LogistEC

Logistics for Energy Crops' Biomass

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Collaborative project (small or medium-scale focused research project targeted to SMEs)
SEVENTH FRAMEWORK PROGRAMME

Priority: Food, Agriculture and Fisheries, and Biotechnology

Deliverable D2.3

Samples selected from most relevant harvesting systems and supplied to WP3

Due date: M12

Actual submission date: M20

Project start date: September 1st, 2012

Duration: 42 months

Workpackage concerned: WP2

Concerned workpackage leader: Rothamsted Research (RRes)

Dissemination level: PU

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Glossary and Definitions

Project Partners:

CRL	Coppice Resources Ltd, UK partner
ECN	Stichting Energieonderzoek Centrum Nederland, Dutch partner.
FCBA	Forêt Cellulose Bois-construction Ameublement, French partner.
RRes	Rothamsted Research, UK partner
SGB	Sutton Grange Bio-Drying, UK partner
SSSA	Scuola Superiore di Studi Universitarie di Perfezionamento Sant'Anna, Italian partner.

Other:

SRC	Short Rotation Coppice. In many European Countries considered to be a 3 year harvest rotation. In France (FCBA) considered a longer (6 year) rotation.
TGA	Thermo Gravimetric Analysis
VSRC	Very Short Rotation Coppice. In France (FCBA) a 3 year harvest rotation.

Summary

Objectives: The objective of this deliverable was to provide the working material for WP3, Task 3.2 which has the objective "to thermally pre-treat woody SRC energy crops (by means of torrefaction) and grassy energy crops Miscanthus and giant reed grass (by means of Torwash) to improve briquetting properties as well as end-use". Samples were supplied early in the timeframe of the project and so were based upon early assessment of the most relevant harvesting systems conducted in WP2, Task 2.1 and the most common energy crops grown along a North-South transect across Europe.

Rationale: Task 3.2 "seeks to enhance the qualities of densified materials with respect to the efficiency of logistics and storage". Torrefaction and Torwash are technologies with potential to achieve this, but that have not been widely applied to energy crops thus far. Therefore it was necessary to supply WP3 (Task 3.2) with representative materials in sufficient quantity to allow work to begin early in the project timeframe and gain knowledge and experience to apply to subsequent investigations within LogistEC. Specifically "an indicative operating window for the lab scale screening torrefaction and Torwash tests will be obtained (in particular a preferred operating temperature)".
It was decided that this would be best achieved by choosing commercial crop (rather than field experiment) derived material. This removed limitations on quantity available and provided representative materials. Supplying these materials was a Deliverable of WP2, Task 2.1 where the partners were evaluating current harvesting technologies in commercial scale cropping. As harvesting method and immediate post-harvest management can affect energy crop qualities it was decided to use early results from Task 2.1 to determine the exact materials to be chosen.
Unfortunately the first season of comparison of current harvesting technologies was severely disrupted by the poor ground conditions in many areas of Europe (as described in the report for the first reporting period). However it was possible to begin to assemble data from various sources (manufactures brochures, grey literature and scientific papers) and to begin to verify those data (see Deliverable 2.2.).
Based upon that early assessment samples were collected from the most promising harvesting systems and crops grown in a transect of latitude from UK to Italy.

Teams involved: RRes and CRL (UK), FCBA (France), and SSSA (Italy) supplied samples to WP3 (ECN, Netherlands).
SGB (UK) advised RRes and CRL.

Geographical areas covered: France, Italy and UK. Netherlands received samples.

The samples collected and sent to WP3;

1) Woody crops. SRC willow (CRL) eucalyptus (FCBA) and poplar (FCBA & SSSA), cut with a forage harvester in winter, producing wood chips of 20 – 70 mm length. Chips are ambient dried in an outdoor stack.

This is an efficient harvesting method with a low cost per ha but relatively high capital costs.

FCBA work with two categories of coppice, short rotation coppice (SRC) and very short rotation coppice (VSRC) depending upon the length of the harvesting rotation (6 *cf*. 3 years). This may impact upon the diameter of the stems harvested and thereby the ratio of wood to bark, a ratio that influences energy crop quality attributes. FCBA supplied eucalyptus and poplar from both systems.

CRL and SSSA crops were grown on a 3 year harvesting cycle.

2) Grass crops. Miscanthus (RRes and SSSA) and giant reed (SSSA) cut dry (<20% moisture) in spring and stored indoors.

Cutting in spring is standard practice to achieve low moisture contents and elemental composition desirable for thermochemical energy conversion technologies. In the UK, miscanthus biomass is mostly stored outdoors in large stacks of bales. In other countries storage sheds are more commonly used.

Outdoor storage is effective due to a large surface area to volume ratio. Previous work has shown that the samples supplied to WP3 were representative of material from the core of a large scale outdoor store.

Approximately 1 kg (on dry matter basis) of each material was supplied with the knowledge that more could be sourced if / as needed within the following 3 months. Unfortunately the eucalyptus and poplar from FCBA was not available in further quantities, it represented the last of the 2012-13 harvested material.

SSSA milled the poplar to 5mm particle size prior to delivery to ECN. The other materials were “as harvested” and were further prepared at ECN; for the TGA analysis all materials were milled to <1 mm particle size, for the Torwash experiment the grasses (giant reed and miscanthus) were milled to 10 mm particle size, and for the Torrefaction experiments the material was left as delivered.

Conclusion

In total 9 biomass samples (6 woody and 3 grasses) were supplied to ECN to begin their work within WP3.

All were harvested by current “best practice” technologies and represented the current supply of energy crop across a broad North South latitude gradient within Europe.