Assessing grandfathering options under an EU ILUC policy

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Summary and key conclusions

The European Commission is expected to publish in 2012 an Impact Assessment on Indirect Land Use Change (ILUC) associated with biofuel production, possibly accompanied by a legislative proposal to amend the Renewable Energy Directive (RED) and Fuel Quality Directive (FQD). The RED and FQD contain a grandfathering clause aimed at protecting current investments in the EU biofuel sector against the change in policy by the instruction of an ILUC policy measure. This grandfathering clause covers all production capacity in operation by the end of 2013, the clause terminates at the end of 2017 after which an ILUC policy measure would take full effect.

The possible introduction of an ILUC policy measure means the grandfathering clause becomes relevant. This report aims to analyse the existing ILUC grandfathering clause as well as other possible grandfathering options that have been raised by stakeholders in the policy debate on ILUC. The report starts with an assessment to what extent the EU biofuel sector needs protection if specific ILUC policy options are introduced. Subsequently, 5 different grandfathering options are analysed to see to what extent they sufficiently protect the EU biofuel sector without leading to additional ILUC emissions after 1-1-2014, when it is assumed in this report that an ILUC policy option will be introduced.

The EU 2020 targets to achieve 10% renewables in transport and 6% GHG-reduction from fossil transport fuel use will not affected by ILUC policy. This means that the EU 2020 demand for biofuels will not be affected by ILUC policy. The increase of overall EU biofuel consumption in the years up to 2020 is likely to lead to an overall increase of jobs in the EU biofuel sector. However, this is the average picture. Analysis of the EU biofuel sector shows that farmers and the EU ethanol sector is not expected to be faced with challenges by any of the ILUC policy options discussed in this report and is likely to experience growth and job creation in the coming years. The EU biodiesel sector however, would face challenges if ILUC-factors introduced and possibly if GHG-thresholds are raised to 65%, and hence need grandfathering in order to adapt to the ILUC policy measures.

How much protection does the biodiesel sector need? Looking at investments and assuming an average production installation payback time of 8.5 years, some 80% of biodiesel installations would need protection in 2014. This figure decreases to only 5% at the end of 2017, meaning that after 2017 most investments are expected to be paid back. Looking at protecting jobs in the EU biodiesel sector, extended grandfathering of current production levels beyond 2017 is required because ending operations of a biofuel installation will lead to job losses, even if investments have been paid back.

While the current grandfathering clause protects investments in the EU biofuel sector, it does lead to substantial additional ILUC emissions between 2014 and 2017. The existing grandfathering clause in effect means that any increase in EU biofuel production up to the end of 2017 will be protected from the ILUC policy measure, with associated additional ILUC emissions as a consequence.

Overall, it can be concluded that grandfathering option 4B, the grandfathering of installation's average 2010-2012 production levels up to 2020, is best suited to protect the interests of the EU biofuel sector and if combined with an ILUC policy option that effectively addresses ILUC[1] ensures no ILUC emissions will take place beyond 2017.

[1] As described in section 3.1, a raising of the GHG-thresholds would address *direct* GHG-savings and not target *indirect* GHG-emissions.

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1 Introduction

1.1 Background

Indirect Land Use Change (ILUC) associated with biofuel production has been widely discussed among many stakeholders in the EU since early 2008. This discussion initially led to the inclusion of a review clause into the EU Renewable Energy Directive (RED) and Fuel Quality Directive (FQD), which states that the European Commission will assess and report on ILUC and if appropriate propose policy measures aimed at addressing the effect. The directives refer to such a proposal being 'based on the best available scientific evidence' and 'containing a concrete methodology for emissions from carbon stock changes caused by indirect land use changes, ensuring compliance with this directive and in particular with RED article 17(2).[2] This wording refers to a possible introduction of ILUC-factor(s) into the directives.[3]

With view to this possible proposal, a grandfathering clause has been introduced into the RED and FQD. A grandfathering clause is a legal provision which allows an old rule to continue to apply to some existing situations, while a new rule will apply to future situations. The grandfathering clause in the RED and FQD states that once a policy measure aimed at addressing ILUC has been introduced, biofuel production installations that started production before the end of 2013 shall be exempted from ILUC measures until the end of 2017 if their biofuels achieve a greenhouse gas (GHG) saving of at least 45%[4]. The grandfathering is capped at the installed capacity level by the end of 2012. The grandfathering clause postpones a future EU ILUC policy to take (full) effect in order to protect current investments in biofuel production installations.

