



LEARNING DIARY: BIOENERGY MARKETS AND POLICIES

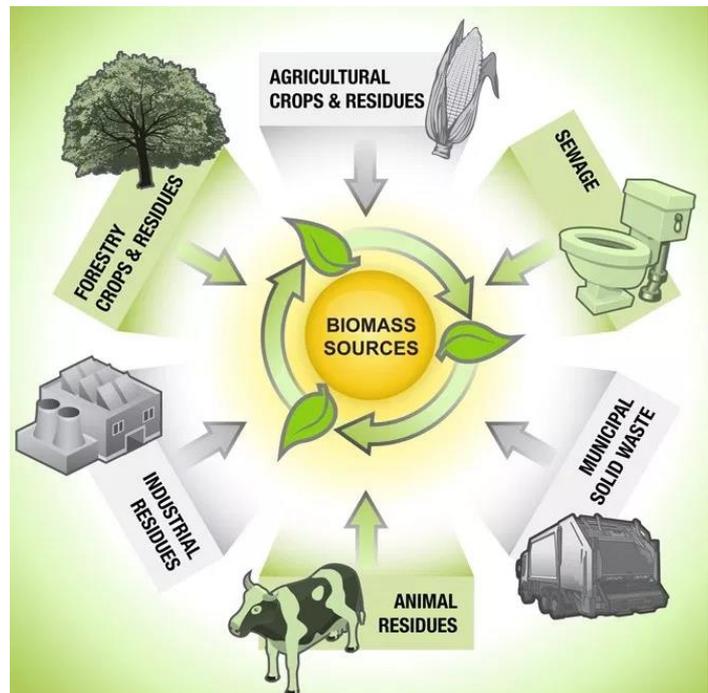
- I. Basic concepts in bioenergy
- II. The role of policy on bioenergy markets
- III. Economic instruments of policy
- IV. Adoption dynamics in bioenergy markets
- V. Biomass Market behaviour
- VI. Bioenergy Governance
- VII. International bioenergy markets
- VIII. Bioenergy market supply chains
- IX. Policies for EU & Nordic Bioenergy
- X. Bioenergy: Recent & future trends

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I. Basic concepts in Bioenergy

Bioenergy is the energy which is stored in biological matter or “biomass”. This can be anything from plants to straw to slurry to food waste and even sewage. When these materials are used for their energy content, they are referred to as “feedstocks”. Sometimes feedstocks are grown specifically for their bioenergy content (known as “energy crops”), while others are waste products from industries such as agriculture, food processing or timber production. Biomass generate energy depends on the type of biomass being used. Dry, combustible feedstocks are burnt in boilers or furnaces, while wet feedstocks are put into sealed tanks, where they



create biomethane gas as they rot. Burning the biomass or biomethane produces heat which can be used to warm homes, shops and offices, or it can be used to drive steam turbines to generate electricity much in the same way as coal or gas fired power plants.

Sources:

- Solid biomass (wood, straw)
- Wet biomass (organic waste, manure)
- Starch plants (sugar, cereals)
- Oil crops (rad seed, sunflower)

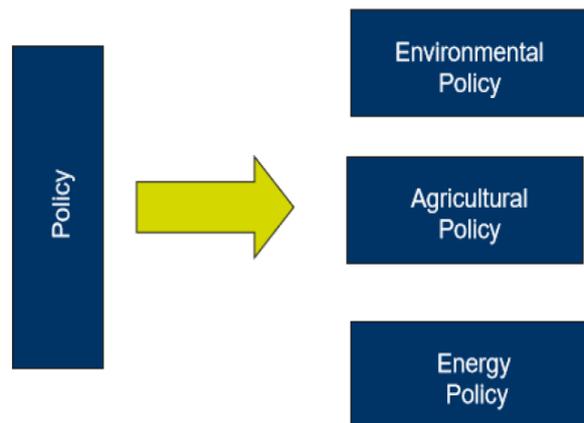
Sources of forest wood biomass for energy came from an “energy forest”. Forest residuals or slash can be primary, secondary or tertiary. Primary residues – logging residues, stumps, whole trees for energy. Secondary residues – industrial residues, bark, sawdust, shavings and chips, endings, black liquor. Tertiary residues – recycled wood, furniture, demolition or construction wooden debris, wooden packages.

