

Learning diary

Bioenergy Markets and Policies

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Background (11.01.2018)

We could establish 3 stages in the bioenergy development:

- 1970s: oil shocks, we realized how dependant to oil we were
- 1980s: revolution, increase of oil price which is stimulated biomass energy interest
- 1990s: energy crisis, global warming and end of resources encourage the development of renewable energies.

We are not using renewable energies because of the environment but because of the geopolitical context, to not be dependant of oil and dollars. First, it was a geopolitical decision, and the environmental conscious came later.

European Union depends on oil, so it depends on Russian, so they are trying to avoid their oil dependency and to reduce the demand. We depend on 70% of energy coming from outside currently.

A bioenergy is an energy made from biological materials (biomass)

Technology, Efficiency, Planning, Sustainability, all those elements make bioenergy different than just transforming wood into energy. Biomass is renewable, and it takes less than 1000 years.

Peat: preliminary stage of oil, huge energy content, but not renewable because it takes too long time to renew it (better than oil)

Biomass from tree is not the main reason why the tree is cut. It is for timber. But branches, stem top are suitable for biomass. Main sources of biomass for energy currently used in Finland are: tree top mass, branches, stumps (final cutting), and small diameter trees harvested when forests are being thinned

In Finland, more than half of local energy is derived from renewable energy sources.

The role of policy

The role of bioenergy policy is mainly to avoid oil, diversify and promote different sort of bioenergy.

The concept of externality is when the cost or benefit affects a party who did not choose to incur that cost or benefit (Wikipédia). Externalities play an important role in forestry.

Reasons to support bioenergy production in Finland:

- Carbone neutral -
- soil/water
- Decrease of environmental hazard
- Availability of wood
- Local economy (impossible to monopolize the forest)
- Existing technology (in Finland)
- Sovereign energy strategy
- diversify

Reasons not to support bioenergy production in Finland:

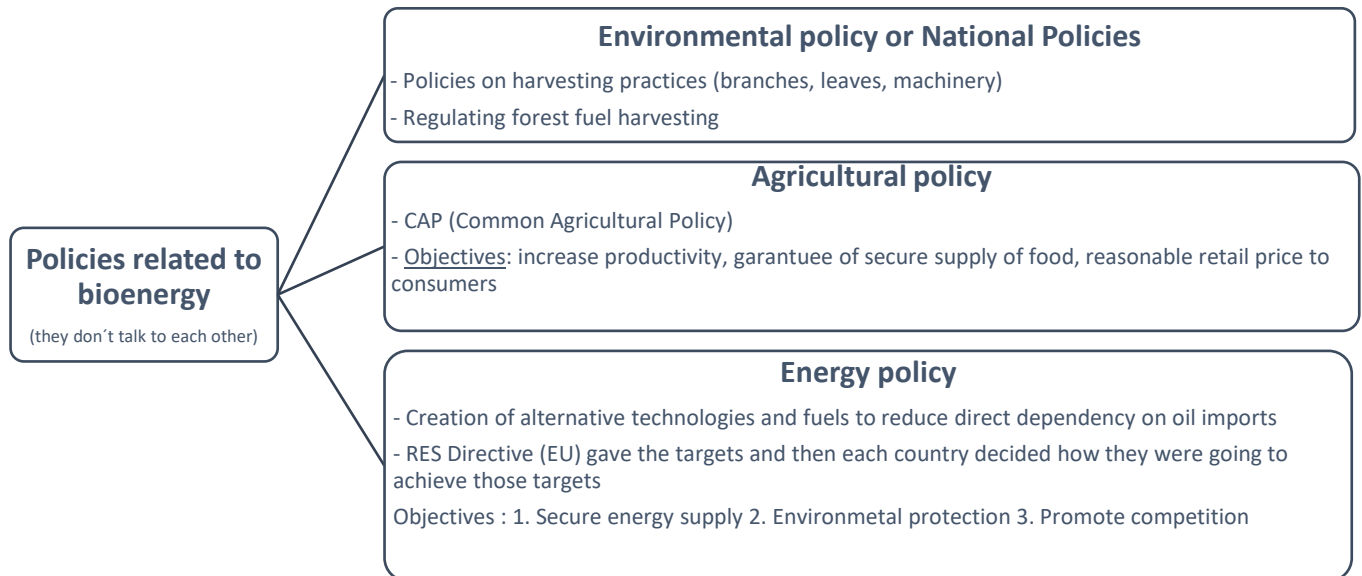
- Costs
- Deforestation (sustainability)
- Not carbon neutral
- Food security
- Decrease of growth

