

## **BEACON -A Biorefining Centre of Excellence for Wales** **A partnership between Aberystwyth, Bangor and Swansea Universities**

### **Executive Summary**

Increasing awareness regarding the environmental impact of producing chemicals, materials, transport fuels and energy from fossil fuels such as natural gas, coal and oil is driving a reappraisal of how best to produce these commodities. Current worldwide consumption and demand for fossil fuels, particularly oil, is placing a massive strain on a finite resource, particularly when taken in the context of India and China's rapidly expanding economies. Given the finite nature of fossil fuels, their ongoing price volatility and issues around security of supply an alternative is to make *e.g.* transport fuel, chemicals, additives and biocomposites from plant biomass directly using a process called biorefining. Plants contain a wide range of complex chemicals that can in principle be used as substitutes for petrochemical feedstocks. Products derived from such chemicals have advantages in terms of renewability and reduced environmental impact. In the longer term such products are also more economically sustainable in the face of rising oil prices. In many cases large quantities of chemical materials can be extracted directly from plants or obtained by chemical or biochemical (fermentation) methods. The concept of a biorefinery is to find ways to obtain value from the whole plant, often in conjunction with advanced enzymology, microbial genetics and fermentation and plant chemistry.

The development of plant/ crop biorefinery technologies is the ambitious, timely goal of this project. Indeed, the European Commission has recently highlighted bio-based materials as worthy of special support under its Lead Market Initiative. Successful implementation of a biorefinery will present a total solution to the supply of bio-based materials.

BEACON will create a platform to generate closer links between Welsh academia and industry in the area of low carbon technologies, promote Welsh expertise in scientific research and innovation within Europe and the United States and facilitate inward investment in these technologies for the benefit of Wales, along with expansion of the scientific skill base.

#### **The aim of BEACON**

The main focus of the BEACON initiative is to use the concept of biorefining to work with Welsh end user companies, in order to identify a wide range of products from plant material which are tailored to their requirements. The biorefinery concept uses non-food crop feedstocks in much the same way that oil refineries use crude oil to produce a broad spectrum of commodity products. It seeks to give Welsh manufacturing companies a commercial advantage in the marketing of these renewable products as well in the future environmental and economic sustainability of their businesses through application of these developing technologies.

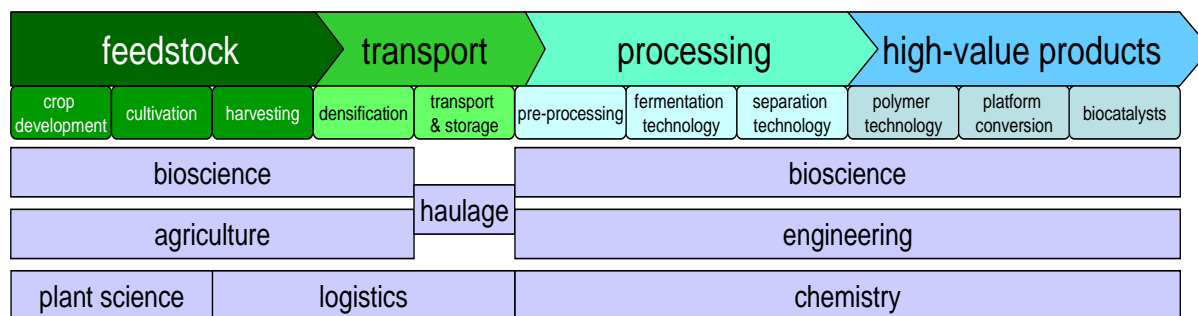
## **The Primary Objectives of the BEACON project**

- To exploit expertise in plant biosciences; microbiology; chemistry; biocomposites and life cycle assessment at Aberystwyth, Bangor and Swansea Universities. This will be achieved by biorefining plant material to assist Welsh companies in a variety of sectors by developing innovative products, which will have advantages based on renewability and reduced environmental footprint. This will promote the use of lignocellulose feedstocks and directly avoid competition with food production
- To create integrated supply chains including growers, processors (chemical, biochemical and engineering; industry and academia) and end users (industrial partners in chemical and energy sectors) forming a network across the supply chain
- To facilitate knowledge transfer between the different groups in this network e.g. between academia and industry
- To expand the knowledge based bio-economy in Wales through the creation of new jobs in existing companies and in business start-ups in cutting-edge scientific areas within plant science, chemistry, biotechnology, chemical and process engineering
- To support the demonstration and commercialisation of the biorefinery development work carried out as part of the initiative, with a focus on Welsh industrial end-users. Potential new products, processes and services will be generated within 5 years from the commencement of the project e.g.: New mechanical methods for processing biomass; New biocomposite materials; A multiplicity of platform chemicals derived from plant feedstocks e.g. organic acids; New processing systems e.g., Microbiological, Enzymatic and Chemical technologies; New plant derived bio-plastics
- To generate and exploit patentable technologies (IP)
- To provide demonstrations both of equipment and processes to Welsh companies in industries using bulk chemical feedstocks
- To support existing companies and producers but also attract significant long-term inward investment
- To ultimately reduce GHG emissions in Wales by developing 'Green Technologies'

BEACON will develop and utilise the research, technology and innovation capacity and expertise in the universities and the ability to commercialise and exploit research to build business capacity to develop and take-up improved products processes and services.

## **Who are the target sector beneficiaries for BEACON?**

The potential supply chain for BEACON is outlined below, but the areas where the project will be most active are in, processing and high-value products. BEACON will not directly support crop development, cultivation, harvesting, and agriculture. The supply-chain can be quantified by concentrating on processing and high-value products and identifying the levels of company activity within those sections of the supply chain, i.e. cosmetics and personal care, nutra/pharmaceuticals, agrochemicals, coatings and adhesives, speciality polymers and surfactants, and biofuels. Additional opportunities for new plant fibre based materials will exist in the following sectors: packaging, automotive, construction and the aerospace industries.



### The BEACON biorefining supply chain

BEACON will fully explore the sectoral opportunities identified in an independent feasibility study published in 2008 (The Biorefining Opportunities in Wales: From Plants to Products, prepared by Chemistry Innovation Knowledge Transfer Network in collaboration with the National Non-Food Crops Centre and Trends Business Research) and will operate a policy of non-exclusivity i.e. all interested parties and businesses will be encouraged to participate within the BEACON network.

#### Reaching the beneficiaries

A number of mechanisms will be utilised to engage with potential sectoral beneficiaries i.e.:

- Seminars: These will be targeted at potential commercial/ industry partners with the aim of promoting a broader base of interactions with Welsh SMEs
- Demonstrations: These will demonstrate specialist equipment or methodologies that will assist companies to develop or improve products and processes
- Scoping discussions and diagnostic interviews: These will follow-up on initial contact and will aim to identify technology related problems or 'bottle necks' where BEACON can assist
- Attendance at trade-shows, conferences and network meetings will assist in raising awareness and attracting commercial partners
- Annual conferences to be held at each of the campus of the three academic partners over the five year project: These activities will promote new interactions and act as a platform for informing the network of new developments within the BEACON collaboration
- A designated website used as a portal to market BEACON and as a conduit to specific teams undertaking defined activities: This will be used to disseminate BEACON's successes and capabilities.
- A series of computer generated visualisations which will graphically demonstrate key technologies

## BEACON: the benefits to Welsh Small and Medium Enterprises

