biomass research

Biomass availability: comparing assessment methods

J. (Hans) W.A. Langeveld

Introduction

While the demand for biofuels is increasing, the availability of sufficient biomass feedstocks is questioned. Different methods are used to assess biomass availability. We discuss four assessment methods: (1) assessments based on ecological models[1,2]; (2) assessments based on trade and economic models[3]; (3) scenario studies[4,5] and (4) trend studies[6].

Production ecology studies

Early assessment studies combined agro-climatic and crop data to calculate potential yields, compensating expected losses by pests, weeds, diseases and suboptimal management. These so-called Agro-Ecological Zones (AEZ) studies accommodate a range of conditions. They have been criticized for providing unrealistically high yield figures and for ignoring non-technical limitations (e.g. access to credit or water).

Economic studies

Economic assessments follow insights on market development and competition. They are based on production cost analyses and aim to determine how producers will meet demand for biofuels. Economic studies can identify (un)expected impacts of biofuel policies, but show limited ability to predict price fluctuations (like those occurring in 2007–2008).

Scenario studies

Scenario studies compare possible options for future biomass production and demand. They combine many assumptions (e.g. on population and economic growth or technology development). Hoogwijk *et al.* (2005)[5], for example, evaluate the impact of four IPCC climate change scenarios on potential biomass production. Outcomes are highly informative but can not be treated as accurate predictions.

Trend studies

Trend studies assess future production by extrapolation of historic trends. Outcomes can provide reality checks for policy targets or for predicted technology, market or yield levels. Outcomes should be interpreted with great caution.

Compairing study outcomes

We compared outcomes of four study types (Table 1). Highest estimates are given by ecological studies, economic studies providing lowest figures. Outcomes of scenario studies vary greatly; no global trend study could be obtained. High estimates of ecological studies are explained by the fact that they do not take non-ecological (e.g. economic) limitations into account; low availability of economic studies are due to the exclusion of ´uneconomic´ production (generating insufficient added value).

Biomass Research
P.o.Box 247, 6700 AE Wageningen, The Netherlands - T: +31-652058537 - E: info@biomassresearch.eu

Table 1 Estimations of potential biofuel production in 2050 (EJ/year)

Source	Study type	Biofuel potential
Wolf *et al.* (2003)	Production ecology	360-648
Fischer and Schratzenholzer (2001)*	Production ecology	370–450
Doornbosch and Steenblik (2007)	Economy	43
Hoogwijk *et al.* (2005)	Scenario study	35-245
Dornburg *et al.* (2008)	Scenario study	200-500

*Notes: *only half of available biomass is used; rest is devoted to production of power/heat.*

Differences are also - at least partly - explained by assumed biomass-to-biofuel conversion rates, some using a low (35%) and others a higher rate (40 to 55%). The low estimate by Doornbosch and Steenblik[3] is further caused by the fact that only half of available biomass is considered (the remainder being allocated to heat and power production).

Conclusion

Variation in biofuel availability estimates can be explained by methodological differences. Studies based on ecological models provide the highest estimates; those including economic and market limitations report the lowest potentials. Next to methodological backgrounds, outcomes are determined by by assumed biomass-to-biofuel conversion efficiency rates.

References

[1]Wolf, J, Bindraban, P.S., Luijten, J.C. and Vleeshouwers, L.M. (2003) 'Exploratory study on the land area required for global food supply and the potential global production of bioenergy', Agricultural Systems, 76, pp 841–861

[2]Fischer, G. and Schrattenholzer, L. (2001) 'Global bioenergy potentials through 2050'. Biomass and Bioenergy, 20, 151-159.

[3]Doornbosch, R. and Steenblik, R (2007) 'Biofuels: is the cure worse than disease?', Organisation for Economic Cooperation and Development (OECD), Paris

[4]Dornburg, V., Faaij, A., Verweij, P., Langeveld, H., van de Ven, G. (et al.) (2008). 'Biomass assessment: Global biomass potentials and their links to food, water, biodiversity, energy demand and economy', Environmental Assessment Agency, Utrecht (the Netherlands)

[5]Hoogwijk, M., Faaij, A., Eickhout, B., de Vries, B. and Turkenburg, W.C. (2005) 'Potential of biomass energy out to 2100, for four IPCC SRES land-use scenarios', Biomass and Bioenergy, vol. 29, issue 4, pp 225–257

[6]Langeveld, J.W.A., Corré, W.J. and Davies, J. (2007) 'Biofuel Production and Consumption in the European Union: Confronting Ambitions with Potentials', Paper presented at the 15TH European Biomass Conference and Exhibition held 7-11 May 2007 in Berlin