UNIVERSITY OF EASTERN FINLAND

Bioenergy Markets and Policy

Learning Portfolio

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My learning diary will be based on the main questions and main topics of the course that can be done from the course material.

Basic concepts

Many of the bioenergy-related terms that are bandied about in the public debate are not used in a standardized manner. Bioenergy is the final energy or useful energy that is converted and made available from biomass. Biofuels are liquid or gaseous fuels of biogenic origin; they can be used as transport fuels or deployed in the stationary applications of power generation or cogeneration. The prefix ‘bio’ has a positive connotation, but biofuels may also be derived from the non-sustainable cultivation of energy crops. Because of this, the term ‘agrofuels’ is now often used, or – less frequently – ‘agri-ethanol’, ‘agroenergy’ or ‘agrogas’. However, ‘bioenergy’, ‘biofuels’ and ‘biogases’ are the more familiar terms.

The role of policies

The importance of forest bioenergy in Europe has gained more focus than before because of the European Union’s renewable energy policy and its climate change mitigation objectives, in particular. Moreover, energy security issues, rural policies as well as income and employment generation related to bioenergy production have all played important roles. As forest bioenergy is a multifaceted and complex issue, there is a continuous need for evidence-based information that helps better understand the many-sided opportunities and impacts of forest bioenergy in Europe.

Given the uncertainty of future carbon and energy prices, renewable energy sources (RES) policies help to promote new investments. However, they can also cause new problems. Subsidies directed to one sector may harm other sectors and can also increase the costs of mitigating climate change. For example, research has found that if subsidies are given for biodiesel production, this tends to increase the forest biomass price, which in turn may decrease the production of wood-based heat and power. In some cases, it could also decrease pulp and panel production.

Policy makers need to be better informed about the many impacts that policies may have. They need to have clear priorities guiding them to accept trade-offs between sometimes conflicting policy goals.

Economic instruments to promote bioenergy development

Economical instruments in energy policy can focus on the two sides of market trade: demand and supply. The market price is set by the demand and supply curve. When the price rises the demand will go down, but supply will go up and vice versa. The effect of a changing price on the demand or supply is called elasticity. When the quantity changes a lot the product is elastic, when the quantity changes little the product is called inelastic.

Examples of inelastic goods are oil, energy and food. Elasticity affects the intensity of the economic instruments needed to accomplish the goals. With a very elastic product a small subsidy can cause big changes in demand or supply and vice versa. For instance: the demand curve of food products can be considered very inelastic, the demand will not change a lot when subsidies are given to these products.

Taxes and subsidies are examples of economic instruments to influence markets. There are different ways to implement these instruments. You can put taxes on consumption or production. The effect might be the same achieving lower quantities but the road towards it is different. Taxation is used to discourage the use of market product, this can be done to compensate for negative externalities created using the product. Subsidies can be given for product to compensate for positive externalities. For instance, with the use of bioenergy, a positive externality is the effect on the local economy, for this reason subsidies can be given to promote the product.

Taxation and subsidies can also have indirect effects on other markets. By putting taxes on oil-based energy, the use of alternative energy sources might flourish by gaining competitiveness. It is a game on how high taxes or subsidies should be to become effective without too much costs or effort. It has all to do with competitiveness and elasticity and reaching a turning point. When a subsidy is too low it might have no effect, when it is too high your losing money on the subsidy.

Adoption Dynamics

Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person must

perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible.

Adoption of a new idea, behavior, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation later. When promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation.

There are **five established adopter categories**, and while most of the general population tends to fall in the middle categories, it is still necessary to understand the characteristics of the target population. When promoting an innovation, there are different strategies used to appeal to the different adopter categories.

1. Innovators - These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.
2. Early Adopters - These are people who represent opinion leaders. They enjoy leadership roles and embrace change opportunities. They are already aware of the need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change.
3. Early Majority - These people are rarely leaders, but they do adopt new ideas before the average person. That said, they typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.
4. Late Majority - These people are skeptical of change and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include information on how many other people have tried the innovation and have adopted it successfully.
5. Laggards - These people are bound by tradition and very conservative. They are very skeptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.