Examples of externalities:

- Positive: a reforestation Pinus radiate plantation
 - ➔ profitability: 4,5% (normal good)
 - ➔ profitability including public goods and externalities: 6,18%, plus job generation: 7,13%
- Negative: acid rains in Ducktown (USA) caused by the technic used in copper mines that affected soil, water, and forest health.

There are different tools used in bioenergy policy such as education, taxes, subventions, quotas (Swedish 5%, Finland 10%) or certifications (green energy).

3 Mains policies affected by bioenergy:



Economic Instruments in energy policy

a) Economic Instruments

- Capital subsidies
- Tax incentives
- Energy tax policies
- Guaranteed policies, ex: 10% has to be biomass
- R&D
- "soft actions"
- Eco-labelling
- Information/promotion campaigns

Subsidy: form of financial aid or support extended to an economic sector (or institution, business, or individual) generally with the aim of promoting economic and social policy.

Tax: mandatory financial charge or some other type of levy imposed upon a taxpayer (an individual or other legal entity) by a governmental organization in order to fund various public expenditures.

Examples:

Capital subsidies: on district heating systems (Sweden, Austria)

Tax incentives: Tax exemptions on incomes (Sweden, USA)

Energy tax policies: CO₂ taxes (Finland, Denmark, Sweden, Netherlands, and Norway)

Guaranteed markets: Obligations percentages Renewables (Germany)

Some products can be exempted of taxes because there are different groups. So, sometimes it is quite unfair, we have to pay more than the market offers.

b) Energy policy

A market works when there are competitors. There are different profiles of consumers (for example when a person has no bike or car, the market has a local monopoly).

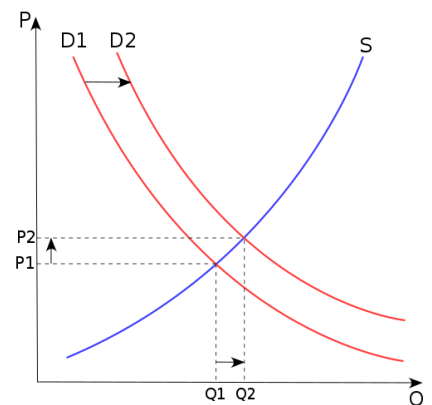
The policy can control the demand and the supply. And supply and demand is an economic model of price determination in a market.

The demand depends on consumers, local actors, society and district heating sector while the supply depends on biomass from the forest and energy crops.

c) Bioenergy Market Economy

The aim is to create a demand and a supply, so policy has to create a **market** for the bioenergy. For this they used different tools as market study or questionnaire.

