Substitution of fossil fuel-based resources – what do we know about the availability of bio-based inputs in Germany

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Overview

- Key messages
- Introduction and Background
- Natural resource input in economics – reason why that input was ignored for a long time
- Status of agriculture, forestry and fisheries in Germany
- The bioeconomy monitoring project – what do we know about the bio-based input
- Conclusions

Key messages

- We have limited knowledge about the bio-based input in Germany
- Bio-energy sources provide 9% of total energy production
- Agricultural production systems are mostly intensified with high negative external effects
- Agriculture, forestry and marine ecosystems would need to provide much more input for a bio-based economy/bio-economy
- For a long-time erasure of land/natural resources in the production function for economic growth

Introduction and Background

- Our economy is based to a large extent on the input of (cheap) fossil fuels / fossil resources
- Fossil resources are condensed solar energy from periods long ago, plants based and limited
- In the long run those resources will run out – sooner or later
- Today the negative impact of CO2-emissions from fossil fuels on the climate is demanding a much faster reduction of the use of fossil resources

Natural resource input in economics – reason why that input was ignored for a long time

- Classical economics claimed that **land** is the most important production factor
- Especially the invention of artificial fertilizer led to a more efficient use of the production factor land
- Fertilising a field means ‘an investment’, also increasing investment in technology – for neo-classical economists that meant that agriculture is a ‘normal business’
- Result: Land was subsumed under the production factor K (man-made capital) and then ignored

Natural resource input in economics – reason why that input was ignored for a long time

- Natural resource input was ‘re-introduced’ in 1974 during the debate on the ‘Limits to Growth’ – land not really back
- The possibility of substitution of fossil fuels/resources will depend on the available land as land is able to convert solar energy into food resources/bio-based resources
- The economist Georgescu-Roegen claimed in the early 1970ies that land will become the scarce factor – his work influenced the development of ecological economics substantially

Status of agriculture, forestry and fisheries in Germany

- Agriculture: In many parts of the world highly intensified production systems (many economist would say ‘efficient’) with substantial negative externalities (see previous talk) – further increase in production while at the same time preserve ecological functions is questionable
- Forestry: In Germany higher pressure on resources while at the same time huge losses due to climate change – need time to replant, increase in production possible but unclear to which extent

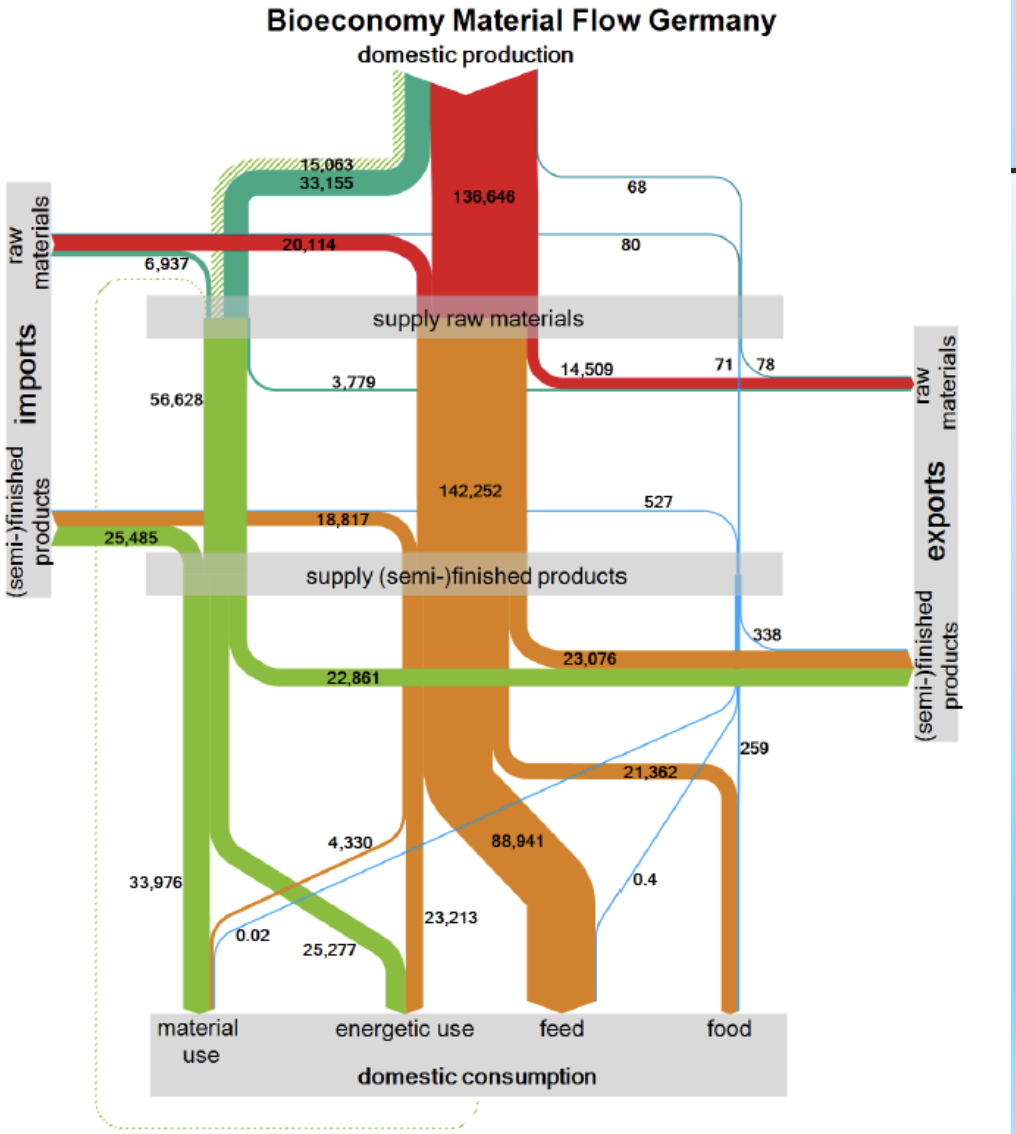
Status of agriculture, forestry and fisheries in Germany