Biomass is a renewable energy source that can offer a viable supplement to petroleum-based liquid transportation fuels (biofuels)—such as gasoline, jet, and diesel fuel. It can also be converted to produce valuable chemicals for manufacturing or used to power the electric grid. The two most common types of biofuels in use today are ethanol and biodiesel. Biofuels can be used in most vehicles. Biomass fuels can also be used to produce heat and electricity using processes like those used with fossil fuels. In northern Europe, biomass is mostly use for district heating and transportation. Beyond converting biomass to biofuels for vehicle use, it can also serve as a renewable alternative to fossil fuels in the manufacturing of plastics, lubricants, industrial chemicals, and many other products currently derived from petroleum or natural gas.

II. The role of policy on bioenergy markets

Policy is a set of ideas or a plan of what to do situations that has been agreed to officially by a group of people, a business organization, a government, or a political party. It is also use for guiding decision-making. Policy provide general guidance organisation's goal, specific guidance toward implementing strategies to achieve the goal, and it provide a mechanism to control the behaviour of the organization. Policy plays an important role behind the bioenergy market and human behaviour towards the commodity.

Example: Renewable Energy Directive and the Fuel Quality Directive were amended by Directive (EU) 2015/1513 to strengthen the GHG saving criteria. It addresses indirect land use change by limiting to 7 % the share of conventional biofuels that can be counted for the 2020 renewable energy target in transport and sets an indicative target of 0.5 % for advanced biofuels. To incentivise the use of renewable electricity in the transport sector, it can be counted 2.5



times for rail transport and five times for electric cars. In order to receive public support or count towards mandatory national renewable energy targets, biofuels and bioliquids used in the EU must satisfy the following sustainability criteria set out in the amended Renewable Energy Directive, which apply regardless of the geographical origin:

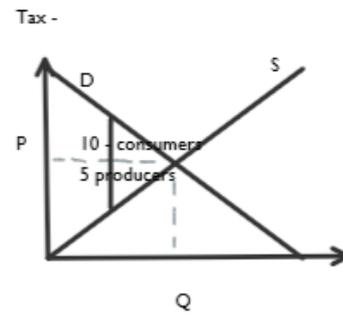
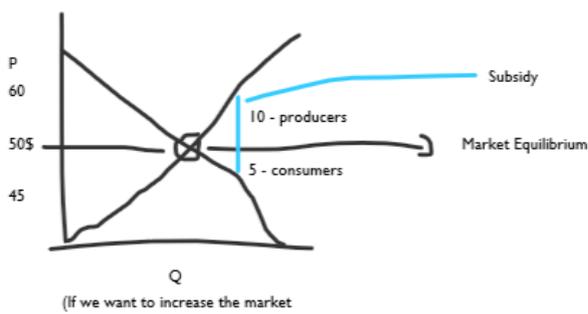
- Biofuels must achieve GHG savings of at least 35 % in comparison to fossil fuels. From 2018, this value rises to 50 %. Installations put into operation after 5 October 2015 must achieve GHG savings of at least 60 %.
- Biofuels cannot be grown in areas converted from land with previously high carbon stock, such as wetlands or forests.
- Biofuels cannot be produced from raw materials obtained from land with high biodiversity, such as primary forests or highly biodiverse grasslands.

Energy mix to reduce dependency on oil imports/ fossil fuels is one of the roles of policy in bioenergy. This guide and monitor the countries' commitment towards sustainability, lessening emission, land use management and may attract investments from local to international level. Mechanisms to support bioenergy production:

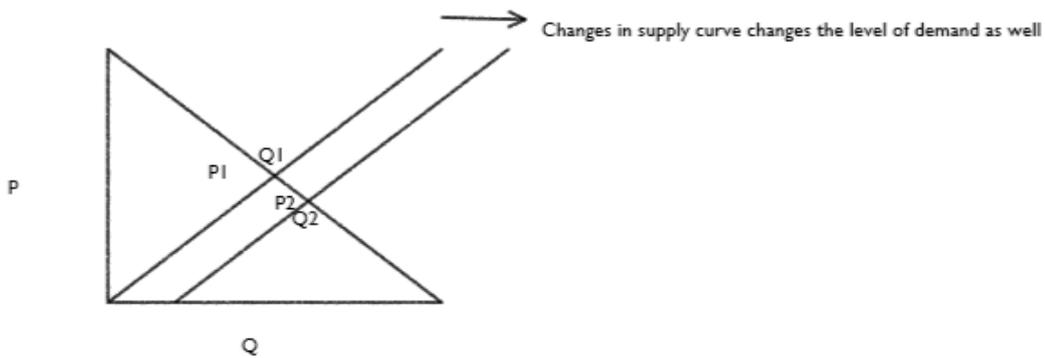
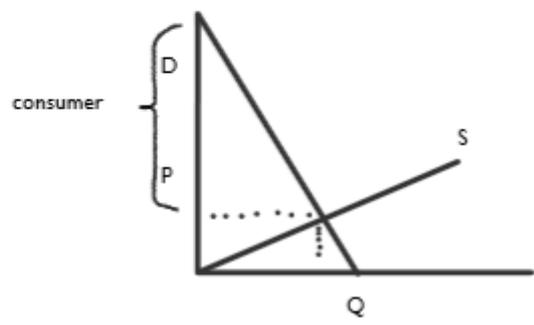
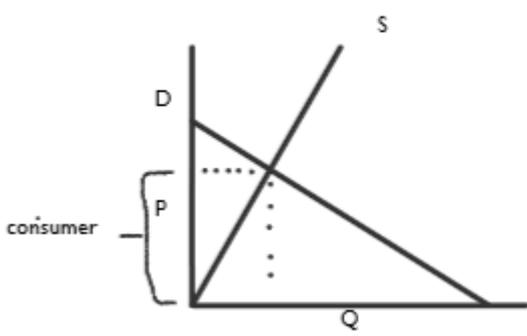
- Subsidies and incentives from the government allocated on different level (forest owners to produce more trees, plants in making bioenergy available, consumers in using bioenergy)
- Tax - when using oil or not using bioenergy
- Information - increasing awareness, public opinion, campaigns, education, promoting
- Investments
- Forbid the use of oil - force to use other alternatives - enforcement
- Regulation implementation

III. Economic instruments of policy

Supply and demand, in economics, relationship between the quantity of a commodity that producers wish to sell at various prices and the quantity that consumers wish to buy. It is the main model of price determination used in economic theory. The price of a commodity is determined by the interaction of supply and demand in a market. The resulting price is referred to as the equilibrium price and represents an agreement between producers and consumers of the good. In equilibrium the quantity of a good supplied by producers equals the quantity demanded by consumers.

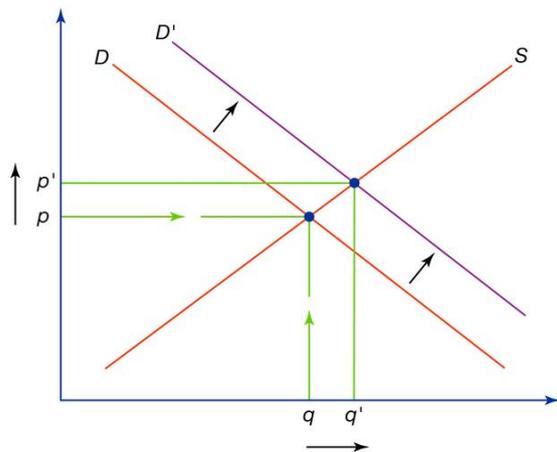


(Elasticity of the Market)



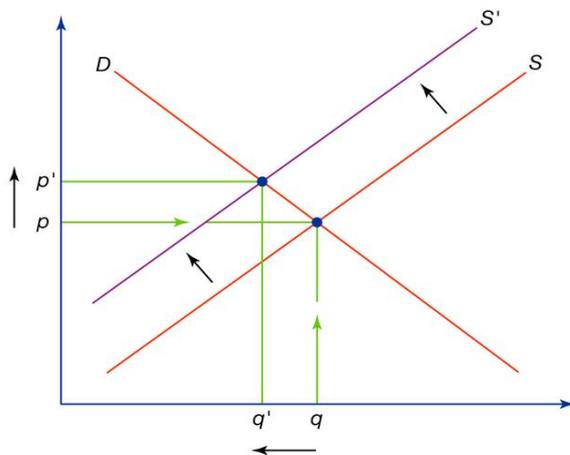
Modifying the cost/price curve also affects the market size

A shift in demand



Increase in demand Illustration of an increase in equilibrium price (p) and equilibrium quantity (q) due to a shift in demand (D).