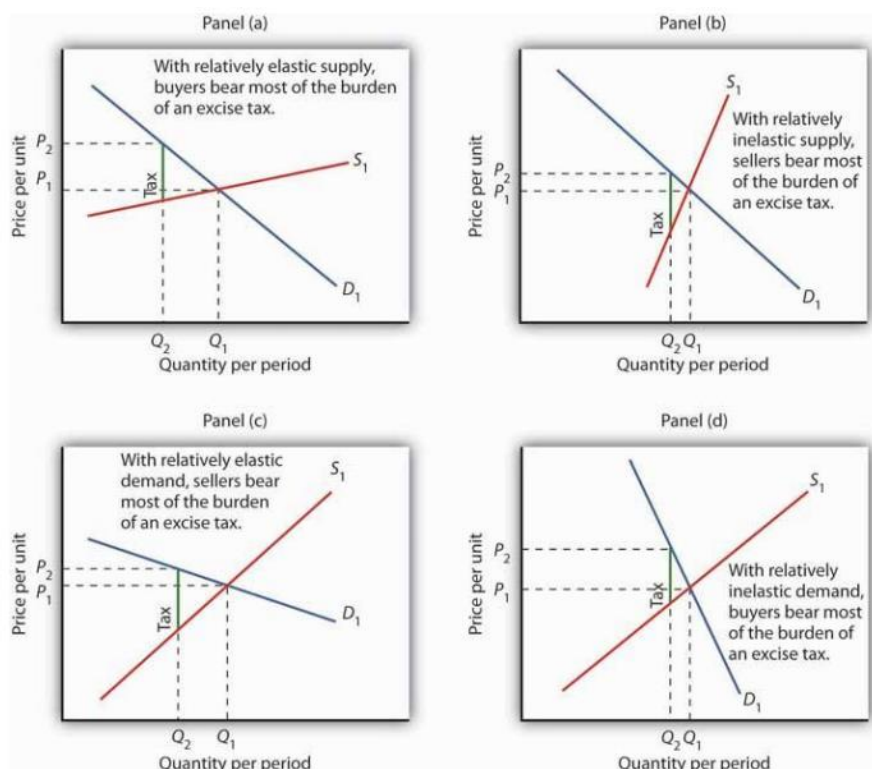
Subsidies and taxes will affect more the consumer or the producer, it depends on the elasticity of the demand and the supply.



Example of oil: Elastic demand, inelastic supply

When we are taxing oil, most of the tax goes to the producer.

- ➔ decreasing taxes on oil will benefit producers and not consumers
- ➔ If you tax a lot, it will be a burden for the producer and he is going to revolt.



Adoption dynamics in bioenergy markets

Plantations for biomass is like agriculture, it requires a lot of actions, but it grows rapidly. Transitions to reach the goal depend on the yield and the total area planted.

Promotion of renewable energy in Sweden

Sweden was the first country to have plantations for biomass., particularly focusing on fast growing willow plantations.

In the 1970S, after the oil crisis, Swedish government rationed gasoline and heating oil to decreased oil dependence. And they introduced research grants and investments on bioenergy developments. In Netherland there was huge penalties on oil using. In the 1980s Sweden had the first commercial plantations and until the 1990s they established a plan for de-regulation of Swedish agricultural sector. In 1995 Sweden joined the EU CAP implement.

Swedish policy measures to encourage willow cultivation:

- Subsidies
 - o To diversify the agricultural sector, 1200€/ha
 - o Willow production, 1330€/ha (this price represents around 10% of the plantation)
+530 ecu for fencing
- Taxation:
 - o Taxes on sulphur and CO₂ in heat production increased (biofuels exempted)
 - o Subsidies are located on producers and taxes too
 - o Swedish policy was based on **creating a supply** of biomass but not a demand

In one-year subsidies has decreased a lot and this affects commercial plantations established. Then they realized that decreasing subsidies was not a good thing and they increased them, but the consumption of wood biomass and the commercial plantations established were no longer coordinated.

- ➔ It's a failure, not a total failure but after this only a few people started plantations.
- ➔ This is an example of lack of communication.

Dynamics of adoption

This is the innovation curve. It works when there is a stable policy.

The producer has to focus the promotion on people who are likely to buy his product.

