

Dutch Bioeconomy Barometer in 2013

Status of Dutch bioeconomy in 2013 and development of Bioeconomy Barometer

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What is the bioeconomy?

The bioeconomy comprises those parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy (EC, 2015). The bioeconomy is an essential alternative to our current fossil-based economy and can provide opportunities for innovation, jobs and economic growth in Europe.

Why a Bioeconomy Barometer?

Designing and implementing consistent long-term policies to stimulate the transition to a bioeconomy requires the development of an analysis framework for monitoring the evolution and impacts of the bioeconomy. This includes frequent monitoring of both the development and its direct and indirect impacts. The results presented in this document are a first, preliminary assessment of the direct and indirect macro-economic importance, energy use and greenhouse gas emissions of the bioeconomy in the Netherlands in 2013.

Data included in the Bioeconomy Barometer

The Bioeconomy Barometer presented in this document is based on a disaggregated version of the Input-Output table of the Dutch economy that is annually compiled by Statistics Netherlands (CBS, 2015). LEI-WUR further disaggregates the IO table provided by Statistics Netherlands into an Input-Output table with 19 primary sectors and 20 food and feed processing sectors (Verhoog, 2015). In this document the direct and indirect impacts of the bioeconomy are evaluated for 9 aggregated sectors that together capture the bioeconomy according to the definition of the EC (EC, 2012). The impacts considered include the turnover, value added and employment (Figure 1), but also energy use and greenhouse gas emissions (Figure 2).

Turnover, value added and employment of the bioeconomy

- The turnover (i.e. the gross value of output of sector activities) of the bioeconomy in the Netherlands in 2013 was 105 billion euro (Figure 1), which is equivalent to 9.4% of the total turnover value of the Dutch economy.
- The value added (i.e. the turnover of the bioeconomy minus the value of intermediate uses of good and services) of the bioeconomy in 2013 was 28 billion euro. The share of the bioeconomy in the value added of the total economy in 2013 amounted to 4.9%.

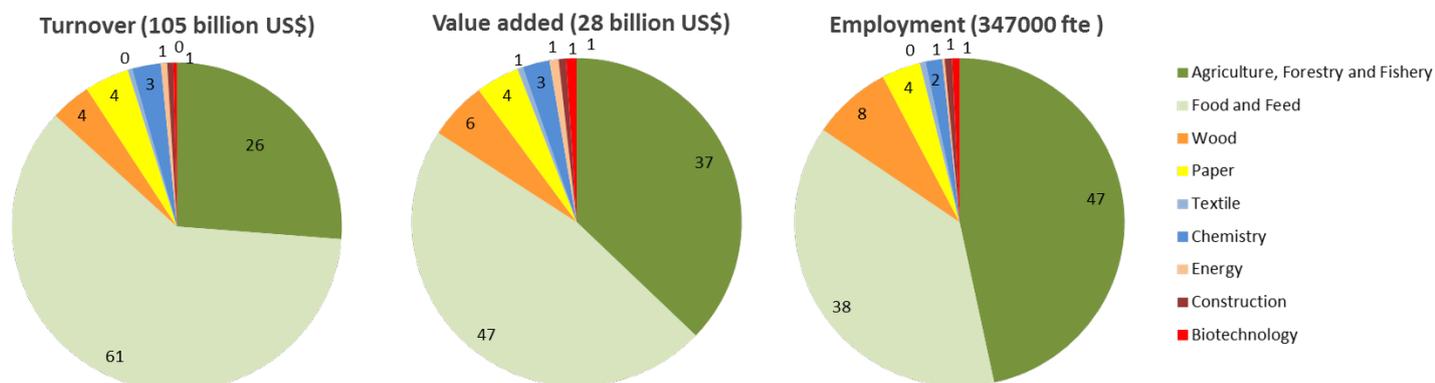


Figure 1. Share of turnover, value added and employment of the bioeconomy (%) in Dutch totals, in 2013

- The employment of the bioeconomy in 2013 is estimated at 35 thousand full time equivalent jobs or 4.9% of the total employment in the Netherlands.
- The primary sectors (agriculture, forestry and fisheries) accounted for 26% of the turnover of the Dutch bioeconomy. The primary sectors are relatively labour intensive, which explains the relatively high share in the value added (37%) and employment (47%). The food and feed sector accounted for 61% of the turnover, and 47% and 38% of the value added and employment, respectively. The wood processing sector contributed 4%, 6% and 8% to the turnover, value added and employment, respectively. These results show that the chemistry and energy sectors are relatively labour extensive (capital intensive) compared to other sectors of the bioeconomy sectors.

