Rising to the climate challenge

Innovations in domestic biomass feedstock production

Wood Heat Conference 2023

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.

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Growing Innovation

Terravesta

- Miscanthus biomass supply chain
  - 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™
  - Others in development with Aberystwyth University
- Heavily invested in Miscanthus R&D

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Growing Innovation

Long Road To Success

- 10 years of Miscanthus innovation ongoing
- Research is long-term commitment
  - 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)

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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 bio-based 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

OMENZ
Optimising Miscanthus Establishment for Net Zero

Project OMENZ – **O**ptimising **M**iscanthus **E**stablishment through improved mechanization and data capture to meet **N**et **Z**ero Targets

(TER-303-1-M; TER-303)

CHAP CROP HEALTH & PROTECTION

LIVERPOOL JOHN MOORES UNIVERSITY

Energene Seeds Ltd

TJSS LTD

UNIVERSITY OF LINCOLN

Cranfield University

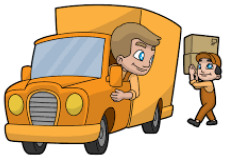
Department for Energy Security & Net Zero

Climate Change Challenge to Address

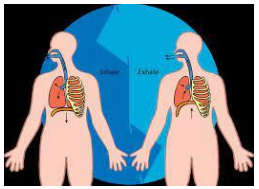
- Carbon dioxide emission issue (74.4% of GHG)*

Agriculture

Manufacturing



Transport



Being Alive

E.g. 1 Respiration (living being):

$C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2 + \text{energy}$

glucose oxygen water carbon dioxide

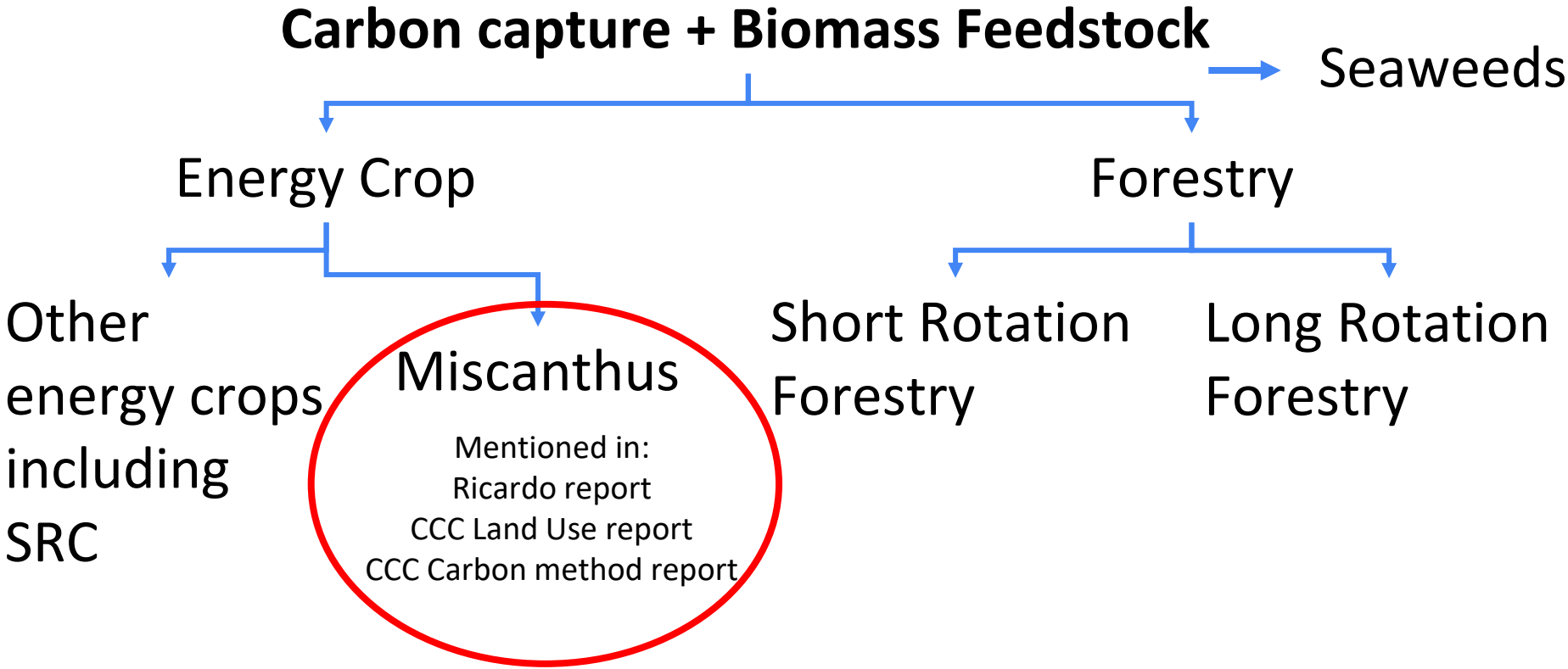
E.g. 2 Combustion (petrol vehicle):