The stages by which a person adopts an innovation, and whereby diffusion is accomplished, include awareness of the need for an innovation, decision to adopt (or reject) the innovation, initial use of the innovation to test it, and continued use of the

innovation. There are **five main factors that influence adoption of an innovation**, and each of these factors is at play to a different extent in the five adopter categories.

1. Relative Advantage - The degree to which an innovation is seen as better than the idea, program, or product it replaces.
2. Compatibility - How consistent the innovation is with the values, experiences, and needs of the potential adopters.
3. Complexity - How difficult the innovation is to understand and/or use.
4. Triability - The extent to which the innovation can be tested or experimented with before a commitment to adopt is made.
5. Observability - The extent to which the innovation provides tangible results.

Market Behaviour - How different types of measures can affect bioenergy markets?

- Capital subsidies
    - Example on pellet heating system in Germany.
    - Often used to reduce the risk and decrease the investment costs of early adopters.
- Tax incentives
    - For instance, less taxes on income for a person who did an investment in renewable Energies – this is possible in France and Sweden among others.
- Energy Tax Policies
    - Mostly taxation on fossil fuels with high emission like carbon tax in Finland or the carbon & sulphur tax in Sweden. Reasons: independence, less environmental hazards, local economy.
    - The tax changes the price of goods and, as a result, the quantity consumed.
- Guaranteed Markets
    - Like the electricity law in Germany, where the producer of bioenergy knows beforehand (before the production) that they will have a fix price for the energy produced.

Governance

Governance can be defined as any effort to coordinate human action towards goals, and can be understood in a broader sense than government as it can encompass coordination mechanisms that rest outside the authority of states (IUFRO, 2010)

The role of ENGO's in bioenergy policy and governance, ENGOs (environmental non-governmental organizations), they are organizations that are not run by federal or state governments but rather have funds issued to them by governments, private donors, corporations and other institutions. In order to fully understand the social, economic and environmental effects an organization can have on a region, it is important to note that the organization can act outside the formal processes that state governments and other government institutions must comply with.

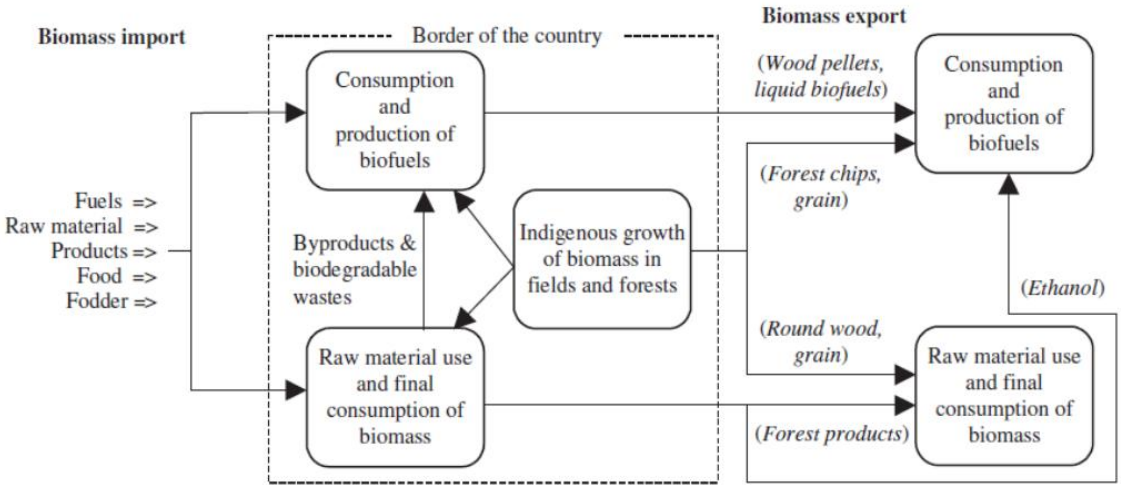
Private and non-private funding influences and affects the way environmental ENGOs view and report environmental conditions. The concept of what is local is crucial to the kinds of efforts and objectives environmental NGOs will carry out. This aim will aid how environmental NGOs will “facilitate, fund, promote, and provide planning and organizational assistance to so called grass roots organizations". Their efforts come in many forms such as: launching campaigns against fossil fuels, international energy dependence, and "international campaigns against the degradation of environmental goods caused by practices like clearing of timber and criticize states for their ineffective policies or transnational corporations for environmentally damaging production and pollution.

