Workshop Minutes

BIOLYFE Workshop on Challenges and Opportunities for Lignocellulosic Ethanol Biorefineries – A SWOT analysis

Place: Casino de Madrid, Madrid, Spain
Date: 3rd April 2013, 17:15-19:00
Occasion: 3rd International Conference on Lignocellulosic Ethanol

Agenda

1. Introduction and concept of the workshop
2. Discussion of key issues
   - 2.1. Avoidance of negative impacts of too high straw extraction rates
   - 2.2. Land availability and land allocation for dedicated bioenergy crops
   - 2.3. Cooperation with farmers
   - 2.4. Logistics and storage
   - 2.5. Acceptance and public support
   - 2.6. Economic performance of 2nd generation bioethanol plant
   - 2.7. Further issues
3. Concluding remarks and action items

1. Introduction and format of the workshop

The workshop was held in plenary. About 2/3 of the conference participants joined the workshop (about 100 persons).

The workshop was led by Guido Reinhardt (IFEU, chair), Walter Kretschmer (IUS, WP leader sustainability work package in BIOLYFE) and Maria Müller-Lindenlauf (IFEU, Co-Chair). The Workshop started with an introduction held by the chair Guido Reinhardt, followed by an explanation of SWOT analysis (analysis of strength, weaknesses, opportunities and threats) and the workshop format by Walter Kretschmer (IUS, work package leader in the BIOLYFE project). The preparation committee decided to select several key issues out of the some hundred SWOT arguments that were identified in the preliminary SWOT analysis. These key issues were shortly introduced by Maria Müller-Lindenlauf and then put for discussion amongst the participants. The participants had the change to write additional comments on concept cards and return them to the IUS and IFEU after the workshop. Both oral comments and comments delivered on concept cards are summarized in the following.

Furthermore, IUS and IFEU prepared a questionnaire that was included into the conference folder. The results of the questionnaire evaluation are not part of the minutes because participants can still hand in questionnaires by email.

The results of both the workshop discussion and the questionnaire evaluation will be included into the final BIOLYFE SWOT analysis.

2. Discussion of key issues

In the following, the introduction for each key issue delivered by Maria (IFEU) is shortly summarized. Afterwards the statements given by workshop participants are reported. The statements express the personal (expert) opinions of the participants.

2.1. Avoidance of negative impacts of too high straw extraction rates

Introduction

Straw is a main feedstock for lignocellulosic ethanol. As a residue, it has a potentially high sustainability combined with low prices and low competition. Selling of straw is an additional income opportunity for farmers and contributes to rural development. But too high straw extraction rates can have a negative impact on soil fertility and thereby reduce straw availability in the future and the sustainability of the entire value chain. The total straw availability is considered high (about 50 Mio t in Europe) but on a regional scale sufficient straw availability for an industrial bioethanol plant can be critical. Competition with traditional uses (animal bedding) and other innovative uses (use for direct

combustion in CHP plants) limits straw availability for lignocellulosic ethanol plants. A high demand for straw combined with limited regional straw availability might increase the "temptation" of unsustainably high extraction rates.

Discussion

- Regional availability of straw has to be considered by planning bioethanol plants
- A lot of biomass is available in southern Europe. Regional straw availability differs much amongst European regions.
- Regional differences in soil quality → regionally different sustainability requirements needed.
- The incorporation of straw carbon into humus / the exchange of carbon between the soil /the residues / the atmosphere is regionally different and depends e.g. from climate; Recent research exists on this, e.g. from JRC.
- The need for straw left on the field depends also from tillage system
- Some years ago the burning of straw on-site was forbidden in Spain (and other southern European countries?) because of the risk of open fires. This increased the straw availability.
- The positive aspects should be appreciated, not only the negative ones. E.g. in the case of Denmark, the straw availability is very high, and the use of this straw can contribute to local development. But other use options for straw have to be also considered, e.g. production of biogas.
- Straw left on the fields can be a source of pests/fungi; higher extraction rates lower the negative implications; differences between climatic zones (southern and northern Europe) have to be considered.
- The nutrient availability in the soils could be increased by returning the stillage or ashes to the soil.
- It was questioned if weather prediction can also be used to predict straw availability. IFEU replied that there are models on the market to predict grain harvest based on weather and further indicators, and that these models can be adapted to predict straw harvest, which closely correlates with grain yields.
- Availability of straw could be increased by breeding new long-stem-varieties. But: farmers prefer short stem varieties because they are less sensible to breakdown by wind and heavy rainfalls.
- Straw instead of grains could become a main crop because of revenues for farmers.
- In some regions, other residues are more suitable: e. g. in the case of sugar cane, it is possible to leave the straw and take the bagasse as feedstock for 2G ethanol production
- From the industry point of view, not only the physical availability is important but also other issues: organising aspects, involvement of farmers, problem of constant supply, too many clients involved in the whole provision process. Constant supply is very difficult to achieve because the availability depends on too many variables.