Energy use and emissions of the bioeconomy

- The total energy use of the bioeconomy in 2013 was 283 PJ (Figure 2) or 13% of the Dutch energy use.
- The bioeconomy sectors emitted 35 Mt CO₂ eq., which corresponds to 21% of the total emissions of the economy.
- These results show that the bioeconomy uses more energy and emits more greenhouse gas emissions per euro value added than the average of the Dutch economy. This is mainly the result of the relatively energy and greenhouse gas emission intensive production of the primary sectors (agriculture, forestry and fishery). These sectors used about 50% of the energy and emitted 79% of the greenhouse gas emissions of the bioeconomy. The food and feed sector is relatively energy and greenhouse gas extensive.

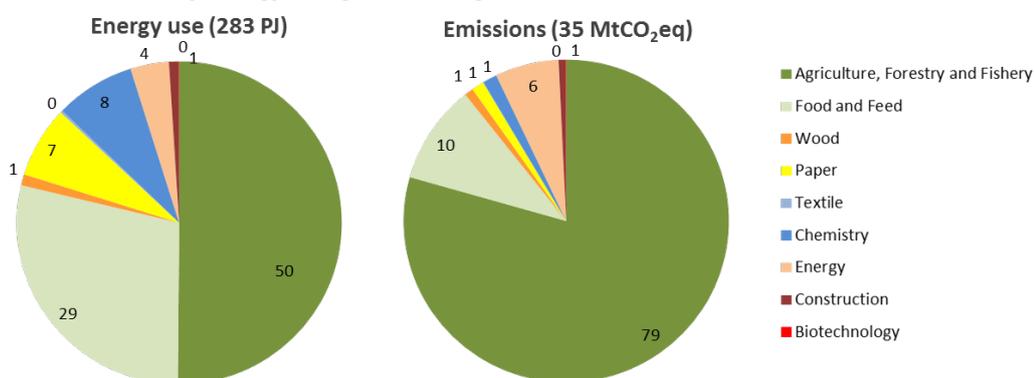


Figure 2. Share of energy use and emissions of the bioeconomy (%) in Dutch total, in 2013

Regional turnover, value added and employment of the bioeconomy

- Figure 3 shows the value added and employment at regional level. The province of North-Brabant had the highest contribution to the value added in 2013 (7.7 billion euro), followed by Gelderland (3.5 billion euro) and South-Holland (5.4 billion euro). The value added of the bioeconomy is lowest in the region Utrecht (1.4 billion euro).
- In terms of employment, North-Brabant is also the most important region (67 thousand jobs), followed by South-Holland (60 thousand jobs) and Gelderland (51 thousand jobs).