The European Commission is expected to publish an Impact Assessment on ILUC in 2012, possibly accompanied by a legislative proposal to amend the RED and FQD. If the Commission publishes a proposal aimed at addressing ILUC in the RED and FQD, the grandfathering clause described above will become relevant. The notion that the current grandfathering clause is linked to the possible introduction of ILUC-factors as described above raises the question whether the current clause needs to be reassessed if the European Commission decides to propose a different policy measure. As different policy options are discussed it makes sense to analyse the effect the existing grandfathering

[2] This article contains a minimum required GHG-saving thresholds for biofuels of 35% compared to fossil fuels, rising to 50% on 1-1-2017 for all biofuels and 60% on 1-1-2018 for biofuels from installations which started production on or after 1-1-2017.
[3] During the RED trialogue negotiations in 2008 the ILUC policy options discussed where the introduction of either ILUC-factors or a bonus for low ILUC risk biofuels. The final text refer to a possible introduction of ILUC-factors.
[4] The RED/FQD grandfathering clause (RED article 19.6, FQD article 7d.6) states: "Such a proposal [for a methdology to deal with ILUC] shall include the necessary safeguards to provide certainty for investment undertaken before that methodology is applied. With respect to installations that produced biofuels before the end of 2013, the application of the measures referred to in the first subparagraph shall not, until 31 December 2017, lead to biofuels produced by those installations being deemed to have failed to comply with the sustainability requirements of this Directive if they would otherwise have done so, provided that those biofuels achieve a greenhouse gas emission saving of at least 45 %. This shall apply to the capacities of the installations of biofuels at the end of 2012."

clause and to assess other possible alternative grandfathering options that have been raised by stakeholders recently.

1.2 Aim of this document

This report aims to analyse the existing ILUC grandfathering clause as well as other possible grandfathering options that have been raised by stakeholders in the policy debate on ILUC.

This report describes the EU biofuel sector and assesses to what extent the various steps in the biofuel supply chain need protection against a decrease in demand due to the introduction of an ILUC policy option. The report investigates various options of grandfathering biofuel production from ILUC policy measures, starting from the notion that a credible grandfathering option protects current investments and jobs in the EU biofuel sector as long as necessary while providing an incentive for the sector to steer towards low-ILUC risk production in order to safeguard the policy objective to reduce GHG emissions compared to fossil fuels. The report outlines different grandfathering options and analyses them, including their interaction with various possible policy options. The report starts with an overview of the current EU biofuel sector (Chapter 2). This overview is used in chapter 3 to assess the expected impacts of four different grandfathering options on biofuel feedstock production, feedstock processing and biofuel production after having described five different grandfathering options. Also, the interaction between grandfathering options and three possible ILUC policy measures is discussed. Finally, Chapter 4 concludes with general observations and recommendations. The figure below shows the set-up of this report.

This report does not aim to highlight a preferred ILUC policy option. The introduction of policy measure(s) and related grandfathering will be the result of a political decision by the European Parliament and Council following a Commission proposal.

1.3 Assumptions when assessing grandfathering options

The analysis performed in this report starts with the following assumptions:

- The EU ILUC policy will cover biofuels as well as bioliquids, the term 'biofuels' in this report can be understood to mean 'biofuels and bioliquids'.
- We assume an ILUC policy option to take effect early 2014[5], this means the grandfathering options will take effect in early 2014 as well;
- In this report, the term low-ILUC risk biofuels is understood to mean biofuels that are produced with a low risk of causing ILUC. Examples of such biofuels[6] include:

[5] Assuming publication of a legislative proposal in early 2012, adoption by European Parliament and Council by end 2012, followed by publication in the Official Journal and a transposition period for Member States.
[6] A methodology for Low-ILUC risk biofuel production at project level is provided in the field testing version of the Certicfication Module for Low Indirect Impact Biofuel production, available on the RSB-website: http://rsb.epfl.ch/files/content/sites/rsb2/files/Biofuels/Working%20Groups/II%20EG/Low%20Indirect%20Impact%20Biofuels%20Certification%20Module%20-%20Field%20testing%20version%20-%20July%202011.pdf

- biofuels from wastes/residues included on a positive list for low-ILUC risk;
- biofuels produced additionally from yield increase above Business As Usual yield development;
- biofuels produced on land that has become available by integrating biofuel cropping systems with more intensive lifestock herding biofuels produced additionally from integration of biofuel crop with lifestock herding;
- biofuels produced degraded or on unused lands.[7]

The draft version of the European Commission Impact Assessment on ILUC includes most of these practices under section 4.4.2 'project level solutions'.