A shift in supply



Decrease in supply

Illustration of an increase in equilibrium price (p) and a decrease in equilibrium quantity (q) due to a shift in supply (S).

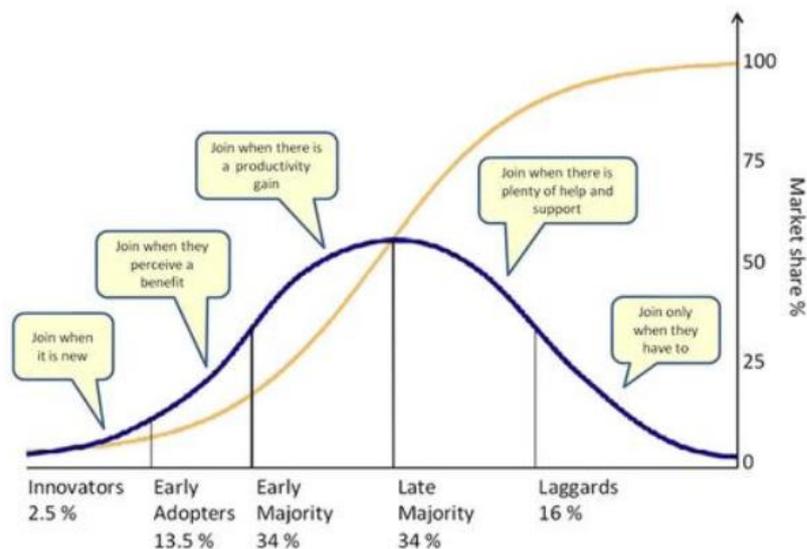
A subsidy is a benefit given by the government to groups or individuals, usually in the form of a cash payment or a tax reduction. A subsidy is often given to remove some type of burden, and it is often considered to be in the overall interest of the public. Taxes and subsidies highly affect the behavior of the bioenergy market. Subsidies are used to encourage the consumer or producers to use a certain product. On the other, tax drives a wedge that increases the price consumers have to pay and decreases the price producers receive.

IV. Adoption dynamics in bioenergy markets

In the early 1960s, Rogers developed a theory called the Diffusion of Innovations. The theory focuses on understanding the factors that can accelerate or inhibit the spread and adoption of a new idea within a community or organization.

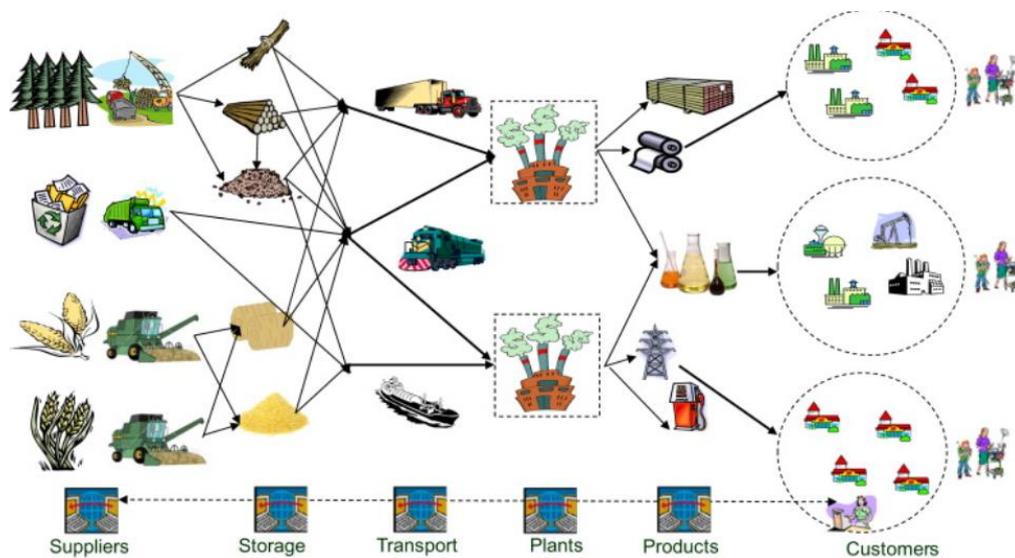
According to Rogers, not everyone has the same motivation for adopting a new idea. He identifies the following five types of adopters:

- **Innovators** adopt something simply because it is new. They love exploring for the sake of exploring and are willing to take risks, even if those risks result in failure.
- **Early adopters** are often opinion leaders. They are similar to innovators in how quickly they adopt, but they are more concerned about the coolness factor and maintaining their reputations as being ahead of the curve on new ideas.
- **Early majority and late majority** are the critical mass that ensures adoption. The early majority looks for productivity and practical benefits more than coolness or reputation. The late majority is similar but also expects a lot of help and support before they are willing to commit.
- **Laggards**, as the term implies, are slow to adopt. They are the most resistant to change and do so only when forced to adopt because everyone else has.



V. Biomass Markets: model behaviour

Market behaviour can be affected by several factors and actors in a market place. In bioenergy in Finland, usually it was the forest owners, dealers and bioenergy plant that processes the wood. Many cases of transaction can be derived from these actors. The forest owners establish and sell their wood where the dealer will act a middleman between the forest owners and bioenergy plant. However, in the real market scenario there can be a lot of dealers but limited bioenergy plant which might affect the price of the goods in the market. There are cases as well where the dealers can dictate a price to the forest owners since, for example, he/she is the only one dealer in the area which may lead to monopoly. Monopoly of the goods and services leads to easier transaction with the actors however there less competition in type of business.

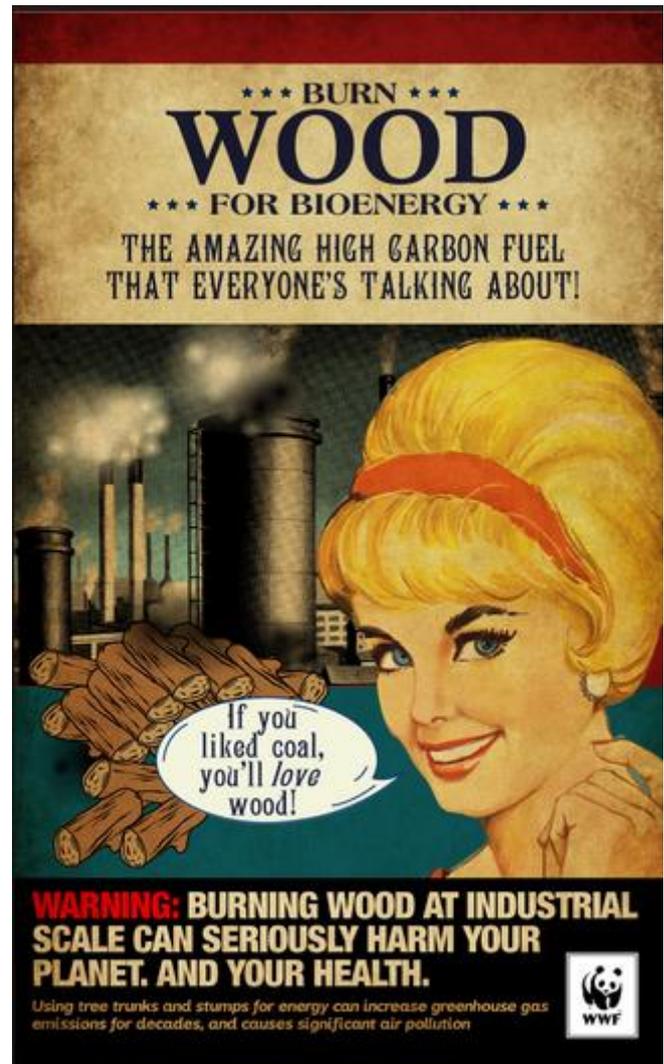


The lecture/exercise in this topic is quite interesting because we had an experience on how bioenergy works including putting taxes and subsidies. It made me realise and understand more how the market works considering policies which limits or expands the activities of producers and consumers.

