



GREENAGER +



FARMING

“Agriculture for building constructions”

Building with:

- Fast growing trees
- Fast growing shrubs
- Fast growing plants
- Fast growing grasses
- Straw remains and roadside grass
- Reed and reed remains

**THE NEW EARNINGS MODEL FOR
CONSTRUCTION AND AGRICULTURE**

**Hemp | Elephant grass | Mammoth grass | Kiri | Poplar | Reed
Suncrown | Alfalfa | Sugar beat | Roadside grass | Straw remains**



GREENAGER +



BIO-BASED CONSTRUCTION



GREENAGER+ specialises in making building products and construction techniques circular and sustainable, particularly floors, roofs and walls. Achieving the European targets of being CO₂ neutral by 2050 (and already 50% by 2030) will also require a commitment to bio-based construction.

The will and knowledge is there, and **Greenager+** and its partners want to go full steam ahead.

However, our fear is that insufficient bio-based material will be available in the short term, which is why **Greenager+** wants to be a leading **LINK** between construction and agriculture.

Greenager+ develops and supports several bio-based building applications and is itself committed to:

- Hennep (Cannabis sativa) and Sun Crown (Siphium perfoliatum) being the fastest growing plants
- Elephant grass (Miscanthus giganteus) and Mammoth grass being the fastest-growing shrubs
- Kiri (Paulownia) and Poplar being the fastest-growing tree
- Alfalfa, fast growing proteinrich grass
- Residual flows (straw, reed, roadside grass)

Apart from the fact that these crops grow very quickly and are therefore profitable to commercialise, they also have an excellent insulation value. For this reason, **Greenager** has bet on these crops to turn them into insulating mortars for floor, roof and wall applications. The enterprise uses the straw part of hemp, elephant grass, mammoth grass and poplar as well as the saw shavings of the kiri tree for this purpose. The fibers are also suitable for making construction panels.

Greenager+ also wants to be the strongest link for agriculture to be able to sell the other parts of these crops for other applications in construction (building bricks, roof tiles, doors, frames, furniture, cellulose, ceiling and wall insulation), road construction (bio-asphalt), agriculture (growing mats, quality litter) industry (car parts, composites, trendy design) and food (food supplements) ...

Together with its partners **GREENAGER+** is also in a position to guide agriculture and the furniture industry in the transition from traditional farming to sustainable and innovative agriculture.

Together with its partners, **Greenager+** is also in a position to calculate the CO₂ uptake of crops in the field and in the long-term storage of its building materials in order to supply CO₂ certificates (**CARBON CREDITS**) to agriculture. **A NICE EXTRA INCOME FOR THE FARMER.**



THE KIRI TREE (*Paulownia*)

This (fastest-growing) tree is less known to us. In many cultures, it is called the 'tree of the future'. The Kiri tree grows as tall as 6 metres in its first year of life, with a trunk diameter of 40 cm after a few years. It is pest-resistant and mature after only 7 years. Due to its rapid growth, this tree can absorb up to 40 tonnes of CO₂ per Ha, per year. At its peak (6th year) this can be as much as 60 tonnes. Besides absorbing CO₂, this tree also absorbs up to 150 kg of nitrogen.

The carbon credits associated with this huge uptake of CO₂ and nitrogen make it particularly interesting for farmers or investors to bet on this crop. Even now, this tree already has applications. Best known are skis and snowboards, as the wood is extremely light. It is also already used to make doors, windows, furniture and home interior finishes. This wood is also expected to be used for timber-frame construction soon. **Greenager+ is working on an insulating mortar where wood shavings from the kiri tree are going to be used as filler.** Indeed, this wood has a weight of only +/- 290 kg/m³ in solid form. The shavings are even much lighter still. It is expected to make an excellent insulating mortar. CLT construction panels can also be made from it.

The flakes can also be used to make the plates and composites



HENNEP (*Cannabis sativa*)

Hemp is the fastest-growing plant. For this reason, even in ancient times this plant was used as a building material. As an example, the secret of how the Great Wall of China is still in such good condition is its lime-hemp mixture. Hemp absorbs CO₂, grows in any climate and is not susceptible to diseases and pests.

Since the 1990s, as a result of the first climate convention (UNFCCC, 9 May, 1992), hemp has found its way back into building applications. Initially as insulation mats, insulating fibres, loam plasters and loam boards. Since the Green Deal (4 July, 2022), betting on hemp as a solution to reduce CO₂ emissions has gained momentum. **GREENAGER+ developed a full-fledged thermal insulating mortar, a bio-alternative to previously developed cement-bonded EPS mortars:**

Therm-I-Can (Thermal Insulating Cannabis)

- The filler is hemp straw in granule sizes from 2 to 6 mm
- The binder is lime-based
- Addition of an aerogel adhesive made from plant waste increases the insulation value.

