BioreFuture 2009

Biorefinery Euroview BIOPOL

Workshop summary report:

The workshop began with introductions from the coordinators of the two projects, **Dr. Bert Annevelink** (Wageningen UR, Netherlands) from Biopol, and **Christophe Luguel** (Industries & Agro-Resources Cluster, France). A welcome address was also given by **Dr. Piero Venturi** of the European Commission's DG RTD, the scientific officer for the two projects.

'Defining biorefineries and different concepts'

Prof. Wim Soetaert (Ghent University, Belgium) followed the welcome speeches with an overview of the definitions and concepts used by both projects. Both projects identified 4 main biorefinery concepts on the basis of either feedstock or technology, giving rise to overlap as well as synergies between the different concepts. He pointed out that biorefineries based on oil, sugar or starch are already existing biorefineries, but that a lot of research still needs to be done concerning the lignocellulosic biorefinery. The interactions between the different concepts were demonstrated, for instance where the outputs of one process can be suitable inputs to a different biorefinery facility. On example is the potential use of residues from the oilseed, green or cereal biorefinery in a lignocellulosic biorefinery for the production of cellulose fibres, chemicals, lignin and/or energy. Prof. Soetaert made clear that although biorefinery concepts are becoming increasingly complicated as new technologies emerge, the four main types presented remain valid and useful to cover all research in this field. Translating the complexity of these classifications into real-world developments is possible, however, and exemplified by the Rodenhuizedock biorefinery in the port of Ghent – the largest integrated bio-energy production complex in Europe.

'Mapping EU biorefinery activities & the consumer landscape'

The first presentation of project results in the morning session was given by Dr. Vincent Steinmetz (CARINNA, France) and Dr Hans Reith (ECN, Netherlands). They gave a detailed overview of existing biorefinery activities, including industrial plants and research facilities. This is the first time that such information has been compiled from a variety of sources including: a collaborative survey of 110 European industrial actors undertaken by the two projects; interviews; land-use databases, site visits, and input from experts.

The results showed some important trends. Most biorefinery developments are occurring in Western European countries and many are co-located with chemical and biofuels industry developments, as well as agro-industries, pulp & paper and forestry industries.

'Whole crop', 'multiple feed', 'green' and 'lignocellulosic' biorefineries are popular ventures so far, and they generally take advantage of locations with existing local bio-industry, local R&D facilities, local feedstock supply or local transport hubs. Periodic updating of the mapping overview in order to monitor the evolution of biorefineries in Europe is recommended. Furthermore it is recommended to analyse barriers and potential solutions for the development of biorefineries in Eastern EU countries. Key success factors for the establishment of biorefineries can usefully be identified from the mapping and can assist the design of policies to foster European biorefinery developments.

Prof. Klaus Menrad (FH Weihenstephan, Germany) presented results from a survey of consumers who were asked about their attitudes towards bio-based products. With consumer chemicals representing as much as 10% of EU chemical sales, he stressed that consumers could play a critical role in providing markets for biorefinery products. The results indicate that European consumers are very positive towards the biorefinery concept, but possess a low level of knowledge of policy targets in Europe, such as those for biofuels or bio-based products. Nevertheless, the respondents were generally positive towards the prospect of products such bio-based shampoos and detergents, and many would be willing to pay a premium, albeit a small one. This work suggests a role for consumer products to be strong sources of revenue for biorefineries, but raises questions about how such products can be reliably labelled in order to enable consumers to make well-informed choices.

'Technical Descriptions & Prospects for Further Demonstrations'

The first afternoon presentations elaborated on some specific biorefinery concepts. Dr. Leena Fagernäs (VTT, Finland) described how 'lignocellulosic' biorefineries could be used to produce fuels and chemicals via gasification or bioconversion. Her work on the scale and requirements for a gasification plant suggest that such a plant, producing fuels and bulk chemicals, would be viable and present an opportunity for integration with pulp and paper mills. Prof. Birgit Kamm (Biopos, Germany) focused on how 'whole crop' and 'green' biorefineries have the potential exploit materials whose uses could be expanded to include higher value materials. Straw and grass provide two excellent opportunities, and new processes that offer the ability to lower the costs of on-site enzyme production point to exciting new directions.

