Press release

nova-Institut GmbH (www.nova-institute.eu)
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Global bioeconomy in the conflict between biomass supply and demand

How much biomass can be sustainably produced globally in 2050? How much of the demand for food, feed, materials, bioenergy and biofuels can be met by this supply?

nova-study gives detailed view of supply and demand scenarios until 2050 for Germany, Europe and the world

The results of the study **"Sustainable Biomass Potentials for Biofuels in Competition to Food, Feed, Bioenergy and Industrial Material Use in Germany, Europe and the world"** provides a detailed view of possible scenarios for sustainable supply of biomass up until 2050, and of the development of demand in all sectors using biomass: food, feed, chemicals and materials, bioenergy and biofuels. The scenarios are based on well-founded assumptions on factors such as population growth, income developments, changes in consumption patterns, land erosion, efficiency gains in agriculture, etc. Due to this transparent approach, it is clear to see under which assumptions either global supply shortages or a sufficient coverage of demand may occur.

While the German long version of the report details all parameters, scenario assumptions and full results over 270 pages, the English short version presents only the main assumptions and results in an aggregated form. Nevertheless, the full list with all input parameters (about 100) and the balance of supply and demand is shown in the annex of the short version.

Moreover, a modelling tool is now available which makes it relatively easy to work out new scenarios with varied input parameters. Interested parties please contact nova-Institute.

All documents and main graphics of the project can be downloaded for free at http://bio-based.eu/nova-papers

The project was funded by the German Federal Ministry for Food and Agriculture (BMEL) and the German Federal Ministry for Economic Affairs and Energy (BMWi) under grant number 22501112 resp. 12BMU011, and carried out by an expert team at the nova-Institut. The results of the study were first published in August 2015.

The English short version is different from the German short version in several aspects. Most importantly, it focuses only on results on the global level, and contains one additional scenario "High demand – low pressure" which integrates solar fuels and chemicals from CO_2 into the supply side. This scenario has been developed in the project "Sustainable Agriculture, Forestry and Fisheries in the Bioeconomy – A Challenge for Europe" (Mathijs et al. 2015), carried out by an expert group of the Standing Committee on Agricultural Research (SCAR) as the 4th Foresight Exercise. The results were presented to the public in October 2015. Michael Carus of nova-Institute was part of this group as "long-term expert".

Results of the study

The following two graphics show the results of the global biomass supply and demand scenarios. They include the global situation in 2011 and the scenarios for 2050 described above.

