

Miscanthus - how it fits

- Very fast growing, high yielding perennial grass.
 20+ year life.
- Annual harvest after second year enables it to supply the demand/supply gap of the next 30-50 years (CCC/Biomass Strategy)
- Ecologically a Savanna/plains type landscape with strong biodiversity above and below ground.











Terravesta

- Miscanthus biomass supply chain
 - o 11 years in operation
- Long term biomass offtake contracts for Miscanthus growers
 - We manage haulage from farm to end-user
- Help new growers establish new Miscanthus crops
- Our own hybrid Terravesta Athena™
 - O Others in development with Aberystwyth University
- Heavily invested in Miscanthus R&D



Long Road To Success

- 10 years of Miscanthus innovation ongoing
- Research is long-term commitment
 - O Breeding for new varieties
 - GIANT LINK (2011 2016)
 - Novel uses / Phytoremediation
 - Miscomar (2016 2019)
 - Miscomar+ (2020 2023)
 - Development of seed-based Miscanthus
 - MUST (2016 2019)
 - RPLUG (2021 2022)
 - End uses
 - GRACE BBI (2017 2022)
 - Upscaling
 - OMENZ (phase 1) (2021 2022)
 - OMENZ (phase 2) (2022 2025)





Research Projects

GIANT LINK (2011-2016

www.miscanthusbreeding.org) £6M match funded.

- · Generated the largest ex situ collection of Miscanthus types outside Asia.
- DNA mapping revealing >3,500 relevant trait markers
- >3,500 potential crosses
- · Major potential yield advances through genetic improvement
- · Trials in Sicily (Uni Catania), Germany (Julius Kuhn Inst), Poland
- · Terravesta lead commercial partner, Aberystwyth University project leader

Optimisc (2011 - 2016) €4M EU funded

- · Testing different Miscanthus crosses in different climates and conditions.
- Trials sites Russia, Ukraine, Turkey, Germany, Netherlands, Belgium UK.
- Terravesta supplier of support and resource

Miscomar + (2020 – 2022)

https://projects.au.dk/faccesurplus/research-projects-3rd-call/miscomar/

- · Partners from UK France, Germany, Poland
- · De-risking establishment on highly marginal and contaminated land

MUST (2016-2019) £1.8M UK funded

- Terravesta project partner
- Developing agronomy and systems for upscaling commercial production and roll out of seed based hybrids developed under GIANT.
- Developing seed production and crossing block design in collaboration with University of Catania. (Prof. Cosentino)
- Parental multiplication and performance trials Julius Kuhn Institute, Germany (Pr. Kai-Uwe Schwartz, Pr Jorg Greef)

Miscomar (2016 – 2019) www. Miscomar.eu

- Evaluating performance of different Miscanthus Genotypes on different marginal and contaminated sites.
- IETU (Poland), Uni of Hohenheim (Germany), Aberystwyth, Terravesta

GRACE (2017-2022) www.grace-bbi.eu €15M, 21 partners

- Demonstration project for supply chains using Miscanthus and hemp into biobased industry
- Multi-location field trials Croatia, Italy, Germany, France, Netherlands, UK.
- Industrial processes for building materials, bio-ethanol for road fuel, bio-plastics, bio-chemicals.

Project in the Biomass Feedstock Innovation Programme (Phase 1 + 2):



Former Department for Business, Energy and Industrial Strategy (BEIS) current Department for Energy Security and Net Zero's Net Zero Innovation Portfolio

Project OMENZ – Optimising Miscanthus Establishment through improved mechanization and data capture to meet Net Zero Targets (TER-303-1-M; TER-303)



















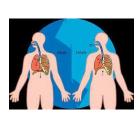


◆ Carbon dioxide emission issue (74.4% of GHG)*









Agriculture

Manufacturing

Transport

Being Alive

E.g. 1 Respiration (living being):

$$C_6H_{12}O_6 + 6O_2 O_5 + 6CO_2 + energy$$

glucose oxygen water carbon dioxide

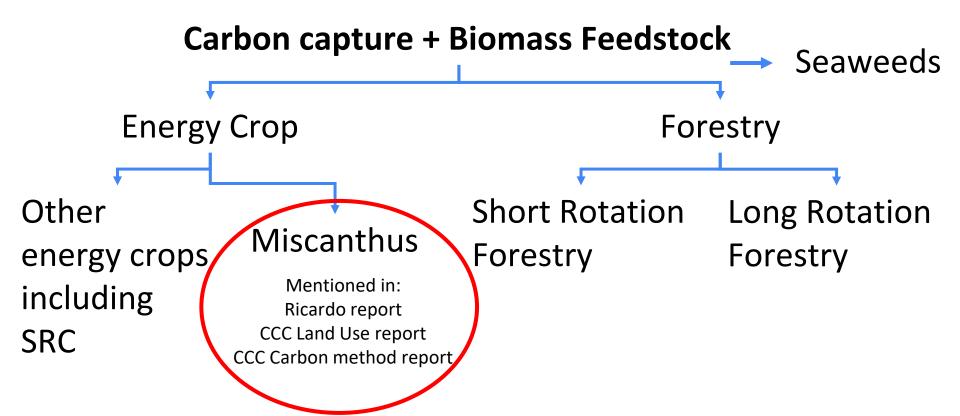
E.g. 2 Combustion (petrol vehicle):

$$2C_8H_{18}$$
 + $25O_2$ $\boxed{2}$ $16H_2O$ + $18CO_2$ + energy octane oxygen. Water carbon dioxide