2.2. Land availability and land allocation for dedicated bioenergy crops

Introduction

If biomass from bioenergy crops is used as feedstock, the biomass production requires additional land. This implies direct and indirect land use changes. The most sustainable option is to use fallow land for the bioenergy crop cultivation. This way no displacement of food crops occurs and the income opportunities of farmers increase. But fallow land is limited and often of poor fertility. If crop land currently used for food and feed production is turned into a bioenergy crop plantations, indirect land use changes may occur in other parts of the world (because the demand for food and feed is still the same and the displaced food has to be produced elsewhere). In the case of clearing of natural ecosystems to gain new arable land, severe environmental impacts are likely. In the case of a displacement of food crops, the (regional) food availability can be shorted and food prices could rise.

Discussion

- Sustainable land use is crucial for success and acceptance of 2nd generation bioethanol
- Food versus fuel does not exist at the moment (e.g. Africa). The danger for lack of food is very low.
- Food markets are influenced by agricultural policy, so sustainable agricultural policies are the key driver for food security and not biofuel industries.
- Land use not crucial. There is enough land available. In former times industrialized countries like EU and USA had a problem to get rid of biomass and introduced policy measures to lower agricultural production; Today there is still a biomass surplus (corn). The biomass prices are down because of high availability. The biomass is sufficient for food and fuel production.
- Lignocellulosic bioenergy crops are very efficient in land use. Land use efficiency is much higher compared to 1st generation biofuels, e.g. sun flower plantations.
- Land-use change is not driven only by land availability and markets but also by policies. Agricultural policy framework is crucial.
- South-Africa abandoned bioethanol production because of food versus fuel issues → there are regional specific political conditions to be considered.
- Double use crops can provide even more food. Pure lignocellulose crops (e.g. Arundo) do not provide food, compared to 1st biofuels, additional land is needed to produce food.
- Further research should be undertaken regarding intercropping of food and feed crops with bioenergy crops. E.g. if it is suitable to grow any food crop like peas, beans, etc. just after the Arundo harvests in order to get a second crop in the same land while Arundo is taking a while to regrow up. This way the available land could be used more efficiently.

2.3. Cooperation with farmers

Introduction

A good cooperation between farmers and industries is unavoidable to achieve sustainable biomass supply chains. The cooperation between farmers and 2nd generation biofuel industries is not yet fully established, in particular with regard to the cultivation of bioenergy crops like Arundo, which are currently cultivated only on a small scale. Farmers are motivated to grow bioenergy crops or to sell straw to the biofuel industry because of additional income opportunities. On the other hand, agronomical, technical or social difficulties may hinder them to shift to bioenergy crop cultivation. E.g., a lack of knowledge with regard to perennial grass cultivation may hinder farmers to plant Arundo.

Discussion

- It is important to involve regional and local farmers organisations and regional institutions.
- Producer groups should be established to boost farmer involvement (infrastructure & logistics issue) and to get financial support from EU member states.
- Experience exchange among European farmers should be supported by policy makers and Industries. Workshops with famers and industry are needed. E.g., farmers could be invited to next ICLE or a side event.
- Farmers object Arundo because of its bad reputation of being a weed and its invasiveness.
- Change in crops should be facilitated (training, subsidies, etc) to minimise farmer's burdens.
- It would be easier for the farmers if biofuel industries stay with the food crops and don't change to 2nd generation; farmers are used to these crops and it is easy for them to follow the market requests.
- High bureaucracy (RED) efforts for farmers reduce willingness to grow bioenergy crops (certification needed!). The additional income of about 800-1000 € per year (case of Italy) is not sufficient to motivated farmers to take remarkable risks or handle high bureaucratic burdens.
- Growing perennial binds the farmers for many years. It is recommendable to start the cooperation with annual crops and change to perennial crops later when cooperation and the industry are both well established.
- Farmers have yearly planning. They need training to think in longer time periods. Long term planning is needed to grow perennials.
- Annual crops provide more flexibility: Multifunctional, use for food also, fast shift to other crops is possible.