Technically, it is also possible to bind the hemp with a durable glue or bio-polymer to plate insulation, fiber boards and composites.

ELEPHANT GRASS (*Miscanthus giganteus*)

Elephant grass (fastest-growing shrub) has also gained popularity as an innovative alternative to agriculture. *Miscanthus* cultivation is definitely circular because it enriches the soil instead of impoverishing it. Besides absorbing CO₂, this shrub (grass species) also absorbs nitrogen and purifies the soil. Even PFAS pollution can be controlled with elephant grass. The high yield of this shrub (150 to 175 m³/ha) has made it an interesting crop for construction and agriculture. Most well-known applications are cellulose, lignin and recently 'Grassphalt', a sustainable asphalt that consists of 50% lignin, derived from elephant grass. The roots are then turned into pellet granules.

GREENAGER+ developed a full-fledged acoustic insulating mortar, a bio-alternative to a previously developed mortar based on EPS and vermiculite.

Therm-I-Grass (Thermal Insulating Grass)

- Again, the filler is the straw part in sizes 2-6 mm
- The binder is lime-based or bio-adhesive/polymer-based
- Addition of an aerogel adhesive improves the insulation value
- The fiber is also suitable for making construction panels.

MAMMOTH GRASS

Mammoth (Giant) grass is a fast growing grass similar to Miscanthus, lighter in color, with a higher yield. It absorbs more CO₂ but also particulate dust. It grows in any climate and reaches 6 - 8 meters in height in one year. One plant can be harvested for up to 20 years. **Greenager+** focusses on this crop because of the special nature of the fiber and want to use it to make insulation mortars, insulating boards, fiber boards, seamless (blow-in) insulation and composites.



SUGAR BEET

Sugar beet absorbs a particularly large amount of CO₂. 1 hectare of sugar beet converts 35 tons of CO₂ into 13 million liters of oxygen every year. With a yield of +/- 80 tons/Ha, good for 13 tons of sugar, it is a good revenue model in agriculture. **Greenager+** aims to use the molasses (waste) to make citric acid, which together with linseed are the main components for bio resin. The residual flow is also suitable for bio gypsum. Making a bio alternative to PUR is also technically possible.

ALFALFA (*Medicago sativa*)

Alfalfa is a protein-rich crop and therefore offers perspective in our story. The plant has the unique ability to fix nitrogen, regardless of the presence of nitrogen in the soil. The powerfully developed root system can absorb an enormous amount of CO₂. We, together with partners, focus on this crop for its high percentage of proteins, to turn it into a bio binder.



SUN-CROWN (*Silphium perfoliatum*)

Sun-crown is much more than a forage crop. It contains a lot of proteins and sugars and therefore interesting to use into making bio binders. Sun-crown has deep roots and can therefore absorb a lot of CO₂. Because the plant produces many flowers, the crop is also very interesting in terms of biodiversity. In addition to being used for bio glue, bio plastic and a bio alternative to rock wool can also be made with it, as well as paper and carton.



CO₂-NEGATIVE
NITROGEN-NEGATIVE
BUILDING SYSTEMS

POPLAR (*Populus*)

The fast growing variant of this tree can grow up to 40 meters high. Leonardo da Vinci's painting 'Mona Lisa' is painted on poplar wood, clear proof that this wood is sustainable. Our grandparents made great use of poplar for shoring up coal mine shafts and making clogs and matches. Greenager+ is betting on this tree for modular building systems and to use the fibers in construction applications such as bio foam concrete, seamless (blowin) insulation, insulation boards, fiber boards and composites. The wood is also suitable for CLT construction panels.



CORPORATION CHAIN



To accelerate interaction between construction and agriculture, **Greenager+** has set up its own chain together with some agriculture companies and some knowledge institutions for all usable crops under the name "**Landbouw voor Pand bouw**".

We want to inform both construction and agriculture as correctly as possible and, above all, show that it is possible.

Circularity and sustainability is not a doom story, but a doing story and then it becomes a flower story.

CARBON CREDITS (CO₂-RIGHTS)



All the crops we use absorb a particularly large amount of CO₂. Our products have been developed to store this CO₂ for a large period of time. This makes the crops and the end products eligible for carbon credits, which we can award to the producers and farmers who supply the fibers.

- **Carbon removal**
 - underground in roots of crops
 - above ground in bio building materials
- **Carbon storage**
 - capture and storage of CO₂

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