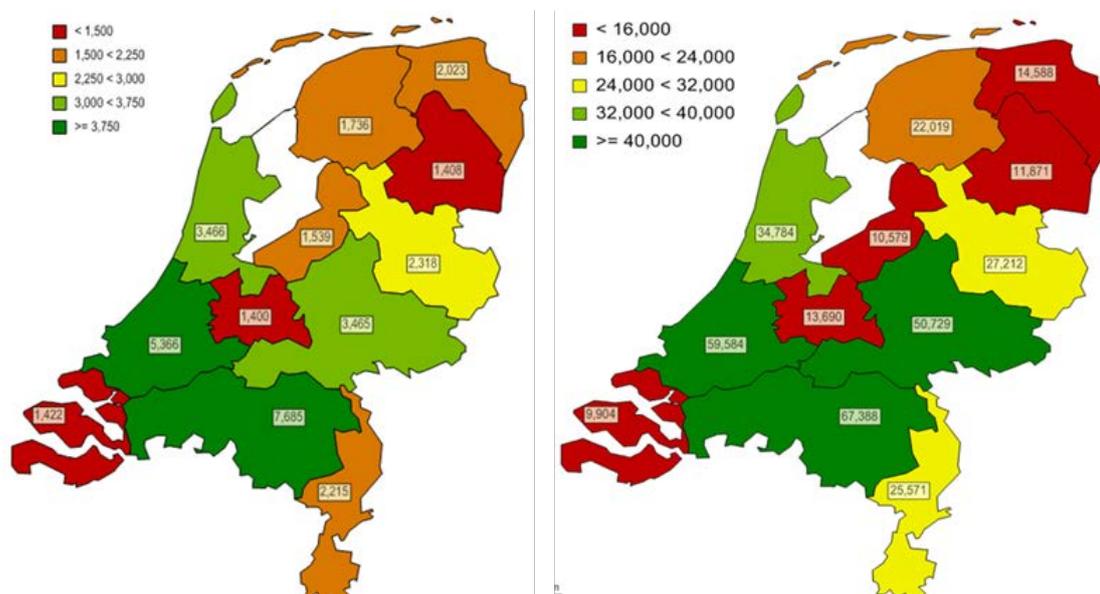


Figure 3. Value added (€ million; left) and employment (labour units; right) of the bioeconomy in Dutch provinces, in 2013.

- Figure 4 presents the location of biochemical and bioenergy production in the Netherlands. The chemical industry and research institutions are mainly located in the provinces of North-Brabant (e.g. Green chemistry campus in Bergen op Zoom, Corbion), South Holland (especially in the area Rotterdam and Delft) and Limburg (i.e., DSM and Chemelot). The energy sector is more equally spread across the Netherlands.
- The figure below also shows the location of the biobased paper and pulp industry and of the biobased textile and clothing sector. Traditionally, paper and pulp production is concentrated in the provinces of Gelderland, North Brabant, Groningen and Limburg. The paper and pulp industry in these areas is closely located to the producers of raw materials such as forestry, wood and arable crops. The textile sector is concentrated in the provinces of North Brabant and Overijssel.

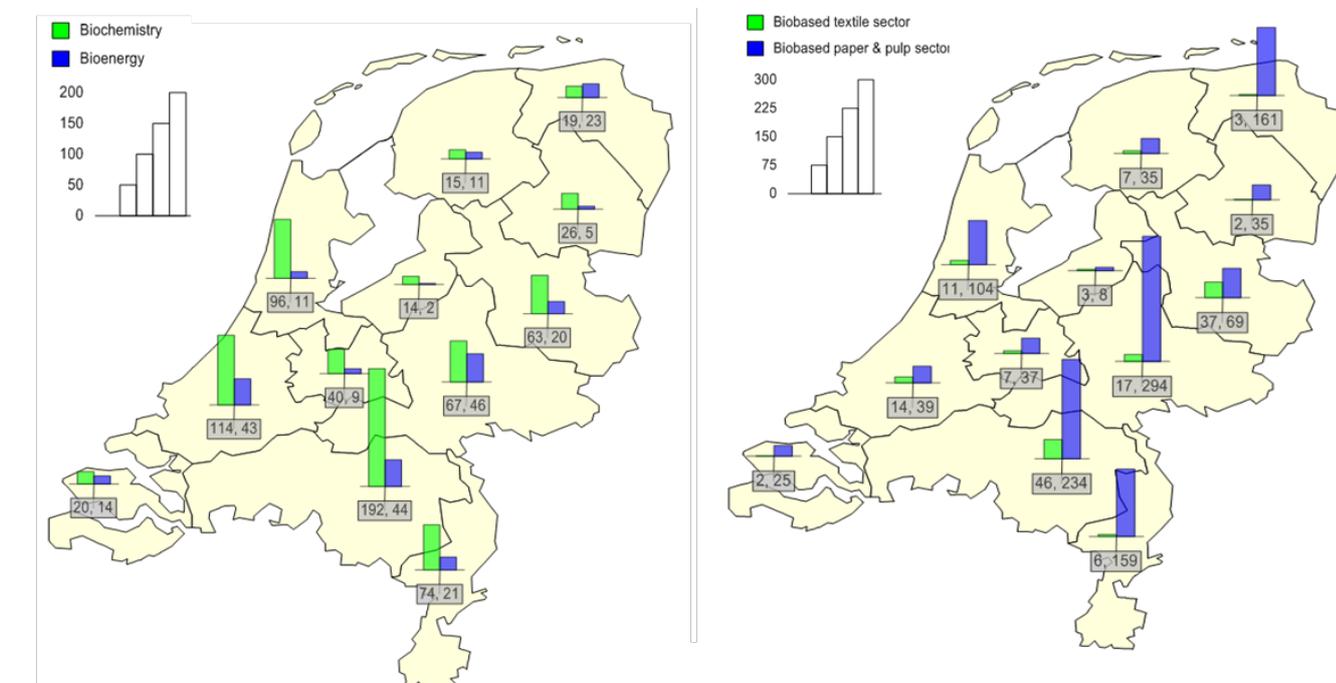


Figure 4 Value added ((€ million) of bio-based chemical and energy sectors (left), and paper & pulp and textile sectors (right) in Dutch provinces, in 2013.

