Sustainable Biomass – UPM Journey Beyond Fossils

Intermediate cropping & eligible feedstock for fuel sectors: challenges and opportunities

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UPM BIOFORE – BEYOND FOSSILS

This is UPM

Wood-based raw materials

Low-carbon energy

BUSINESSES:

- UPM FIBRES
- UPM ENERGY
- UPM RAFLATAC
- UPM SPECIALTY PAPERS
- UPM COMMUNICATION PAPERS
- UPM PLYWOOD
- UPM BIOREFINING

55 production plants

17,200 employees in 44 countries

RENEWABLE AND RECYCLABLE PRODUCTS FOR:

- PACKAGING
- LABELLING
- TRANSPORTATION
- ELECTRIFICATION
- CONSTRUCTION
- COMMUNICATION
- TISSUE AND HYGIENE PRODUCTS
- MANUFACTURING
- BIOPLASTICS
- BIOMEDICALS

10,500 customers

170 million end-users globally

Our businesses

UPM Pulp
A versatile range of chemical pulp for many growing end uses

UPM Timber
Certified sawn timber for joinery, packaging, furniture, planing and construction

UPM Forest
Sourcing wood raw material for sustainable and recyclable products

UPM Energy
Zero-emission electricity generation of hydro, nuclear and thermal power

UPM Raflatac
Self-adhesive paper and film products incl. label materials, graphics solutions and removable self-adhesive products.

UPM Specialty Papers
Labelling materials, release base papers, flexible packaging papers, office and graphic papers

UPM Communication Papers
Magazine paper, news-print and fine papers for a wide range of end uses

UPM Plywood
Plywood and veneer products for construction, vehicle flooring and LNG shipbuilding

UPM Biofuels
Wood-based renewable diesel and naphtha

UPM Biochemicals
Glycols, lignin products, renewable functional fillers

UPM Biomedicals
Wood-based biomedical products for medical and life science applications

UPM Biocomposites
Composite decking materials and wood-based biocomposites

UPM BIOREFINING

UPM Lappeenranta Biorefinery

- Advanced biofuels: renewable diesel & naphtha
- Since 2015
- Production volume: 130 000 tonnes per year

UPM Leuna Biorefinery

- Renewable biochemicals
- 750 million € investment
- Start late 2023
- Production volume: 220 000 tonnes per year

UPM Rotterdam Biorefinery

- Advanced biofuels and SAF
- Renewable materials
- Basic engineering phase on-going – no investment decision
- Production volume: max 500 000 tonnes per year

Our climate commitment

WE ACT THROUGH FORESTS

Committed to climate-positive forestry and enhancing biodiversity

WE ACT THROUGH EMISSION REDUCTIONS

-65% from own CO_2 emissions

-30% from CO_2 emissions of supply chain

WE ACT THROUGH PRODUCTS

Innovative products

Scientifically verifying the climate impact of all our products

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

BUSINESS AMBITION FOR 1.5°C

OUR ONLY FUTURE

THE CLIMATE PLEDGE Paris... 10 years early

UPM BIOFORE – BEYOND FOSSILS

Sustainable biomass is one corner stone to create future beyond fossils

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Woody biomass and forest industry residues

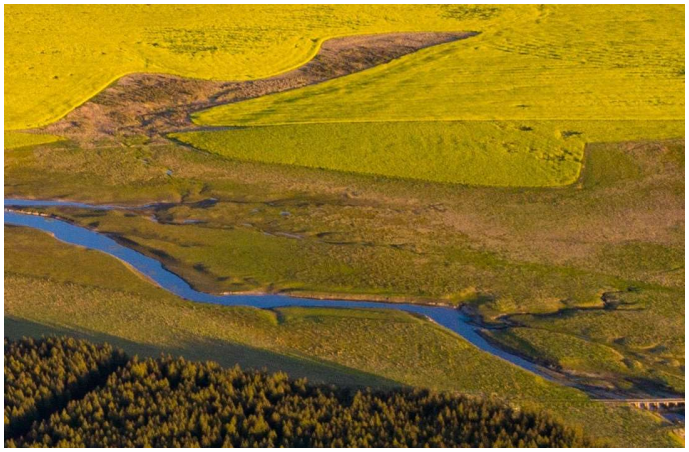
Forest industry residues like crude tall oil, saw dust, harvesting residues.