2.4. Logistics and storage

Introduction

Mature 2nd generation bioethanol plants require very large amounts of feedstocks (some hundred t DM per plant and year). This requires efficient logistics. Some types of biomass (e.g. straw) have only

one harvest period per year and have to be stored year round. Others (e.g. arundo) are more flexible in harvest time but require drying. If bioenergy crops are grown on marginal land in remote areas, the infrastructure is often not sufficiently developed.

Discussion

- Transportation of feedstock to plant should be centralised; use of bigger trucks is more appropriate than small farm vehicles. Centralised transport is more feasible but requires organisation between farmers' organisations and the biomass company.
- Storage of straw should be decentralised, at farmer's home or at the field margins.
- Farmers should be encouraged to organise themselves and to come up with solutions for infrastructure and logistics on their own.
- Support from the government is crucial because of high transportation costs (example: Denmark)
- In some cases, pest control in storage facilities can become a problem of pest control (mice).
- Moisture content is crucial for storage. If the biomass is too wet, technical drying is needed which is costly. Solar drying on the field is cheaper were possible. The moisture content depends very much on weather conditions and is very variable; hence costs for drying are volatile.

2.5. Acceptance and public support

Introduction

A successful establishment of 2nd generation bioethanol on European markets can only be achieved with public support and public acceptance. Up to now the EC strongly supported the research and development of the technologies. But the public acceptance of biofuels is low because of feared negative impacts on engines and sustainability issues, in particular the food vs. fuel debate and environmental concerns, even though the acceptance of 2nd generation biofuels is higher compared to first generation biofuels.

Discussion

- Use of GMOs lowers acceptance (example: Portugal)
- Sustainability indicators system should be further developed and applied to increase acceptance and public support
- Other interest groups can influence acceptance, e.g. car industries. There are high differences in acceptance between the regions, depending on the activities of interest groups.
- Critical response by NGOs and environmental groups hinders implementation of bioethanol plants; more efforts on public relation are needed.
- In the debate, the bioethanol industries should point out the strength (e.g. CO2 avoidance) and raise the question what would be the alternative (and what would be the negative consequences in case the alternative is realized).
- Some car companies (e.g. Volkswagen) do not give guarantees for use of biofuels

- Propagate combined production of fuels and feed. E.g.: Without soybean oil for biofuels, soybean protein availability would be lower. 1st generation ethanol production also provides a protein rich feed as by-product.
- Europe invests in R&D, but if the framework conditions for implementation are not suitable, the technology will be implemented elsewhere, so Europe would not profit from the investments for R&D.
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2.6. Economic performance of 2nd generation bioethanol plant

Introduction

If 2nd generation bioethanol plants are not economically competitive with other fuel plants, they cannot succeed on the marked. Even though remarkable cost reductions could be achieved by R&D during the last years (e.g.: reduction of enzyme costs), the production costs are still high, leading to high prices of 2nd generation biofuels, which are not yet competitive without subsidies.

Discussion

- Long-term stable policy is a precondition for large investments. EC should guarantee long term stable policies, at least by grandfathering already established plants in the case of future policy changes.
- Technology is advanced and ready to be implemented on industrial scale.
- Establishment of 2nd generation bioethanol plants has positive effect on economy and job situation, which are of high political interest.
- CAPEX more important than OPEX
- Strength: flexibility of technology. Plants should not focus on one feedstock because the lack of flexibility leads to a high risk of feedstock shortages. In the case of a feedstock shortage the investments would not pay off.
- Flexibility of plant capacity is necessary to react on market requirements.
- 2G is a learning process
- Integration of 1st generation and 2nd generation bioethanol production might turn out to be the most suitable option.

2.7. Further issues

No further issues were discussed.

3. Concluding remarks and action items

The results of the workshop will be integrated into the final BIOLYFE SWOT analysis.

Those participants did not yet deliver the completed questionnaire and still want to do this can find a digital version for download on the conference web page. Please send the completed questionnaires to Walter Kretschmer (kretschmer@weibel-ness.de).