The main concern of ENGOs in Finland related to bioenergy is the production of biomass in a sustainable way, improving its role in local economies. Their tools (research, campaigns, events / protests and lobbyism’s) have influence in governance processes. Other ENGOs´ roles are monitoring and reviewing of political legislation, owning and managing environmental resources, mouthpiece of voiceless, education and counterbalance. Resulting in the creation of reflective thoughts and opinions favouring a civic society.

Since many decades ago, ENGOs have fomented climate change debate, resulting in an increase of bioenergy use. Although ENGOs are presented around the world, internet plays a big role in order to increase the potential impact.

International Markets

For this topic, let’s focus on pellets markets that was the focus of the classes, but first an overview of international trades represented in the figure below, an illustration of biomass streams within a country and between countries. Products presented in brackets represent examples of products.:



The pellets can be made from many different raw materials, but pellets from wood responds for 90% of pellets production in Europe. In 2016, the demand for Pellets in Europe was 21,7 million tonnes and the EU-28 members produced 14 million tonnes, which corresponds to 65% of their own demand, the other 35% comes mainly from North America which produces much more than their own consumption. The pellet industry is now a global market witnessing growth both in production and consumption in many regions around the globe. Pellets are used in various ways in the EU-28, generating heat, electricity, or both in the case of CHP plants, thanks to mature, reliable and efficient high technology processes.

New objectives were embedded in a legislative Directive for Renewable Energy Sources (RES), which would ensure the equitable participation of all EU member states. A first objective concerns the share of energy from renewable sources in gross final consumption of energy in 2020, set at 20%. Wood pellets can contribute a lot in these objectives. The use of wood pellets (replacing fossil fuels) also leads to the reduction of greenhouse gas (GHG) emissions and therefore contributes to another objective of the EU Directive: 20% of reduction in GHG emissions.

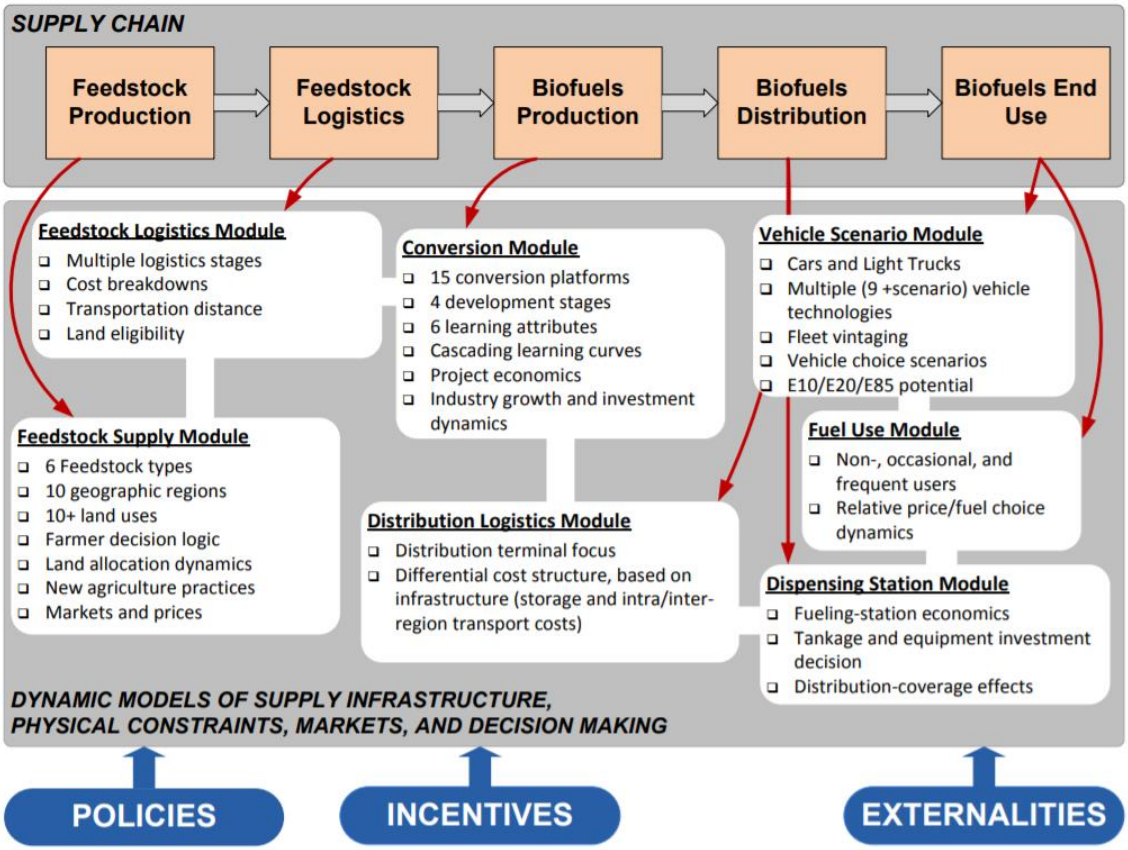
Some of possible threats for the pellets market in Europe: consumption of pellets in EU countries is much higher than production, so it is dependent on imports to supply its demand, there always a risk from this kind of situation. On the other hand, the market shows a tendency to increase the demand if pellets and biomass products, this way, there will be not enough raw materials to the pellets production. Another threat is the competition for land use (specially for wood biomass production) against traditional agricultural activities, to become more attractive for land owner, some policies and market results should be implemented and shown.

