

Cost supply Imports

Introduction:

For the S2BIOM project, the potential of import of lignocellulosic biomass was assessed and specified in the form of cost supply curves from countries outside EU28 such as the Russian Federation, Ukraine, Canada, Brazil and USA. One set of cost supply curves was created to define how much biomass can be imported to EU28 from the rest of the world for bioenergy purposes (mainly heat and electricity), and one curve defining the potential import of biofuels. Though the two cost supply curves differ in terms of the end use of biomass that is imported, they are both defined in terms of the amount of biomass that could in the future be imported for a specific cost. In the case of bioenergy, the cost supply curve was defined in terms of cubic meters of wood chips and wood pellets that can be imported for heat and electricity production. In the case of biofuels, the cost supply curve was defined in terms of PJ of ethanol (1st and 2nd generation) and biodiesel that can be imported for the transport sector.

The assessment of trade potential mainly focused on a subsection of the resources from forestry and agriculture land. This as reliable data is difficult to get on a global scale for all resource categories and as a number of the categories is not being traded due to their inherent characteristics complicated their trade and use for industrial purposes.

Biomass potential

Generic information that is the same for all the estimated biomass types is stated below. Key information that varies between biomass categories is stated in Table concerning biomass potentials.

Short definition of potential types provided:

Technical: What is provided in the cost-curve is the potential for a specific cost category.

Base: No information

User Defined 1: No information

User Defined 2: No information

Short methodological description:

The interlinked GLOBIOM (Global Biosphere Management Model) and G4M (Global Forest Model) model have been used to create cost supply curves of biomass trade (import). In its core, GLOBIOM is a partial equilibrium model designed to assess the resource efficiency of biomass use, including energy production, livestock management, and food and timber production. In essence, it is an economic model that jointly covers the forest, agricultural, livestock, and bioenergy sectors, inherently allowing it to consider a range of direct and indirect implications of biomass use

Key input data used (data sources basic input data):

A large amount of publically available and processes data is being used in the models defined above. These kind of information ranges from FAO statistics on food production, GLC global land cover data, FAO FRA statistics on afforestation/deforestation, FAO stat on production of

woody commodities, and SSP2 assumptions concerning the development of social-economic drivers.

Key model(s) used to calculate potentials:
GLOBIOM / G4M

Biomass potentials

Biomass type	Biomass properties assumed	
	% moisture assumed as received	LHV used for conversion from Kton d.m. to GJ
Wood chips	20%	20.21
Wood pellets	8%	20.37
W_Ethanol	20%	23.4 MJ/liter
C_Ethanol	20%	23.4 MJ/liter
FAME	20%	37.8 MJ/liter

Biomass cost

Generic information that is the same for all the estimated biomass types is stated below.

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Unit conversions

Key unit conversion estimates that are being applied are as follows:

1 USD = 0.697666 Euros based on conversion rates for 2010

1 ton wood pellets = 2.5 m³ wood pellets (JWEE)

1 ton wood pellets = 0.92 t.d.m. wood pellets (JWEE)

1 m³ wood chips = 0.42 t.d.m. wood chips (JWEE)

Summary

The final cost supply curves were estimated for 2010, 2020, and 2030. In terms of the cost supply curve for bioenergy, the import potential is shown in Figure 1, where the potential is shown in aggregate terms covering both import of wood chips and wood pellets. As shown in Figure 1, the import potential to EU from the rest of the world of wood chips and wood pellets is substantial.

In terms of wood chips, the import to EU is currently increasing following a global trend of increasing trade of wood chips. Two major import routes of wood chips to the EU can currently be identified. Hardwood chips are imported with sea vessels to Spain and Portugal mainly from Uruguay, Brazil, Canada, Congo and Liberia. According to RISI the total Atlantic imports of wood chips to Spain and Portugal was about 2 million m³ (0.84 t.d.m). Another trade flow of wood chips originates mainly from Russia to Finland. About 2.2 million m³ (2012, roughly 0.9 t.d.m) of chips was imported by Finland from Russia. It is important to note that these historically reported volumes do not separate the chips for pulp or wood based panel production and energy production. It is estimated by a study from the IEA Bioenergy that less than 10% of the annually reported global wood chip trade volumes are energy-related. In terms of the potential to increase the trade of wood chips for energy purposes, the main increase is estimated in terms of trade from Russia and North Africa due to high trading costs. Relatively low energy density, high moisture content and variable particle size and shape of wood chips are the main factors to limited geography of wood chips trade to energy purposes.