VI. Concepts and approaches to bioenergy governance

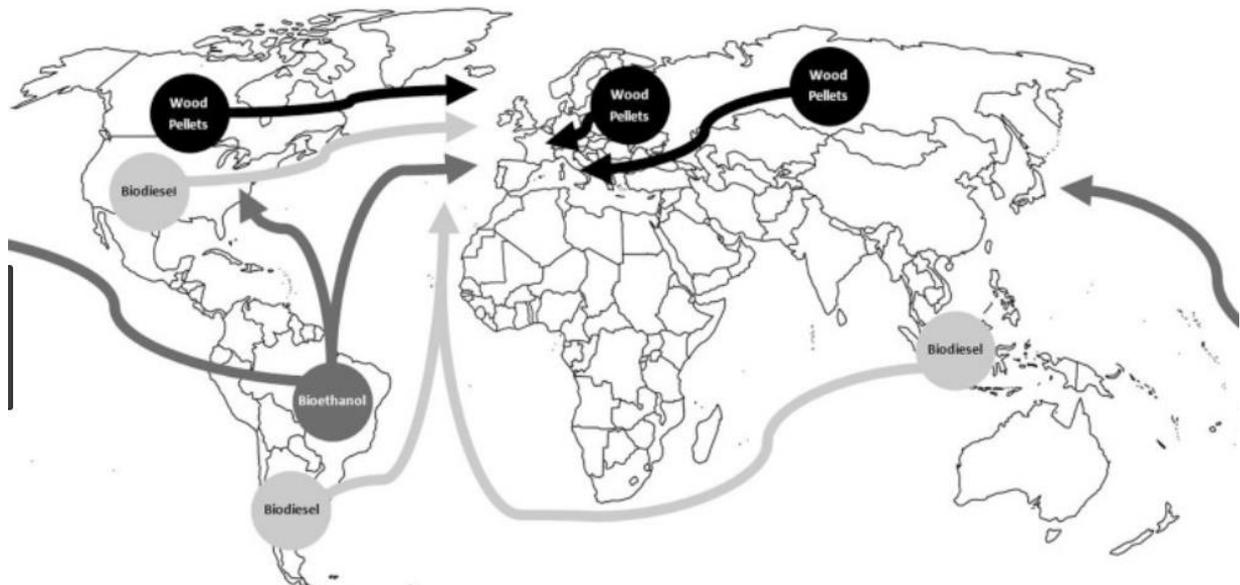
Governance comprises all of the processes of governing - whether undertaken by the government of a state, by a market or by a network - over a social system (family, tribe, formal or informal organization, a territory or across territories) and whether through the laws, norms, power or language of an organized society. It relates to "the processes of interaction and decision-making among the actors involved in a collective problem that lead to the creation, reinforcement, or reproduction of social norms and institutions". It could be described as the political processes that exist in and between formal institutions. According to IUFRO, forest governance are all formal and informal, public and private regulatory structure, i.e. institutions consisting of rules, norms, principles, decision procedures, concerning forest, their utilisation and their conservation, it is also the interactions between public and private actors therein and the effects of either on forests.

Forest conflicts is one of the topics in forestry that exist worldwide. According to FAO, there are the conflicts regarding natural resources management, it occurs when there are disagreements and disputes regarding access and management of natural resources. This exist when one group impairs, hinders, or limits the activities of the other group.