The EU 2020 policy target, 20% renewable energy sources in gross energy consumption (GEC), is a predominant driver for future biomass and waste demand.

Based on this and with an analysis of the trends, the pellets market has much more to growth in near future, supported by policies and behavioural changes.

Biomass to Bioenergy Supply Chain

The figure below describes very well the supply chain for production of biofuels:



Source: NREL (National Renewable Energy Laboratory) is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

International Policies

The EU Policies related to Biomass are divided into Environmental Policy, Agricultural Policy and Energy Policy. The Common Agricultural Policy and Rural Development Policy of the EU aims at the competitiveness of the agricultural sector and the development of rural areas. Almost 50 percent of the overall budget of the EU is spent in the agricultural sector and forestry measures with the goal of producing bioenergy can be financed directly from it.

The Directive 2002/91/EC on energy performance of buildings promotes the energy performance of buildings and fosters the use of renewable energies. So, the

demand for energy wood is stimulated due to its broadly use for efficient heating technologies.

Also, the Renewable Energies Directive (Directive 2009/28/EC) and the Biofuels Directive (Directive 2003/30/EC) fosters the utilization of bioenergy by forcing EU Member States to increase the use of wood via legally binding targets. Furthermore, the EU Emission Trading Scheme (Directive 2003/87/EC), which is the core of EU climate change policy, fosters the substitution of fossil fuels with less carbon-intensive energy sources like biomass.

Future trends

The humanity always liked to play with the future, since ancient ages, from oracles and art to science. When dealing with the forest sector, rotation periods of many species usually takes long times, from 5 to 150 years, somehow you need to predict something and plan with a future view.

Sometimes big changes take place, and nobody had foreseen it, then a shift from "knowing/predicting the future" to "exploring and preparing for unknown futures" become more acceptable and preferable among science and policies, because the world is more complex, interconnected and surprising than before. "What if?" is the key question now, because it considers many unexpected factors.

Different skills become more important for teams that wish to foresight future trends, like versatility, hunger for information, freedom from dogmas, curiosity, humbleness, a capacity to learn from mistakes and cooperation skills. You can have better foresights by combining four perspectives:

LOOK INSIDE

Study the sector/firms, present products and markets, competition inside, performance strategies, mind-set, obtain tacit knowledge

LOOK OUTSIDE

Study competition with other sectors, new possibilities/technologies, global economy, politics, societal atmosphere, and learn from others

LOOK BACK

Consider development, decisions and performance of sector/firms during last 10-20 years

LOOK FORWARD

Try to anticipate unexpected developments and surprising turns with great impact ("black swans"); never rely only on one alternative (BAU or best case)

Bioenergy is one part of renewable energy, which is one part of energy production, which is one part of economy and human life. All these are affected by a big amount of different economic, political, social, ecological, and cultural factors, developments, and events, which should be considered. After this, is possible to say that many different things can happen, changing drastically the bioenergy scenario, knowing this we must be prepared for all of them.

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