$2C_8H_{18} + 25O_2 \rightarrow 16H_2O + 18CO_2 + \text{energy}$

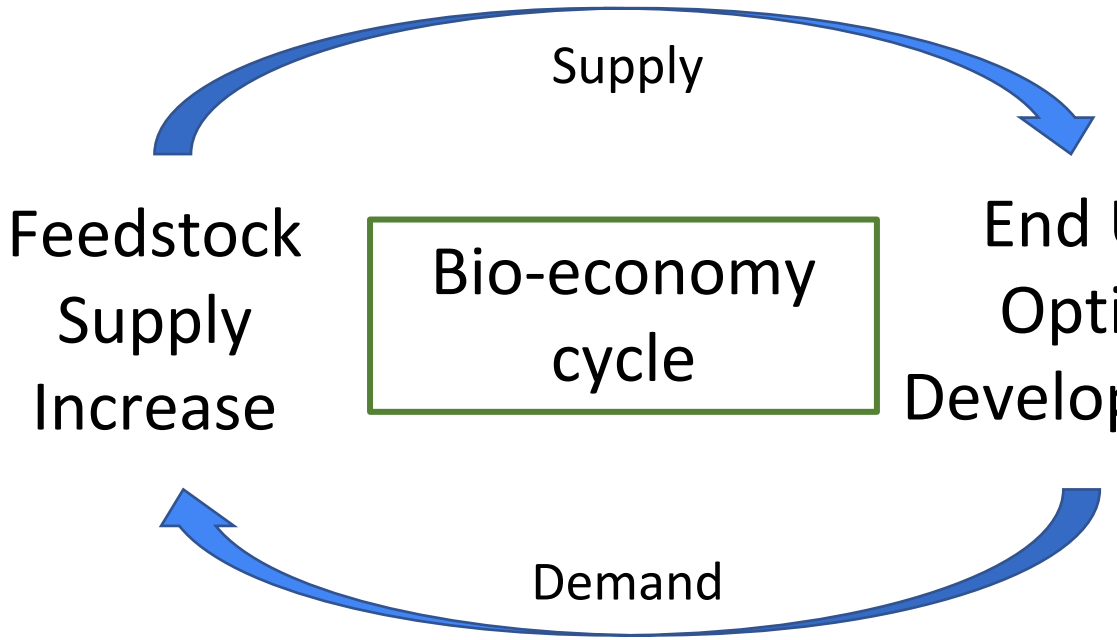
octane oxygen. Water carbon dioxide

*https://ourworldindata.org/greenhouse-gas-emissions

Plant Based Solution: Time Honored Carbon Capture Method



Increasing Biomass Feedstock



- High demand from Renewable Power stations
- Domestic fuel
- Animal bedding
- Eco-concrete
- Furnitures
- Building material

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

OMENZ
Optimising Miscanthus Establishment for Net Zero

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 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

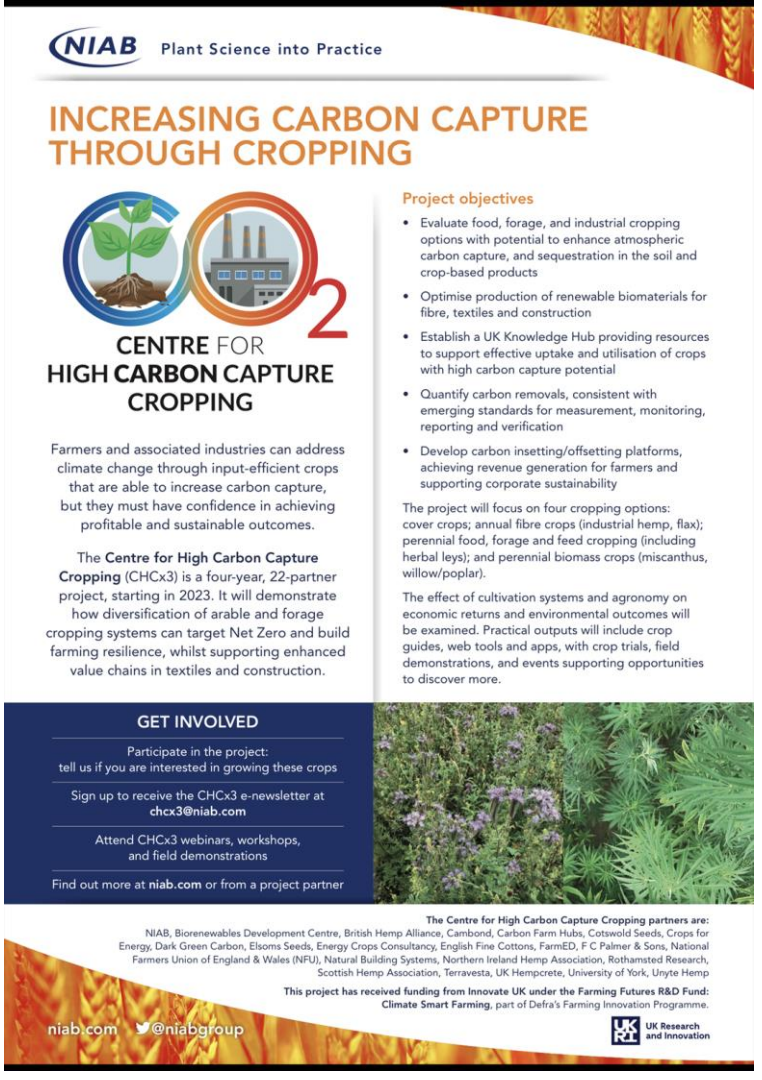
WP 2 Optimising Production of Planting Material (TV)
- Identify faster and easier QC
- Innovation in QC process

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



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biomass connect
DEMO EVENT
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MISCANTHUS ESTABLISHMENT AND CULTIVATION
October 26th - Terravesta Grovefields Farm, Warwickshire
Book online at www.Terravesta.com


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Meeting the challenge involves all of us!
Thank you
Innovations in domestic biomass feedstock production
Wood Heat Conference 2023