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Case Studies for a Biorefinery

Report Categories:
Biofuels
Wood Products
CSSF Activity Report
SP1 - Expand International Marketing Opportunities

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Report Highlights:
The United States and the Netherlands are ideal partners in building a biobased economy and a biobased industrial cluster. USDA/FAS The Hague, the Dutch Government and the Port of Amsterdam jointly organized a workshop at which four business cases for developing a commercial biorefinery were pitched. The cases were evaluated and feedback was provided by experts among the participants. The following government actions were recommended: support the commoditization of feedstocks, create a level playing field with the fossil fuel sector, and introduce a market support program for biobased products.

Transitioning from a linear to a circular economy

In line with the EU 2030 Climate and Energy Framework to cut greenhouse gases by 40 percent, the Dutch Government will support the Dutch economy to transition from a linear to a circular economy, replacing fossil fuel inputs with renewable inputs. The energy, chemical and petrochemical industries are the most likely sectors for this transition as they produce more than half of all Dutch CO_2 emissions. The first industry which needs to be realized in the process chain of this new envisioned biobased industrial cluster is a biorefinery that will convert biomass into valuable components for the chemical industry and biofuels for the energy and transport sector.

A workshop to support transatlantic cooperation

Given the U.S. biomass supply and the infrastructure of the Dutch ports, the United States and the Netherlands are ideal partners in the creation and expansion of a biobased economy. The U.S. Department of Agriculture (USDA), Foreign Agricultural Service in The Hague, Netherlands stood up a task force that included the Dutch Ministry of Economic Affairs and Climate Policy (EZK) and the Dutch Enterprise Agency to jointly organize the workshop "Pitching Biorefinery Business Cases" hosted by the Port of Amsterdam Authority. It was attended by 49 people: 32 representatives of Dutch organizations and 17 representatives of U.S. organizations.

The goal of the workshop was to support transatlantic cooperation in building a biorefinery and creating markets for biobased products. Four companies (three Dutch and one American) presented their cases for developing a biorefinery. After all the presentations were made, each case was evaluated for commercialization. A select group of participants provided feedback for commercialization of the technology. The workshop concluded with possible actions for the private sector, academia and governments.

This event is the third workshop held jointly by EZK and the USDA with the aim of initiating government cooperation and private sector investments in this new sector. The first introductory workshop was held on March 24, 2017, in Rotterdam and it focused on biomass sustainability, biorefinery, bioenergy and marketing of biobased products. A second workshop held in Las Vegas on October 12, 2017 focused specifically on the biomass supply and the Dutch sustainability criteria for biomass.

Summary of the Scene Setting Presentations

Dutch Ministry of Economic Affairs and Climate - Paul Boeding
Dutch Industrial Policy: Transition to a low-carbon energy supply requires great effort from citizens, businesses and governments. The Netherlands has a societal and economic interest to work on a timely and more gradual energy transition.

Agricultural Research Service of the USDA - Dr. William J. Orts
Partnering with the USDA to create bioproducts that meet market needs: It is within the framework of USDA's mission to add value to agricultural products that help the rural economy. USDA/ARS has an

annual budget of $1.1 billion to create marketable biobased products.

Port of Amsterdam - Micha Hes

Introduction to the circular industry in the port of Amsterdam: The port of Amsterdam offers an existing biorefinery cluster and is ready to receive biomass by clearing part of the coal handling site for diversification into other dry bulk commodities.

Office of the Chief Scientist of the USDA - Dr. David Babson

Bioenergy, the Bioeconomy and Climate Change: Climate change is not abstract for USDA. One billion tons of biomass could be sustainably produced in the United States. But both the land and the captured carbon must be utilized efficiently.

Rabobank - Alain Cracau

Green Growth and Finance: This is the right moment for clients and regions to play a distinctive role to realize the opportunities in producing biobased products. The key is to close the gap on innovation, and scale-up projects with strong expertise, networks and collaboration with public-private financing.

Summary of the Biorefinery Business Cases (BCs) and Advised Actions

	BC1	**BC2**	**BC3**	**BC4**
Feedstock	Flexible	Woody biomass	Woody biomass	Wood chips
Technology	Hydrolysis (enzymatic)	Hydrolysis (enzymatic)	Hydrolysis (concentrated acid)	Hydrolysis (enzymatic)
Scale	±30,000 MT	>500,000 MT	>500,000 MT	>500,000 MT
Products	Sugars and lignin	Sugars and lignin	Sugars and lignin	Cellulosic ethanol, lignin
Location	Flexible	Deep sea port	Seaport	Deep Seaport

The size of the biorefinery matters.

The comments, conclusions and advised actions were generally not related to the technology itself but rather to the chosen location and supply chain. BC1 is based on a small-scale biorefinery operation in contrast to the larger plants proposed by the other three technology providers. The refining capacity of BC1 can be expanded by adding reactors. The capacity of the refineries of the other BCs can be expanded by upscaling and adding process technologies to the plant.

For large scale projects, commoditization of the feedstock is important.

The main advantage of the technology used in BC1 is its practicability; however, this makes it vulnerable for illegal replication, despite the protection by patents. The technology of all four providers is proven in practice but the risk of the latter three lays mainly in the complexity of combining different technologies and linking them with the co-site partners.

-Advised Industry Action: build a consortium.
-Advised Research Action: study integration of technologies.

Location is also important. The latter three proposed plants must be located at an industrial site, and require a constant supply and large volume of feedstocks, ideally near a deep-sea port.

-Advised Government Action: support the commoditization of feedstocks.

Both biobased high value products and commodity outputs need government support.
The key for success for all four business cases is the valorization of the output, the sugars and the lignin. The business cases BC1, BC2, and BC3 focus on the valorization of the end products. For the marketing of such products, the intrinsic quality of the product is important.

-Advised Industry Action: create markets.
-Advised Research Action: study valorization of the output.

The introduction of a government program could help to capture added value for the biobased content of the product. With the utilization of the sugars for the production of cellulosic ethanol, the scope of BC4 is more commodity focused than the other cases. For the commercialization of such a project, national government funding and support through the EU Renewable Energy Directive is crucial.

Advised Government Actions for both the United States and the Netherlands:
-Create a level playing field with the fossil fuel sector.
-Lower the risk for demonstration plants.
-Provide long-term (consistent and stable) financial support to facilitate research and market introduction, such as through the development of tax and fiscal incentives.
-Government support should include lignin and CO_2 reduction subsidies or CO_2 prices.
-Enable international collaboration between research institutes and private sector parties.
-Introduce a market support program for biobased products in the Netherlands, such as the USDA Biopreferred® program and act as first user similar to what has already been done in the United States.

For a more information about this event, please contact:

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