The potential to increase import of wood pellets is on the other more substantial than that of wood chips. Wood pellets are, by far, currently the most important solid wood fuel traded internationally. Demand in the EU draws currently the largest trade flows of wood pellets from North-America and Russia. Import of wood pellets to the EU from outside was about 3.2 million tonnes (2.9 t.d.m) in 2012 and customs statistics show that the imports to the EU in 2013 increased to 5.7 million tonnes (5.2 t.d.m). The US and Canada export about 2.7 (2.5 t.d.m) and 2.0 million tonnes (1.8 t.d.m) of pellets to the EU respectively, Russia about 0.7 million tonnes (0.6 t.d.m) per year. Most of the exports from North-America are going to UK, Netherlands, Belgium and Denmark. Russian exports are targeted to Sweden and Denmark.

The potential to increase in import of wood pellets to the EU is estimated to be mainly related to be three major exporting countries: USA, Canada, and Russia. The US and Canada have been the most important sources of industrial wood pellets over the last decade. The imports from North America have been increasing during the last years and so far peak volumes 2.8 million tonnes (2.6 t.d.m) from the US and 1.9 million tonnes (1.8 t.d.m) from Canada were recorded in 2013. North American exports are directed to the UK, Benelux, Denmark and a small part to Italy. Russia has also increased its significance in the EU industrial wood pellet export markets. During 2009-2013 Russian exports to the EU have almost doubled from 0.4 million tonnes (0.4 t.d.m) per year, to 0.7 million tonnes (0.6 t.d.m) per year. Major countries importing Russian industrial wood pellets are Sweden and Denmark where pellets are combusted in coastal CHP

plants. Due to volatile nature of wood pellet production in Russian mills, the export markets are not as stable or established as on the Atlantic side of the EU.