Upcycled woody biomass for chemical refinery moving up the cascade.

Carbon farming

Oil through improved crop rotation by replacing fallow and non productive cover crops in the secondary farming season.

Other feedstock through regenerative land use



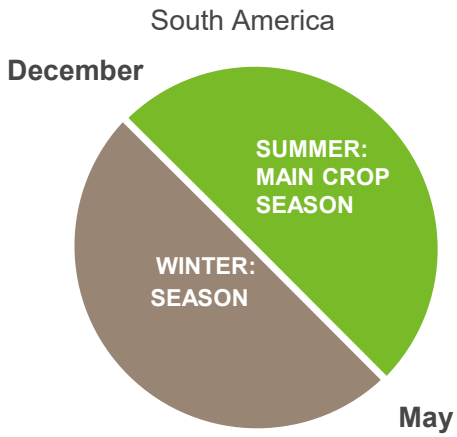
New additional biomass production on unused, abandoned and degraded soils.


UPM
Regenerative land use basic principles:
✓ Utilization of low quality, degraded, abandoned or un-used land
✓ Soil quality improvement, productivity and biodiversity
✓ Low LUC risk
✓ Carbon removals
UPM BIOFORE - BEYOND FOSSILS

Climate positive farming (Carbon farming)

- Regenerative land use: higher rates of carbon sequestration to soil and improved soil productivity
- Additional biomass outside the main cultivation season - No direct or indirect land use change (LUC)
- GHG-reduction from sustainable farming

Sustainable & additional raw material for different sectors (fuels, materials, food/feed etc.)



UPM's RSB certified carbon farming program in Uruguay since

Intermediate crop cultivated at winter season in Uruguay

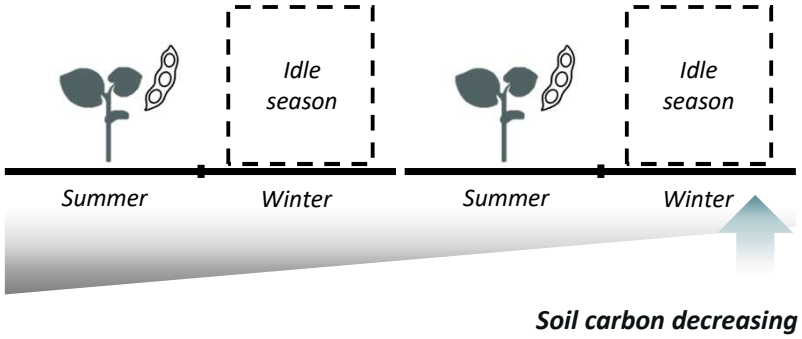
- Typical summer crops soybean and maize
- Winter crops in three years rotation (barley, wheat, non-productive cover crop)

→ **Introduction of additional productive cover crop to the existing crop rotation**

- → Replace non-productive cover crop with Brassica oil crops (for every 3rd winter-season)
- Yield ~1500 kg/ha, max ~2700 kg/ha has been achieved on commercial field
- Yield of residual biomass left to the field is ~6000 to 10 000 kg/ha
- Technical oil for biofuel production and meal for animal feed

