

Learning Diary

BIOENERGY MARKETS AND POLICIES

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Background

Bioenergy is the energetic material created from natural, biological resources. Typically, this includes renewable energy materials which can be considered a small-scale life cycle, such as a material which can regenerate itself within a human life span of 80-100 years. Fossil fuels, although organic and abundant do not fit into this category due to their high carbon emitting potential as well as their inability to be sustaining and regenerating within appropriate time spans which reflect human exploitation habits.

An interesting point about the bioenergy sector is that it developed because of energy security and a backlash against the dominating oil producers of the world – generally, the Middle East. Within 20 years the energy sector of Europe and the United States began to shift. In the 1960s, oil becomes a national resource and no longer private enterprises. In 1975, countries begin to start planning for energy alternatives to shift away from oil. By the 1980s, aggressive policies combating the oligopolized oil industry with a focus on self-sufficiency.

The main goals driving the path for renewables is:

1. Securing an energy source against the whimsical nature of oil
2. Environmental aspirations to reduce greenhouse gases and carbon emissions
3. Increase the competition in a market

One key factor to remember when assessing the energy markets is that oil prices is a political factor. After 1975, when oil came a governmental public good, governments began to use the assets as a global power tool. Bioenergy is the tool that can be used to combat the unfair playing field of oil distribution throughout the world.

Policy

Policy is required for several main reasons.

- 1) To correct unfairness that is apparent in a given situation.
- 2) To make people do what they would otherwise be unwilling to do, but that is for the greater good/god for some reason in society.
- 3) Policy also addresses positive and negative externalities that the price of a good or service is not fully capturing, such as the use of waste-water and sludge of short rotation coppice for bioenergy purposes.

The main policy categories concerning bioenergy are:

1. Environmental policy
 - a. The federal government, The European Union and the regulations they provide on practices such as harvesting, machinery, and allowable limits.
2. Agricultural Policy
 - a. Common Agriculture Policy (CAP) **The most important policy because 50% of EU policy money goes here.
 - i. Subsidies for food production!!
3. Energy Policy
 - a. Used to avoid the dependence on oil!
 - i. Taxation!
 1. Secure Energy Resources
 2. Environmental concern
 3. Promote competition in markets

Policy influences small scale bioenergy consumption. The policies can be good or bad, but this will impact industry, communities, and rural livelihoods. This information can be hard to gather and analyze because effects may be perceived only, or impacts may take longer to pass through the supply chain. Policy can also create conflicting scenarios as incentives for completing sources may undermine the work of one ministry or another. For example, incentives for the use of more efficient machinery for the use of gas or electric may be pitted against the use of biomass as an energy source (EFI, 2014)

One such policy includes the security of renewable energy sources. In 2005 energy use from outside the EU was 50%, the target for 2030 is renewable energy sourcing from outside the EU to 70%. The high percentage is required since the European Union has no reliable source for oil in European Union. Therefore the need to find new sources and develop technologies for existing resources is imperative. While it is a positive goal to aim for more renewables and to reduce the carbon impact of the energy sector, there are a plethora of examples where deforestation and environmentally damaging acts are simply exported to other countries. For example, the Canadian company operating in Kenya is jatropha plantations to support bioenergy exploitation from the oily seed. The planting of Jatropha necessitates the deforestation of native tree species such as acacia, replacing it with the non-native bio-energy crop. This implication means that Europe can keep pristine and natural forests and landscapes at the cost of deforestation or land-use changes in less developed countries.

- Good bioenergy policies in EU, bad practices abroad

In 2008, United Nations Framework Convention on Climate Change started the climate policy “20-20-20” to be reached by 2020. The goals include:

1. Reduce GHGs below 1990 levels by 20%
2. Increase the renewables’ share in the market by 20% *this has already been met. Currently the EU has a renewable share at 20.2% - 22.4%
3. Increase energy efficiency

European Forest Institute (EFI). 2014. Chapter 1, Markets and policy. *Forest Bioenergy for Europe*. What Science can tell us. [\[PDF\]](#)

Economic Instruments

Policy tools include:

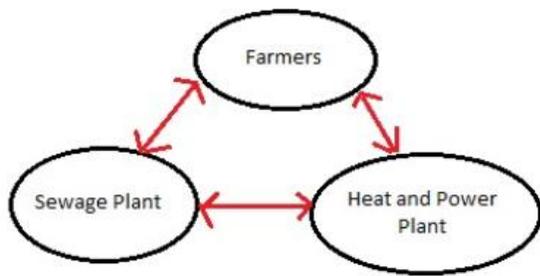
1. Greenlabeling
2. Grants for research
3. Taxes
4. Subsidies

Other examples could include

5. Production incentives
6. The use of certificates

Using energy policies, market effects can be seen on:

1. Capital subsidies
 - a. Ex: Swedish initiative to encourage market involvement
 - b. Ex: Canadian federal subsidy, EcoEnergy (2008-2017), paid to producers for biofuel and biodiesel creation
2. Tax Incentives
 - a. Ex: US Tax exemptions on income taxes to encourage investors and production
3. Energy Tax Policies
 - a. Ex: Baltic and Nordic countries use the carbon tax system to discourage dirty energy
 - i. Taxes only work so long as producers are supplying a relatively small to medium sized energy load. Once production size is extremely large, the tax can be considered negligible and it may still be cost effective to produce a high carbon emitting material and take the tax simply as a cost of doing business. In this case it would be better to implement a cap and trade system when working with international partners.
4. Guaranteed Markets
 - a. Ex: German markets which require compliance in governmental schemes such as the policy to take all diesel and conventional gasoline requiring cars off the road (IRENA, 2017).