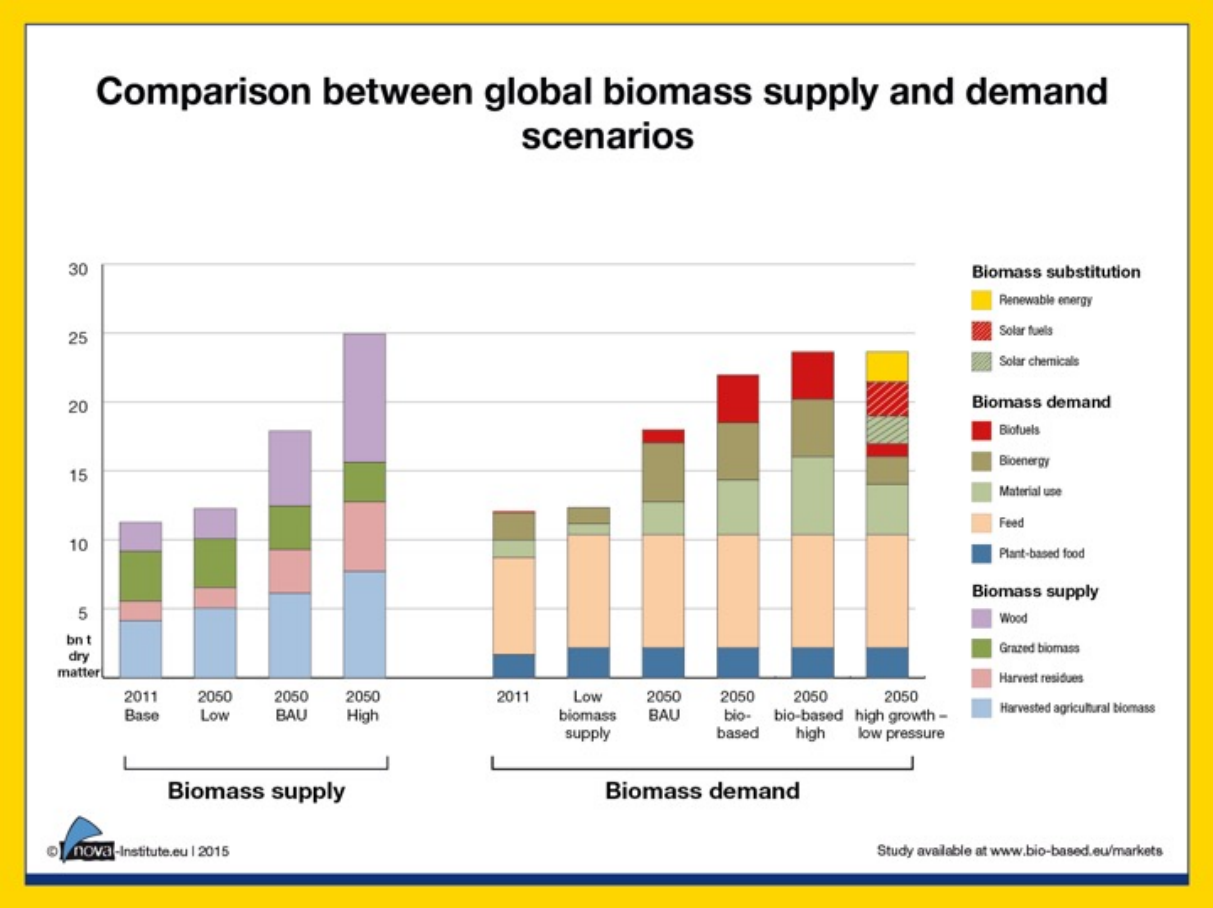

Figure 1: Comparison between biomass supply and demand scenarios (by biomass sources and uses) (Source: nova 2015)

In the LOW supply scenario, the global biomass supply will scarcely change from 2011 to 2050, while it will almost double in the BAU scenario and more than double in the HIGH scenario. The range of global biomass supply in 2050 based on these scenarios will be between 12.4 bn t dm and 25.2 bn t dm (dry matter).

The results regarding the matching of supply and demand in the different scenarios are as follows (please also note "summary and review" at the end):

The results show that the LOW supply scenario would just be able to cover the demand for food and feed but hardly any of the demand for materials and bioenergy and none of the demand for biofuels. As sustainable as scenario LOW is on the agricultural side, the bioeconomy can contribute little to a sustainable fulfilment of other sector's demands and nothing to reduce greenhouse gas emissions in substituting fossil energy and chemicals.

In comparison, the BAU supply scenario could cover the demand for food, feed, materials and bioenergy and could even leave room for an expansion of biofuels of up to 1 billion tonnes dry matter of biomass. That would be enough to produce about 25-30% of biofuels needed to

reach the 2°C climate goal according to IEA 2012. On the other hand, this is about seven times the quantity of biomass used for biofuel production worldwide in 2011.

In contrast the BAU supply scenario in combination with the demand scenario Bio-based or Bio-based High can not quite meet the biomass demand from food, feed, materials and bioenergy.

Supply scenario HIGH can meet the demand of all scenarios and would still leave biomass for further applications. In both supply scenarios BAU and HIGH, it is notable that a relatively high amount of cellulose, resulting from stronger forest utilization and increased use of agricultural by-products will be available. This suggests for BAU and HIGH scenarios that the amount of so-called "second generation" raw materials will grow relative to the use of starch, sugar, fats and proteins, in all sectors.

In the supply scenarios BAU and HIGH, a relevant net expansion of land for arable and permanent crops takes place and concomitantly there is a considerable threat of a further reduction of biodiversity as well as increased emissions of greenhouse gases from agriculture. Hence, these scenarios do not appear to be sustainable at first.

However, the authors show that the LOW supply scenario with sustainable agriculture and forestry could be counterproductive for an overall sustainable development of the global economy, too. This can be prevented if massive investments into solar and wind energy as well as storage systems and Carbon Capture & Utilization (CCU) technologies take place. Only then can the demand of material and energetic use be met without increased biomass supply.

A section on future trends identifies additional systems and technologies that can provide huge additional amounts of biomass without increasing pressure on nature and biodiversity significantly. Prime examples of such technologies are i.e. the reclamation of deserts, turning seawater into drinking water with solar energy, or ocean farming of the macroalgae Kelp. This way, even more additional biomass could be supplied by 2050 than achieved in scenario HIGH through extension of land area and intensification.

The additional demand scenario High growth – low pressure explores how these future trends could ease the pressure on biomass while still meeting the demands of a well-developed bioeconomy. In this scenario, the overall demand is the same as in the "Bio-based High" scenario but biomass is to a larger extent substituted by solar energy and other renewables. As a consequence, the leftover biomass demand can be covered by the BAU supply scenario.

Summary and review

Taking into account a multitude of future trends, it appears that prospective conflicts between creation and preservation of large protected and natural areas and at the same time considerable increase in production of biomass and other forms of renewable carbon carriers can be overcome permanently. Bioeconomy and renewable energies together with CO_2 utilization can secure the global raw material supply long-term and sustainable without endangering nature or biodiversity. However, this requires consistent political guidance and huge investments in new technologies.

Michael Carus, CEO and founder of nova-Institute and co-author of the study, sums it up: "The bioeconomy can, embedded in the right overall strategy with renewable energies and together with the CO_2 economy, make an important contribution to worldwide sustainable development."

Do you want to use your own estimations to develop more future scenarios and analyse the consequences? Or modelling tool makes it possible to calculate new scenarios based on changes in input parameters with little effort. Politics, NGPs, associations and companies can make use of it.

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