- Fisheries: Increase in economic activities limit availability of space for fishing, high fishing intensities with overfished stocks, increase in bio-based resource production (like algae) possible but only limited space for it
- Conclusion: There may be possibilities for an increase in production of bio-based resources but questionable if it is possible to preserve ecosystem functions/services at the same time without promoting less intensive forms of production

The bioeconomy monitoring project – what do we know about the bio-based input

- The Thünen-Institute was requested to elaborate how to monitor the bio-economy (or the bio-based basis of the economy)
- Three objectives:
  - What do we know about the bio-based input in Germany?
  - What would be necessary for a regular monitoring?
  - How far are we with assessment of ‘sustainability’ regarding bio-based inputs

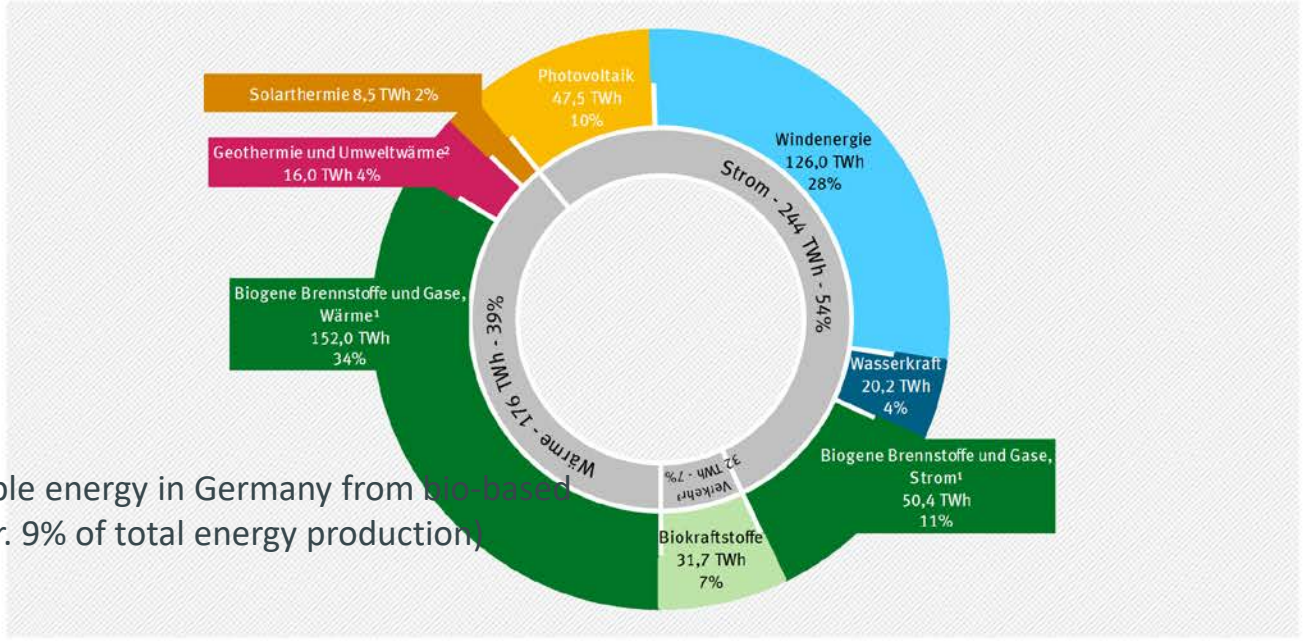
Figure 2.3: Aggregated material flow of agricultural, forest and aquatic biomass in 2015



Source: own illustration

Energiebereitstellung aus erneuerbaren Energieträgern (2019*)

Gesamtenergiebereitstellung: 452,4 Terawattstunden [TWh]



¹ mit biogenem Anteil des Abfalls
² Stromerzeugung aus Geothermie etwa 0,2 TWh (nicht separat dargestellt)
³ Verbrauch von EE-Strom im Verkehr etwa 4,2 TWh
Abweichungen bedingt durch Rundungen, * vorläufige Werte

Quelle: Umweltbundesamt (UBA) auf Basis AGEE-Stat
Stand 02/2020

50% of renewable energy in Germany from bio-based Resources (appr. 9% of total energy production)

Conclusions

- Land as production factor was ignored in economics for a long time
- However, will be the most important production factor in the future to substitute fossil fuels/resources with bio-based ones
- Questionable whether a further intensification of agriculture, forestry and fisheries will be possible with preserving of ecosystem functions/services
- Bio-monitoring project provided information on what limited information we have for bio-based input


Thank you very much!