IRENA Renewable Power Generation Costs in 2017 [\[PDF\]](#)

Adoption Dynamics and Markets

The use of plantations for bioenergy is a practical and efficient way to maximize production outputs. Short Rotation Coppice (SRC) is a common method practiced for differing periods of time depending on localities around the world. In Sweden, time frames of 4-7 years are common and up to 20 years. Improved mechanization and technological advancements has allowed the efficiency of Swedish coppice plantations to raise from 1 ton/m³/year initially to 20 tons/m³/year.

By using models of circular economy, greater adoption practices can be experienced. Through connecting the supply chain in creative and innovative ways, more externalities can be addressed and

Figure 2. Multilateral exchange between industry participants can lead to increased efficiency.

noticed. One example of this is the connection pathway between coppice biomass farmers, heat and power plants and sewage plants (Fig 2). The farmer sells biomass to the heat and power

plant, while using waste products from the sewage plant like sludge and waste-water, and for a payment. The heat and power plant has a set supplier of energy materials, the sewage plant is a customer of the power plants, and the sewage company has also resolved disposal issues. The connection allows the 3 players to develop a mutually beneficial relationship, where waste can become a commodity and guaranteed markets can be implemented.

In all economic endeavors, risk must be assessed. Risk can calculate by the difference between an expected income and the actual income received from a project. Methods to reduce risk in bioenergy include:

- Increasing knowledge
- Advancing technology (ex. Clones, cultivation strategies)

- Subsidies
- Contract design
- Diversification of portfolios

A production equation can be considered as:

Growing Cost + Land Cost + Risk = Total Yield

Professor Håkan Rosenqvist from Sweden stressed the point that it is often more important to increase the value of a biomass crop rather than increase the yield. With an increased yield come increased transportation and processing fees, so rather than make more just make it better.

Market Behaviour

Solid Biomass and liquid fuels are the most relevant trade commodities in the bioenergy market today (EFI, 2016) Their light weight and easily transportable shape allows the easiest shipping and processing dynamics.

When policy makers are assessing situations, they are concerned about markets, but not prices. They will assist producers and consumers in the attempt to regulate markets.

By increasing the supply of a good, the same effect is seen through increasing the demand. Therefore, when considering what to subsidize, the outcome will be situational depending who most needs the subsidy or who it most helps in the long run.

A good thing to remember is that taxes most dramatically effect the producer and not the consumer. When a tax on gasoline occurs, consumers are seeing the smallest share of the increase. Oil companies may rally together to fight the tax as it is an unfair punishment on to the producers.

European Forest Institute (EFI). 2014. Chapter 1, Markets and policy .*Forest Bioenergy for Europe*. What Science can tell us. [\[PDF\]](#)

International Bioenergy Trade and Governance

Governance can be considered as, “The which generates, transports and implements various norms and incentives and other ways to influence people’s way of acting and thing” (Sawatzky, 2017).

When we think of carbon trading schemes, carbon as a commodity seems like a good idea to control its emission into the atmosphere. However

Other factors to consider in the global market is sustainability practices. Currently there is no universal certificate system on biomass so although biomass use can be argued to be carbon neutral, the devastating impacts of unethical forestry can more environmental problems than biomass is solving. For example, biomass in the form of pellets from the US is commonly collected from whole trees on plantations and in wetlands (Fern, 2015). In comparison, Canada is using harvesting residues and low-grade timber for palletization but a lack of standards highlighting this creates an unbalanced market favouring the bottom line and threatening forest ecosystems.

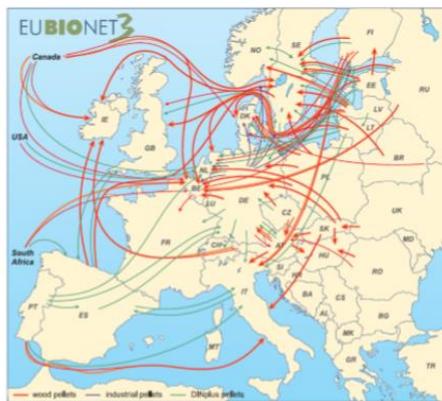


Figure 3. Pellet flow in Europe. The intricacies mean cooperation and good partnership is required to maintain growth in this competitive market where supply and demand has a lasting impact.