VII. International bioenergy markets

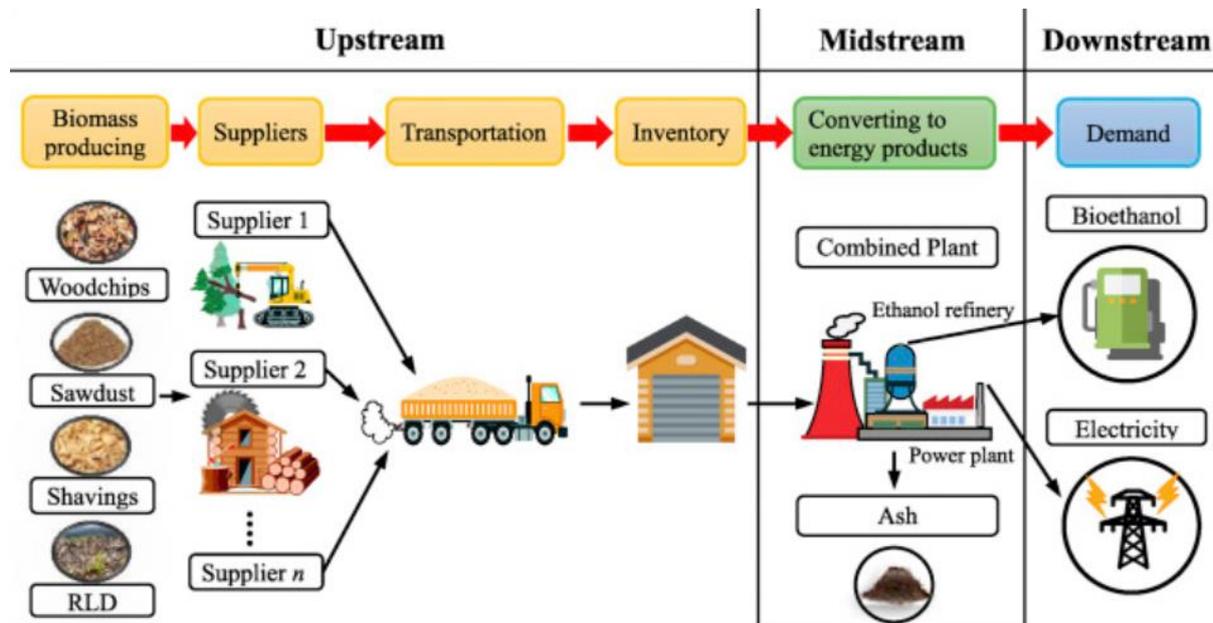
For developing countries, there are many challenges associated with producing bioenergy for the international market. Tariff settings and production quality standards could affect the fortunes of developing countries in the international bioenergy export market. Potential trade opportunities may be reduced by measures which focus exclusively on enhancing production in developed countries, or by protectionist measures designed to limit market access. For example, there are concerns that tariff escalation on biofuels in developed country markets pushes developing countries to export feedstock, such as unprocessed molasses and crude oils, while the actual conversion into biofuels, with its associated value-added benefits, often takes place elsewhere. In addition, tariff barriers such as the ad valorem duty of 6.5 per cent on imports of biodiesel to the European Union and the 54-cent-per-gallon tariff on most imported ethanol to the United States restrict trade from developing countries to some of the most important consumer markets for bioenergy.



To address these concerns, a number of EU and US preferential trade promotion initiatives and agreements have been developed in recent years, offering new opportunities for developing countries to benefit from the increasing global demand for bioenergy. Preferential trade with the EU for developing countries falls under the EU's Generalised System of Preferences (GSP). For instance, there are provisions in the Everything But Arms (EBA) initiative and the Cotonou Agreement which would affect the bioenergy sector. Under the current GSP in effect until 31 December 2008, duty-free access to the EU is provided to denatured and un-denatured alcohol. The GSP also has an incentive programme for ethanol producers and exporters who adhere to sustainable development principles and good governance. The EBA initiative provides least developed countries with duty free and quota-free access to ethanol exports, while the Cotonou Agreement provides duty free access to certain imports from African, Caribbean and Pacific Countries. The Euro-Mediterranean Agreement also has provisions for preferential trade in biofuels for certain countries in the Middle East and North Africa. In the US, ethanol may be

imported duty free for certain Caribbean countries under the Caribbean Basin Initiative, although there are specific quantitative and qualitative restrictions depending on the country of origin of the feedstocks. Provisions for duty-free ethanol imports have also been proposed in the US-Central America Free Trade Negotiations.

VIII. Bioenergy Market Supply Chains



Establishing the biomass supply chain is critical to the viability of a bioenergy project. The supply chain can be broken down into distinct areas:

- Identify locally occurring biomass resources that may be available for use.
- Clarify the roles of individuals and organisations in the supply chain.
- Examine quality control and pre-processing needs for the feedstock.
- Think through storage aspects.
- Evaluate the overall economics associated with collecting and delivering biomass feedstocks.