Multiplier effects of the bioeconomy

The results above show the direct impact of the bioeconomy. Input-Output analyses are used to calculate the indirect effects of the bioeconomy, also known as spill-over or multiplier effects. This applies to both turnover, value added, employment, energy use and greenhouse gas emissions. The indirect effects of the bioeconomy occur from economy activities associated with the bioeconomy sectors, but are not part of the bioeconomy. Examples are bank and consulting services, ICT and also the transport of products of the bioeconomy to intermediate and final users. Table 1 shows the multiplier effects of the bioeconomy for turnover, value added, employment, energy use and greenhouse gas emissions. The multiplier is calculated as the ratio between the total (direct and indirect) effect of a bioeconomy sector and its direct impact. By definition, these indirect effects are positive.

	Turnover	Value added	Employment	Energy use	Emissions
Agriculture, Forestry and Fishery	1.6	1.7	1.6	1.2	1.1
Food and Feed	1.6	2.2	2.5	1.6	1.9
Wood	1.8	1.9	1.6	2.5	1.9
Paper	1.5	1.9	1.9	1.2	1.4
Textile	1.8	2.1	2.1	1.9	4.1
Chemistry	1.6	2.0	2.7	1.1	1.3
Energy	2.2	2.5	6.9	1.1	1.0
Construction	1.9	2.3	2.2	1.3	1.2
Biotechnology	1.6	1.4	1.6	5.7	2.0
Total Bioeconomy	1.6	2.0	2.0	1.3	1.2

Table 1 Multiplier effects (indices) of bioenergy sectors in the Netherlands, in 2013

- The total (direct and indirect) contribution of the bioeconomy to turnover, value added and employment in 2013 in the Netherlands was respectively 1.6, 2.0 and 2.0 times the direct contribution. The direct plus indirect turnover of the bioeconomy in the Netherlands in 2013 amounted to 166 billion euro. The total value added was 55 billion euro and the total contribution of the bioeconomy to employment counted to 69 thousand fte jobs.
- The multipliers for energy use of the chemistry and energy sectors are relatively high, which is the result of the relatively high labour productivity of this sector. Especially the energy sector is capital intensive. On the one hand, the job number which is directly employed in the energy sector is relatively small. On the other hand, this sector generates a relatively high job number elsewhere in the region, like in delivering sectors and in sectors that distribute energy to intermediate and end-users.

Steps needed to develop a more detailed, accurate and comprehensive Bioeconomy Barometer

The development of policies to stimulate the transition to a bioeconomy requires the development of analytical capacity for providing guidance for the design and execution of consistent, coherent, long-term strategies. Such a framework has been developed in the EC funded project 'Design of a systems analysis tools framework for the EU bio-based economy strategy', which was coordinated by LEI-WUR (SAT-BBE, 2015). Second, the EC initiated the 'Bioeconomy Information System Observatory' (BISO) project with the objective to bringing together the data, indicators and tools needed to monitor the progress, to assess the impacts, and to model future scenarios of the bioeconomy (EC-JRC, 2015). Also, in the Netherlands various initiatives have been deployed to monitor the development and impact of the bioeconomy (e.g., Hamer et al., 2015).

The Bioeconomy Barometer 2013 of the Netherlands presented in this document is based on the Input-Output table of the Dutch economy, which is further disaggregated based on various partially incomplete data sources. This approach allows an evaluating of both the direct and indirect contribution of 19 primary sectors and 20 food and feed processing sectors of the bioeconomy to turnover, value added and employment and also energy use and greenhouse gas emissions. A higher level of sectoral detail (e.g. disaggregation of bioenergy into biodiesel, bioethanol, co-combustion of pellets with coal, combined heat and power from biomass, industrial boiler for heat production, etc.) and more diverse set of impact parameters (e.g. employment per education level, emissions of particle matter, NO_x, SO₂) are required to more accurately monitor the progress and to assess the impacts of the bioeconomy. The combination of economic Input-Output table with physical data (e.g. as in Monitor Material flows and Environmental Accounts) could provide more valuable integrated insights in the socio-economic and environmental effects of the bioeconomy. The Bioeconomy Barometer 2013 should thus be seen as a first, preliminary assessment that will be refined, expanded and updated according to future advances in research and policy requirements.

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