There are four principal locations for pellet production in the EU: Scandinavia, Finland, the Baltics, and Central Europe, while the main consumers of pellets within the EU are Denmark and Italy. The main exporters of pellets to the EU are Canada and the Northeast US. 98% of US pellet exports lands in Europe, largely exporting to the UK (Fern 2014). While the Netherlands is a large importer of Canadian wood pellets. Figure 3 shows the complicated network of pellet flow within Europe.

Fern. 2014. Biomass briefing notes. Retrieved on February 12, 2018.

www.fern.org/sites/fern.org/files/briefingnote%20bioenergy%20final.pdf

Sawatzky, Matthew. 2017. Canadian Bioenergy Development and EU Influences. *Alue Ja Ympäristö*. 46:2. pp32-46. <file:///C:/Users/Juliek/AppData/Local/Temp/68854-Artikkelin%20teksti-85299-1-10-20171221-1.pdf>

Bioenergy Regions

Policy mobility is a term used to describe the application of policies made in one setting and extrapolated to conditions in another setting. This does not always work as intended because and adjustment in variables can create dramatic impacts. This transfer of a mandate can be considered throughout locations but also between government levels. General policies that are made at a national level sometimes have difficulty translating at a municipal level. Beyond policies, allowing local governments to actively get involved in their own situation will create greater outcomes that are specifically tailored to the needs of their customers and citizens.

It is obvious that not every policy will be a success but putting a policy into place allows for the feedback loop to adjust the policy specifics as developments occur.

Bioenergy EU Policies

Nordic Countries truly led the way with taxes on fossil fuels. In the 1970s the first fossil fuel tax was implemented as an indirect tax.

Direct tax: placed on producers

Indirect tax: placed on consumers

As a development from that, Finland was the first country to create a carbon-based tax in the 1990s. While new investment grants were being given for coal, peat, and other biomass efficacies.

As mentioned in the policy section above, the EU sometimes has conflicting policy strategies. Finland still has bioenergy grants for peat as a biomass substance and yet supports the protection of wetlands and is expanding its conservation area through national parks and areas of significance.

Strategies of EU Bioenergy Policies:

1) Command and Control

- Measured in tons/year.
- The direct regulation of an industry or legislation regarding what is permitted and what is not. An allowable harvest limit for forest biomass is an example. There are no exceptions. It is a limit that has been decided to be safe, practical, or necessary to protect and preserve goods.

2) Subsidies

- Measured in Euro/investment
- Providing payment and incentive to producer, supplier or consumer.

3) Tax

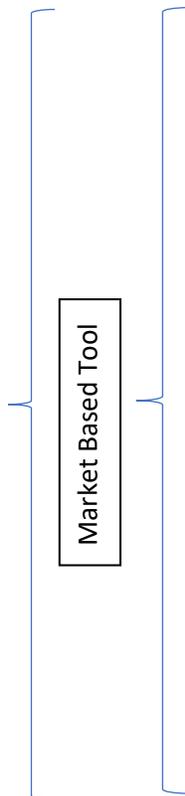
- Measured in Euro/ton
- Ex: Carbon taxes. Used to penalize industrial emission. Tax works within the idea of economies of scale. The more a producer creates, the cheaper his/her production cost will be: The more a producer produces, the lower the tax rate will be in relation to the cost of production. Therefore, small and medium sized firms will be more heavily taxed for production units than will a large company that is already seeing investment growth due to the low cost of production.

4) Emissions Trading

- Measured in Euro/ton
- Ex: Cap and Trade system that limits the amount of Carbon a company can produce. Beyond that, companies must trade available carbon stocks for financial benefits.

Economic Policy Tool

Market Based Tool



Considering carbon stocks is one way to monitor GHG emissions and the impact humanity is having on the earth. Trees in healthy environments will take up more carbon than they emit during their living cycle.

Future Trends

Trends are very geopolitically sensitive as is the precarious state of the world affairs. Depending on who the economic and political power houses are in a moment in time, policies and legislation can be adapted and shifted as interests prevail. My concerns are global disharmony and potential war, which means shortages of resources and a near halting of current environmental strategies and goals. On the other hand, war is a strong motivation factor for developing new technologies and tactics to handle complex problems.

In all likelihood, population will continue to increase as will our ability to use technology to our advantage to do more work with less. To be forward thinking we must continue to focus on optimization and cost reduction in the forestry industry.

One trend that must be analyzed is the future availability of forest biomass for bioenergy. The EU will end up with conflict strategies for land management. On the one hand, the European Commission is undergoing projects such as Natura 2000, setting aside unique habitats and areas of concern for conservation and on the other hand, EU policies for growth of biomass stocks are a priority as well. With Europe's low surface area per capita, local European initiatives will become hard to implement and sustain (Fern, 2015).

Fern. 2017. Biomass briefing notes. Retrieved on February 12, 2018.

www.fern.org/sites/fern.org/files/briefingnote%20bioenergy%20final.pdf