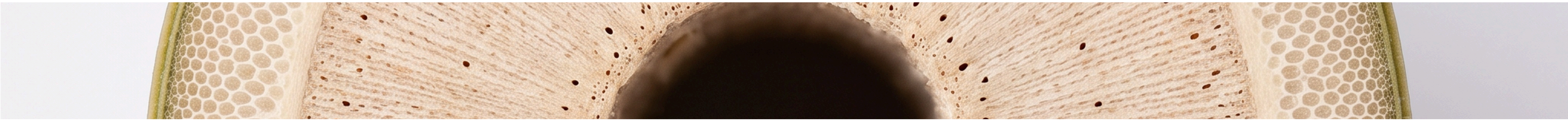
Seeds → Epoxidised-oil bio-resin and feed

2

MATERIALS AND METHODS

A composite with no adhesives and no harmful chemicals

Adapting to hemp a route already demonstrated in wood (Song 2018, Frey 2018). Its bast fibre holds more cellulose than wood and is formed of long, parallel bundles.



Stalk section: bast in the rind, woody core, central lumen. Illustration, not a laboratory photograph.

- 1 Partial delignification. Part of the lignin is removed and the cellulose becomes accessible.

2 Hot densification. Cyclic pressure and heat bring the cellulose chains together.

3 Hydrogen bonds. Cellulose against cellulose: it holds with no glue. At end of life it is ground and pressed again, and pure-cellulose versions biodegrade.

4 One batch, six forms. The same delignified batch is split and each portion goes to a different form. One preparation step shared across six outputs.

3

CATALOGUE · LAYER 1

Base materials

Six forms out of one treated batch.

01Flexible yarn. Delignified fibre, not densified. Woven on an ordinary loom.

02Micro-rod. Densified strand, never ground. The long fibre stays continuous.

03Core-spun yarn. A rigid rod wrapped in flexible fibre. Stiff inside, sewable outside.

04Block. Fibre milled below 100 µm, then densified.

05SOLARIS fabric. Twill and arrest zones alternating, 12x12 repeat, two-shaft loom.

06Pressed sheet. The fabric pressed, keeping its pattern as a density variation.

Reference images: the material has not been made yet.

4

CATALOGUE · LAYER 2

Finished products

What the plant itself or other industries would make from those materials. Some need extra processing stages.

- Construction.** Adhesive-free composites^{H2}, Honeycomb core^{H2}, Multilayer laminates^{H2}.

Protection and shielding. Auxetic metamaterial^{H2}, Thermal and EM shield^{H3}, Adaptive camouflage^{H3}, Ballistic translucent^{H3}.

Transport and hydrogen. Pressure vessels^{H2}, Automotive, marine and aerospace^{H2}.

Energy and electronics. Supercapacitor electrodes^{H2}, FR-4-free circuit board^{H2}.

Wearable and consumer. Modular exoskeleton^{H3}, Furniture, cases, handles^{H2}.

Advanced and end of life. Motor-intention control^{H3}, Self-repair^{H3}, Finishes and treatments^{H2}, Re-densify^{H2}.
- H2 after coupon testing

H3 described, not built

5

RESULTS AND DISCUSSION

What will be measured, and against what

No measurement of this material has been made yet. The protocol is written and the coupons designed.

Density · Tensile and flexural strength · Crystallinity by X-ray diffraction · Thickness swelling after 24 h in water.

Against untreated fibre and against the materials each product would replace. Success will be matching or beating those materials in strength and moisture stability.

1,94 - 4,37 MPa

Fibra de liber prensada en caliente, sin aditivos. Valor en masa; la misma fuente da 126-262 MPa en fibra individual. La única ruta publicada equivalente a la nuestra.

Mishigdorzhlynn 2025 · Polymers 17(23) 3178

150 MPa

Objetivo de diseño reivindicado en masa para el material designificado y densificado. Sin verificar.

A published equivalent route exists in hemp, but its product is a weak sheet, not a structural material. As far as I have been able to check, nobody has taken partial delignification and densification to bast fibre to make a structural material. In wood the same route reached 587 MPa (Song 2018): another feedstock, and a category record, not a ceiling.

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CONCLUSIONS

Who the benefit returns to

With this catalogue the plant would know what to make and who to sell it to, and farmers would know what their stalk is for.

THE SPLIT

Farmers

A share in the sale of products made from their crop. And the crop pays twice: on the sale of the stalk, and in the field the rotation leaves improved.

THE RULES

Price first

The stalk is paid at market price on delivery. The share sits on top, never instead of.

Traceable by batch

The farmer follows their own crop to the product. Without traceability the share is just a promise.

Those who run the plant

A share for those who operate the processing, not only a wage. The plant is where the value is created.

Open books

Members see what was sold and at what price. Secrecy is where distrust begins.

Ownership

The remainder pays capital and risk, and funds maintenance and research.

One member, one vote

The formula lives in the statutes, not in anyone's goodwill.

What has no price yet. The unit price of each product is unset, and with it each share's percentage. Fixing them needs the tests and a market reference. This catalogue opens that work, it does not close it.

PT

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References
Song, J. et al. (2018) Nature 554, 224-228 · Frey, M. et al. (2018) ACS Applied Materials & Interfaces 10(5), 5030-5037 · Mishigdorzhlynn, U. et al. (2025) Polymers 17(23), 3178 · Guajardo, A. A. (2018) Rise Up Hemp. Trabajo de fin de grado, Design+Change, Linnaeus University, Suecia.
The need for a regional processing plant was raised at the 1st Iberian Hemp Congress, 2024.

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