^{*}https://ourworldindata.org/greenhouse-gas-emissions

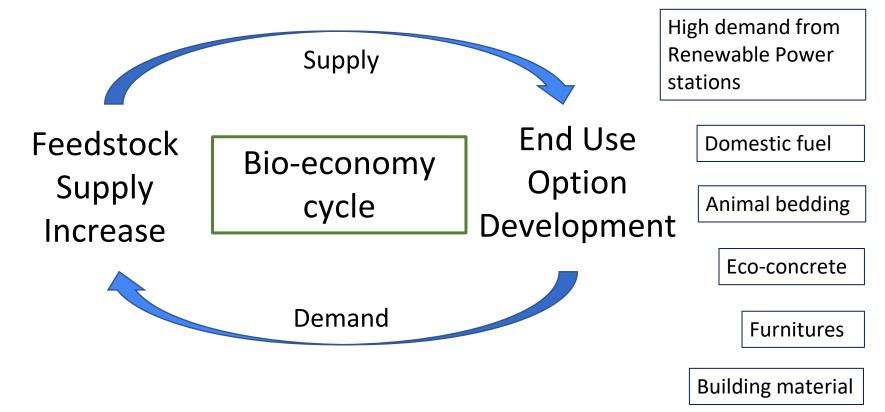
Plant Based Solution: Time Honored Carbon Capture Method





Increasing Biomass Feedstock





Current Hurdle



- Even with ambitious biomass strategy target at 17, 000 (From 23k*) Ha/yr energy crop plantation from 2038+ (from 2030*) onward
- Current TV highest plantation for Miscanthus is <1000 Ha per year

Current plantation of energy crop, including Miscanthus, has to drastically increase

^{+ 2023} Biomass Strategy

^{*} CCC 2020 Land use: Policies for a Net Zero UK- Assumes planting program starts in 2025



Project OMENZ – Phase 2

WP 1 Understanding
Miscanthus Emergence,
Establishment and
Development (LJMU)

 Identified quick wins to be trialled based on plant physiology WP 5 Project Management (CHAP)

Project Goal: Increase planting rate and establishment success

WP 2 Optimising
Production of Planting
Material (TV)

- Identify faster and easier oc
- Innovation in QC process

WP 3 Optimising Miscanthus Planting and Establishment (UoL)

- Determine planting optimal soil planting condition
- Land prep techniques
- Test and validate new equipment
- Planting of trial field

WP 4 Establishment
Monitoring for Upscaling
Production(CU)

Continue improvement of identified monitoring equipment and software

CHCx3

 NIAB led 4 year 22 partner project starting 2023

 Will demonstrate how diversification of arable and forage cropping systems can target net zero and build farming resilience, whilst supporting enhanced value chains in textiles and construction





Plant Science into Practice

INCREASING CARBON CAPTURE THROUGH CROPPING



CENTRE FOR HIGH CARBON CAPTURE CROPPING

Farmers and associated industries can address climate change through input-efficient crops that are able to increase carbon capture, but they must have confidence in achieving profitable and sustainable outcomes.

The Centre for High Carbon Capture Cropping (CHCx3) is a four-year, 22-partner project, starting in 2023. It will demonstrate how diversification of arable and forage cropping systems can target Net Zero and build farming resilience, whilst supporting enhanced value chains in textiles and construction.

Project objectives

- Evaluate food, forage, and industrial cropping options with potential to enhance atmospheric carbon capture, and sequestration in the soil and crop-based products
- Optimise production of renewable biomaterials for fibre, textiles and construction
- Establish a UK Knowledge Hub providing resources to support effective uptake and utilisation of crops with high carbon capture potential
- Quantify carbon removals, consistent with emerging standards for measurement, monitoring, reporting and verification
- Develop carbon insetting/offsetting platforms, achieving revenue generation for farmers and supporting corporate sustainability

The project will focus on four cropping options: cover crops; annual fibre crops (industrial hemp, flax); perennial food, forage and feed cropping (including herbal leys); and perennial biomass crops (miscanthus, willow/poplar).

The effect of cultivation systems and agronomy on economic returns and environmental outcomes will be examined. Practical outputs will include crop guides, web tools and apps, with crop trials, field demonstrations, and events supporting opportunities to discover more.

GET INVOLVED

Participate in the project: tell us if you are interested in growing these crops

Sign up to receive the CHCx3 e-newsletter at chcx3@niab.com

Attend CHCx3 webinars, workshops, and field demonstrations

Find out more at niab.com or from a project partner



The Centre for High Carbon Capture Cropping partners are:
NIAB, Biorenewables Development Centre, British Hemp Alliance, Cambond, Carbon Farm Hubs, Cotswold Seeds, Crops for
Energy, Dark Green Carbon, Elsoms Seeds, Energy Crops Consultancy, English Fine Cottons, FarmED, FC Palmer & Son, National
Farmers Union of England & Wiles (NPU), Natural Building Systems, Northern Ireland Hemp Association, Rothamsted Research

Scottish Hemp Association, Terravesta, UK Hempcrete, University of York, Unyte Hemp This project has received funding from Innovate UK under the Farming Futures R&D Fund: Climate Smart Farming, part of Defrés Farming Innovation Programme.



