



Advances in Biorefineries

Biomass and Waste Supply
Chain Exploitation

Edited by Keith Waldron

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Supply Chain Exploitation

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In the future, many consumer products presently derived from fossil fuel resources such as oil, coal and gas, are likely to be derived from renewable and sustainably produced biomass resources. In addition to the production of liquid and gaseous biofuels used for transport, structural composite materials, reinforced plastics using wood fibres, pharmaceuticals, health promoting products and food sweeteners, bio-products from industrial waste gases, innovative packaging and filtration materials, green biodegradable chemicals including polymers and resins, fine chemicals for paints and adhesives, and many other products are being researched and developed using rapidly advancing biotechnologies. It seems highly likely that these products will make a major contribution through both niche and mainstream markets in the bio-economy of tomorrow.

Very small markets are possible for high value specialty biopharmaceuticals up to \$100,000 per kg and biochemicals with a market price up to \$1,000 per kg, down to relatively low value, bulk, commodity products such as biofuels at around \$1 per litre. So the aim of a biorefinery business should be to extract as much value as possible from the biomass feedstocks by achieving the optimum product mix. Focusing on high volume, low value commodities is usually not the most viable strategy, but neither is concentrating on low volume, high value products. The potential process options are being evaluated through international collaborations such as in the IEA Bioenergy's Task 42, *Co-production of Fuels, Chemicals, Fuels and Materials from Biomass* (www.ieabioenergy.com/Task.aspx?id=4) that was established in 2007.

The concept of a 'biorefinery' varies between a single feedstock converted into a single product (such as sugarcane to ethanol), single feedstock and multi-products (such as oilseed rape to biodiesel, high-protein animal feed, and heat and power generation from the straw), and multi-feedstocks to multi-products. This is analogous to an oil refinery processing a range of petroleum products and base chemicals. During the last century, the number