Energy produced from renewable sources, such as biomass, is being heavily researched due to the recent volatility in fossil fuel energy prices. Some technologies, like solar and wind energy, are more straightforward in that the equipment captures natural energy in its immediate environment, converts it to electricity and then moves it to where it is needed via transmission lines. In other words, the energy resource is 'delivered' to the energy conversion technology by nature. However, biomass energy is complicated due to the bulky, distributed nature of biomass feedstocks and the high volumes of the relatively low energy density materials that must be moved to the conversion equipment.

Once identified the bioenergy market supply, respective policies should also be taken into consideration from local to international regulations.

IX. Policies for EU & Nordic Bioenergy market

It is important for government officials to understand what regulatory tools national governments have to promote bioenergy. Such tools could be policies, legislation or, as is usually the case, a mix of both. Policy and legislative initiatives include measures to encourage private investment in bioenergy industries and financial assistance to public or private investors from national, bilateral or multilateral sources for capital-intensive bioenergy projects. The choice of the instruments is usually informed by the bioenergy sector's relative importance to the country's overall energy security, the level of technological advancement and the level of organization or influence of the players in the sector.

The Renewable Energy Directive (RED) mandates that 20% of all energy usage in the EU, including at least 10% of all energy in road transport fuels, be produced from renewable sources by 2020. Alongside the RED, an amended Fuel Quality Directive (FQD) requires the road transport fuel mix in the EU to be 6% less carbon intensive than a fossil diesel and gasoline baseline by 2020.

- Standard type: Biofuel penetration targets, renewable energy mandates, carbon intensity targets
- Regulating body: The Renewable Energy Directive (RED) is regulated by the European Commission Directorate General for Energy (DG Energy), and the Fuel Quality Directive (FQD) by the Directorate General for Climate Action (DG Climate)
- Current standard: Fuel Quality Directives Directive 2003/30/EC and Directive 2009/30/EC, Renewable Energy Directive 2009/28/EC
- Applicability: All road fuel, electric vehicles

X. Recent and future trends in (bio)energy

Market demand for biomass as a source of energy will surely increase globally in the next years. The awareness of the people towards sustainability greatly affects the demand in this matter. Goods and services are preferred to have that "environmental friendly" approach in order to attract consumers. However, in the case of Nordic countries which seems that bioenergy is an elastic good, international trade would may be in the future if the local supply of biomass is sufficient.

In addition, legislation on the commercial production and trade of bioenergy on international markets cannot be examined in isolation. Only through the identification and assessment of the many activities, institutions, policies and legislative provisions related directly or indirectly to bioenergy at the national level can governments identify strengths, weaknesses, overlaps and gaps. A firm legal basis is fundamental to properly regulate and support the development of bioenergy. Countries that have sound policies to promote the production and use of bioenergy will be at the forefront of realizing the economic and environmental benefits of this sector. The relationships between bioenergy and sustainable development are complex, and

depend on several factors, including the energy crop, method of cultivation, conversion technology and the conditions and alternatives in the specific country. The impacts of policy and legislation in related sectors, such as agriculture, forestry, environment and trade can have a profound effect on the development of effective bioenergy programmes. To achieve an interdisciplinary approach to bioenergy, governments must promote institutional capacity building at the national level so as to ensure coordination among key stakeholders. Governments should encourage cooperation between ministries responsible for energy, agriculture, environment, industry and trade and the private sector. One way to do so is to establish national commissions or boards on bioenergy in which all concerned ministries and outside organizations, industry groups and NGOs are represented. A better understanding of the linkages between different areas of law and a coherent approach to bioenergy would reduce legal uncertainties and encourage the optimal development of the sector. Coordination in this area may be intersectoral, intrasectoral or cross-sectoral, aligning international and national efforts. In any case, strong political will and commitment are required at all levels of government. In order to streamline bioenergy policies and laws, the underlying social, economic, cultural and political causes of non-compliance must be reviewed, as well as the impact of the energy policy and legal framework on the environment, rural development and the poor.

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