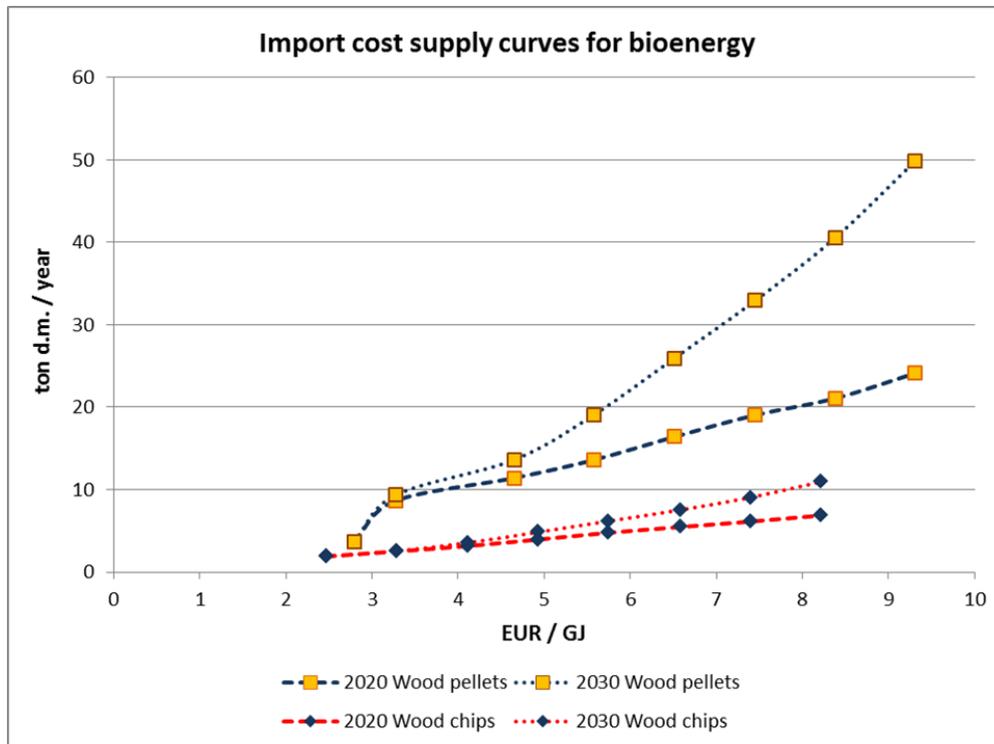


Figure 1: The estimated cost supply curves in 2020 and 2030 for bioenergy. The import potential is defined in terms of import of wood chips and wood pellets [ton dry mass per year], while the price is defined in terms of the cost that a consumer needs to pay for the feedstock [EUR per GJ].

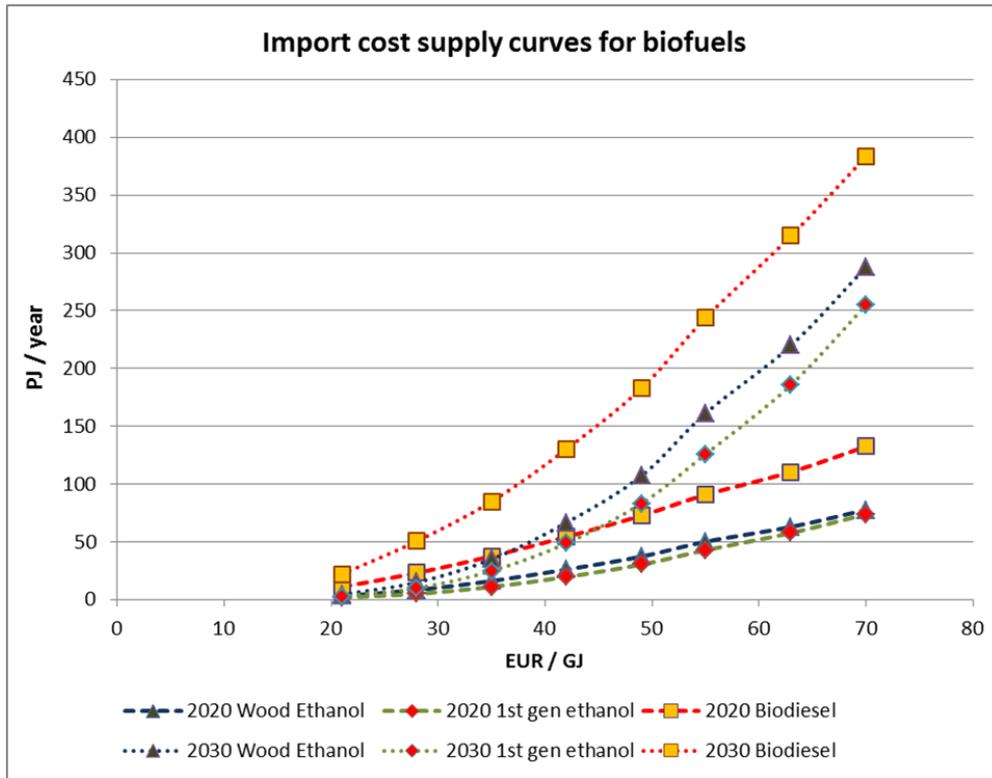


Figure 2: The estimated cost supply curve in 2020 and 2030 for biofuels. The potential is defined in terms of import of 1st generation ethanol from wheat, corn and sugar cane; 2nd generation ethanol from woody biomass; and biodiesel from rape, sunflower, soya and palm oil [PJ per year], while the price is defined in terms of the cost that a consumer needs to pay for the commodity [EUR per GJ].