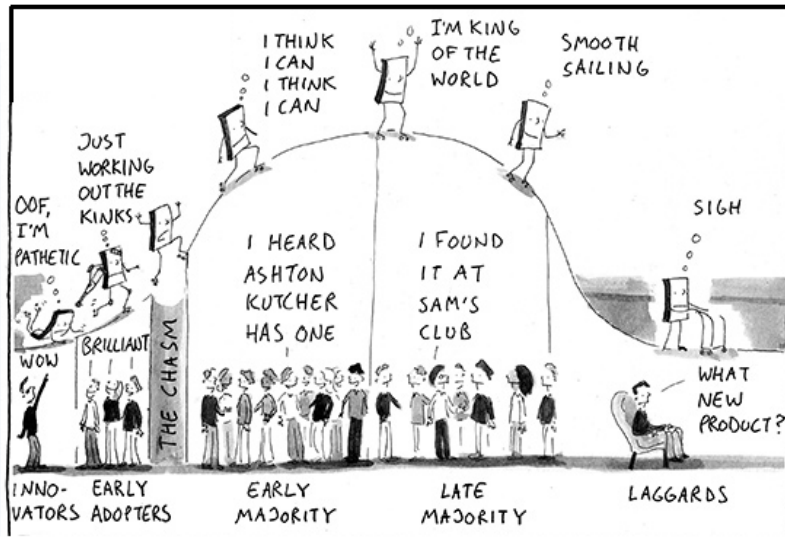


Figure 1 Innovation curve

Example: People who planted willow were very satisfied, but they took the chance of planting willow. Then the subsidies will probably decrease because we know that plantations of willow work.

When 2 camps are balanced we can estimate the risk, which is the difference between the 2 options.

Adoption: profiling

Farmers' motivations for planting were:

- changing the workload on the farm
- good income from sale of chips
- subsidies and expected policies
- land more suitable for Salix than for cereals

Table 9: Influence on Salix activity from certain farm characteristics

<i>positive influence</i>	<i>negative influence</i>
Farm Size Forest land Lease to others Owner age 50-65 Institutional owner Irrigation Mechanization	Pasture Tenancy Owner very young or very old Animal husbandry

The economics of adopting

Costs are higher for pioneer grower than costs projections based on Swedish experience. All the knowledge and the technology did not exist for a pioneer.

In Salix plantation there are about 15000 Salix trees/ha.

If the market size is small, costs are expensive but if the market is big there are more people and it is cheaper.

25% farmers were more interested by the subsidies than by plant Salix and this is why it did not work. Some did not respect the growth time. Salix has to grow for 20 years.

Producing different products leads to a risk, so even if it is expensive, there will be costs reduction later.

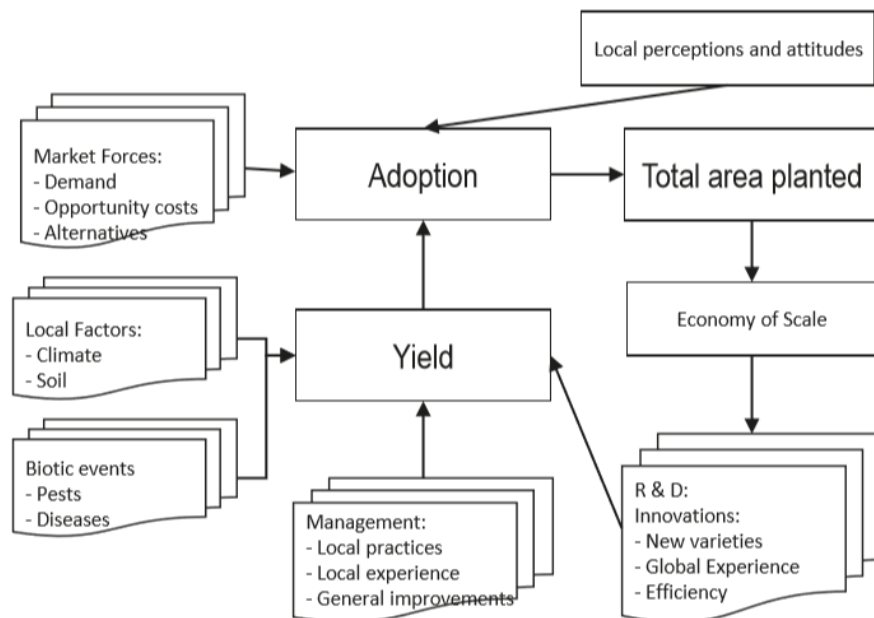
Bioenergy adoption depends on total area planted, yield, local perceptions and attitudes and also market forces (demand, opportunity costs, alternatives).

People with experience improve the overall yield of their plantation.

Trends of Salix productivity:

- new varieties
- experienced farmers
- better overall methods

In 10 years the productivity has changed and so there is a new model to reach:



Conclusion: There was a failure of policies makers, not what they expected

UK had used lot of Swedish experience to avoid issues they met.