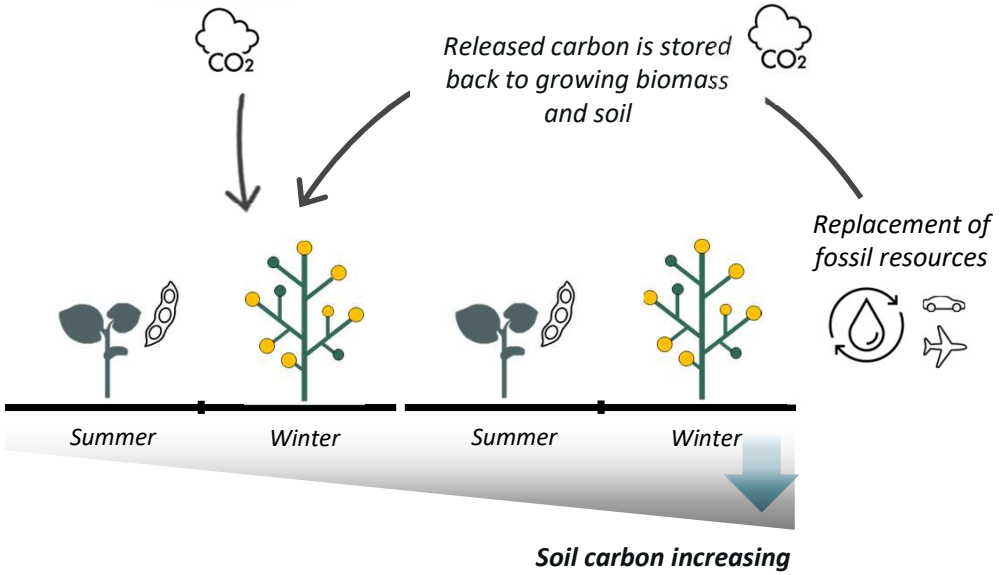
Sustainable land use concepts for additional sustainable biomass and improving soil carbon balance

Intense farming with no diversification in crop rotation can lead to soil depletion



Soil carbon decreasing

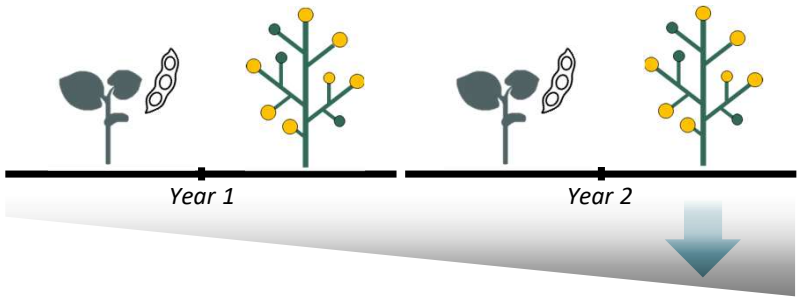
Rotation with productive cover crops creates new sustainable biomass



Soil carbon increasing

Adoption of sustainable soil management practices is in the core of regenerative farming system

CARBON FARMING



Additional biomass › *Positive soil carbon balance and soil health*

MANAGEMENT PRACTICES

*Introduction of an **additional cover crop** to the existing crop rotation, in areas and during seasons where the **land is not in productive use***

Internal carbon inputs into soil
- *Cover cropping*
- *High biomass crop development*
- *Diversification of crop rotation / crop planning*

External carbon input into soil
- *Biochar, manure*

Minimizing soil disturbance
- *Minimum or no tillage*

POTENTIAL BENEFITS

Climate change mitigation
Carbon sequestration
Increased biodiversity
Reduced soil erosion
Improved soil and water quality

Low iLUC risk

Additionality
feedstocks (oil, protein)
Additional income
Increased yields and productivity
Higher nutrient retention and recycling

CHALLENGES

Regulative landscape not developing into favorable direction (especially in EU)

Business as usual vs. Additional production (especially for low i-luc)

Location dependent concepts→ one size does not fit all

Market recognition

OPPORTUNITIES

Push more sustainable management practices into use

Additional economical benefit for farmers

Additional sustainable feedstock

Re-utilization of unused /abandoned land

WE CREATE A FUTURE BEYOND FOSSILS

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