Koen Meesters (Wageningen UR, Netherlands) presented his investigation of the establishment potential and costs of pilot and demo scale biorefineries. By synthesising a range of project results presented he outlined some implications regarding the appropriate technologies for different European regions. Western, and to a lesser extent Southern Europe have good establishment factors for all types of biorefineries (productive agricultural land providing raw materials and oil refineries, chemical industry and cattle to sell the side products). In Eastern Europe these were lower, but since agricultural yields are expected to increase then their potential suitability for future biorefineries will improve. Northern Europe is promising for wood-based processes. Lignocellulosic biorefineries are not considered ready for full scale implementation yet, but considerable technological improvement is expected. Syngas biorefineries are more ready, but have very high investment costs. Overall, demonstration and establishment of biorefineries will depend on consumer, industrial and political acceptance, raw material availability and viable side-product markets, as well as technical and economical feasibility.

'Policy Recommendations and a Discussion of Priorities for Europe'

Both projects aim to provide insights that can be incorporated into European policies relating to biorefinery activities. To give an impression of how the qualitative and quantitative results provide the foundations for sound policy advice, Camille Burel (Europabio, Brussels) presented 12 thought-provoking suggestions. These included standardised LCA methodologies for marketing bio-based products, setting appropriate targets for use of bioproducts in specific sectors, such as mulching films, taking a strategic approach to funding infrastructure projects, and addressing public concerns including GMOs. Overall, there is a clear indication that the EU would benefit from a cohesive legislation strategy to develop the fragmented existing markets for bio-based products, such as plastics and vitamins.

The policy recommendations were followed by interventions from invited speakers from Canada and the European Commission. Maria Wellisch (Natural Resources Canada) gave a highly informative talk about activities in Canada in the context of other initiatives in the US, Europe and elsewhere. Canada, she said, has a vast resource to be tapped, but new developments are often attempts to reinvent the forestry industry, rather than arising from sustainability ambitions. Consequently, the drivers in North America are different to those underpinning many of the European efforts, but are nevertheless accelerating innovation in the field. Dr Alfredo Aguilar (European Commission DG RTD) placed the project work in the context of the EU's Knowledge-Based Bio-Economy (KBBE) agenda. He expressed his confidence that the new information presented at the workshop would help guide the large investments being made in research by the EU.

These 4 presenters were then joined for a panel discussion by Wijnand Schonewille (Port of Rotterdam, Netherlands), Dr. Christian Patermann (ex-European Commission and now advisor to North Rhine Westphalia, Germany), Rene van Ree (Co-chair of the European Biofuels Technology Platform) and moderator Dr. Ausilio Bauen (Imperial College London, UK). The lively discussion raised a number of crucial points for biorefinery development: new markets need to be created for bio-based products through policy actions; Europe should initiate dialogues on the subjects of resource-use prioritisation and genetic engineering; the advantages of biorefining need to be clarified and communicated; and opportunities should be sought for linking new processes into existing infrastructure in order to reduce the costs of establishment.

Concluding remarks

The workshop was wrapped up by Dr Annevelink who thanked all participants for their valuable input on behalf of the coordinators. He confirmed that the presentations would be made available on the project websites, to be joined in May 2009 by the project reports. In recognition of the role of this workshop and others like it in building important networks for biorefinery researchers he indicated that we can look forward to BioreFuture 2010, which will hopefully be held early next year by some of the successor projects of Biopol and Biorefinery Euroview.

Cf **Biorefinery Euroview** (http://www.biorefinery-euroview.eu) and **Biopol** (http://www.biorefinery.nl/biopol)