Expected willow cost reduction potential for 15 year is about 32%. A comparison between Salix plantations in Northern Ireland pioneer cost and costs based on Swedish experience and these

last one were really cheaper. This is showing that when we start a new crop, it is much more expensive, so we have to start with small lands otherwise it will be really expensive.

Biomass Markets: model behaviour

It is the forest owner who decides the price to sell (not lower than the initial cost), then the dealer buys and sells the wood biomass in order to bring it to the plant and the bioenergy plant buys wood to get bioenergy (not higher than the profit with energy).

To understand the bioenergy model behaviour, we played a game during the lecture. There was one group of students who were the forest owners, another group was composed of dealers and the last group corresponded to the power plants which need biomass to create energy. We played many rounds with different rules (time regulation, cap on selling prices, more amounts, etc). According to different contexts, we noticed different situations such as a local monopoly, prices decrease, prices increase. There were also policy makers that controlled the transactions and who established new policies every round.

This exercise showed us how policies are important to guide a market.

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. It is hard to establish an international governance because there are different governments and countries do not have the same ethical system.

“Social acceptance of bioenergy is an essential prerequisite to the political legitimacy of bioenergy [...]”. But these acceptances change country to country and they vary a lot inside a population depending on what people know about bioenergy.

NGO which means Environmental Non-Governmental Organization is an organization formed by members of the public. NGOs have no government connections and are concerned with environmental issues. They try to influence the social and political decisions of an institutional elite by undertaking research, campaigns and advocacy. Their role is monitoring and reviewing environmental legislation, input to environmental policy, have effective dialogues. They also have an advisory role and do environmental awareness and education.

Different NGOs have different targets because they have to adapt their strategies according to companies, the environment where they are, and perceived legitimacy and support of their position. Internet plays an important role for NGOs because it builds connections between different groups and it helps to disseminate information on a larger scale.

International bioenergy markets

3 products are possible to export in Finland:

- Wood chips: short distance markets
- Waste wood: Norway is a net importer
- Pellets: they come from different sources but mainly sawmills. They are used for heating plants, domestic (15%) or medium scale market (10%).

Pellets market

Finland has not a big market for domestic pellets compared to the market in central Europe (25%). There are different qualities of pellets. And you can make pellets with every material, it is just compacting.

Pellets are made from by-products, mainly sawdust, so the production of pellets depends on the timber production. Usually the pellet sector grows around the sawmill sector.

About the pellet trade flows, the bigger producers of pellets in Europe are Sweden (19%) and Germany (20%), followed by Italy (9%). And Sweden is also the bigger consumer of pellets in Europe. Canada and US export a lot of pellet.

Bioenergy policies for EU & Nordic regions

The policy is like a guideline to control the market. The environmental pollution causes economic externality and then the market failure. So, to decrease environmental issues, there are policy tools like command and control, subsidies, tax and emissions trading.

There are 3 crucial steps:

- Reduce GHG emissions
- Increase carbon stock
- Comprise the emission into the bioenergy production

The carbon tax is a way to make users of carbon fuels pay for the climate damage caused by releasing carbon dioxide into the atmosphere. And a subsidy encourage a particular economy.

The main policy in EU for promoting bioenergy is European Union Emissions Trading System (EU ETS). This trading system sets a cap on emissions and requiring entity to keep a permit for each tonne of emitting CO₂.

Recent and future trends

Most important trends point to the renewable energies growth and a decreasing of costs, a phase out of diesel cars but an oil consumption not going down. The road transport is going to be a real issue. Investments in bioenergy depends strongly on price level of other forms of energy production, competition in land use and price level of feedstock.

EU and North America was thinking, nothing really matter if China do not change its energy system using coal as it is the bigger polluter. And now, China is the country which develop the most renewable energies such as solar power and wind power. Currently, their targets are more ambitious than European one. It is a real challenge for them to reduce their emissions which are seriously affecting human health.

Then we don't really know how it will progress, maybe researches will find a super-technology or a plant that can produce a big amount of biomass in a short time. But we are not safe from a war or an accident like Fukushima. Planning and thinking about the future is not a new thing. The most important goal is to ask good questions and be prepare for different alternatives.

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