Contribution to Topic 1

How much biomass fuels can agriculture supply in future? An integrated approach of biomass energy potential assessments from arable land in Baden-Württemberg, Germany

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Abstract:

Background and purpose: In the course of an increased use of renewable forms of energy the importance of biomass is growing. Agriculture is considered in Germany to provide substantial contributions to the overall energy potential from biomass in future. Thus, for a reliable prediction of future energy potentials from biomass the appropriate estimation of amounts of biomass fuels from arable land is of outstanding importance.
The goal of this study is to elaborate an detailed assessment of biomass potentials from arable land. Presently available studies on bioenergy potentials are making only rough estimates, simply distinguishing between potentials for solid, liquid and gaseous bioenergy from arable land. The approach suggested below aims to specify such general assumptions taking into account existing frame conditions of influence on the practical decision of farmers for their land use preferences.
Approach. First of all the total amount of arable land in Germany and specifically in Baden-Württemberg and its currant use is acquired. First of all the cultivation of energy crops on set-aside land is of interest, as there is no competition in use for production of food and feed, but only with other than energetic non food applications. But also competition with food cropping on regularly cultivated areas is a subject of this study. To assess the currant situation technical literature and agricultural statistics were analysed. For selected crops and raw materials costs and market prices were acquired.
Further more, a huge amount of factors influencing the cultivation of energy crops was taken into account, e.g. currant market prices of raw materials, requirements of traditional crop rotations, natural site conditions. For a detailed assessment, many ancillary conditions with major influence on farmer's decisions in cropping had to be regarded, as there are:

- economical aspects like competing market prices of other uses and crops and subsidies
- further processing in solid, liquid or gaseous conversion
- technical aspects like energy efficiencies over the whole process chain of energy supply
- agronomic restrictions as e.g. crop rotation, soil and climate
- competing use of the raw materials for non-food/non-energy applications
- infrastructure

Results. Taking into account such aspects a composition of land use with different energy crops and their probably succeeding conversion lines was derived for Baden-Württemberg. By this way the theoretical potential of bioenergy from arable land was assessed.
Conclusions. The study addresses the production of plants for energy supply. Dependent on which plants are cultivated there are different ways to convert them into end energy or fuels respectively. Solid biomass generally is suited for direct combustion in furnaces but at same time – dependent on the materials properties - a share of it can be also used as co-substrate in biogas plants and others in gasification processes, with specifically different overall energetic efficiencies and end energy outputs per ha of arable land. The way of how converting biomass raw materials into energy amongst others is dominated by the prices that can be paid by the succeeding link in the process chain. Related to end energy the most cost efficient ways of providing a given unit of energy finally will attract the highest amount of biomass raw materials from cropping, be it a solid, liquid or gaseous fuel at the end. The establishment of appropriate political frame conditions may direct this general matter flows into the favoured directions. The general decision of producing biomass for energy use in agriculture amongst others again is a subject of surrounding market conditions and long term security of planning for farmers. The cultivation of annual crops for example allows short time production decisions by the farmers any year, cultivation of e.g. short rotation coppice or Miscanthus only after 12-20 years.