[7] Meaning land with no provisioning services being used.

2 Overview of the EU biofuel sector

2.1 How large is the EU biodiesel and bioethanol production capacity and actual production?

Answer

In 2009, the EU member states produced a total of 7.44 Mtoe of biodiesel and 1.87 Mtoe of bioethanol. In the same year, the installed capacity was 18.61 Mtoe for biodiesel, and 2.92 Mtoe for bioethanol. This means that on average the production capacity is only used around 40% for biodiesel and 64% for bioethanol.

Table 1 provides a historic overview of biodiesel and bioethanol production and installed capacity in the EU from 2005 to 2009. It shows that only a small part of the capacity is actually in use, whereby the installed capacity for biodiesel is the most underutilised.

Table 2 shows how the capacity for biodiesel is distributed over the EU Member States in 2011, as well as the actual biodiesel production in the different EU Member States in 2010.

Table 1. Production of biofuels in the EU compared to the production capacity (both in Mtoe) (Source: EBB, 2011; ePURE, 2010)

	Capacity	Actual Production	Capacity Utilisation
Biodiesel			
2005	3.76	1.63	43%
2006	5.40	2.46	46%
2007	9.16	3.85	42%
2008	14.24	5.67	40%
2009	18.61	7.44	40%
Bioethanol			
2005	0.92	0.55	60%
2006	1.43	0.84	59%
2007	1.98	1.10	56%
2008	2.75	1.54	56%
2009	2.92	1.87	64%

Table 2 Biodiesel capacity and actual production per EU Member State in 2010 (Source: EBB, 2011)

Member State	Biodiesel capacity in 2010 (1,000 tonnes)	Biodiesel actual production in 2010 (1,000 tonnes)	Capacity utilisation
Austria	560	289	52%
Belgium	670	435	65%
Bulgaria	425	30	7%
Cyprus	20	6	30%
Czech Republic	427	181	42%
Denmark	250	246	98%
Estonia	135	3	2%
Finland	340	288	85%
France	2,505	1,910	76%
Germany	4,933	2,861	58%
Greece	662	33	5%
Hungary	158	149	94%
Ireland	76	28	37%
Italy	2,375	706	30%
Latvia	156	43	28%
Lithuania	147	85	58%
Luxemburg	0	0	-
Malta	5	0	-
The Netherlands	1,328	368	28%
Poland	710	370	52%
Portugal	468	289	62%
Romania	307	70	23%
Slovakia	156	88	56%
Slovenia	105	22	21%
Spain	4,100	925	23%
Sweden	277	246	89%
UK	609	145	24%
Total	**21,904**	**9,816**	**45%**

Total EU biodiesel capacity rose to 22.1Mtonne in 2011.[8]

[8] European Biodiesel Board statistics: http://www.ebb-eu.org/stats.php#

How much additional capacity can we expect in the coming years?

Data on planned capacity is scarce and unreliable, as plans that exist today, may be scrapped tomorrow and companies may not want to make their plans public. Several sources provide overviews of plants in the planning, but these should not be considered as exhaustive, for the above-mentioned reasons.

Table 3 provides an overview of planned capacity to be built for ethanol production in the EU according to data from ePURE (the European bioethanol industry association). As of 1st of Dec 2011, Alternative Energy eTrack lists number of plants in operation, planned and suspended. An overview is given in Table 4 below.

Table 3 Ethanol capacity under development in the EU (Source: ePURE, 2011)

Member State	Company	Capacity (Mln Litres)
Bulgaria	Crystal Chemicals	13
Germany	ESP Chemies Gmbh	140
	Süd Chemie (Straubing)	1.3
Hungary	Pannonia Ethanol (Dunaföldvar)	240
Italy	Mossi & Ghisolfi Group (Crescentino)	50
Lithuania	Bioetan	100
UK	Vivergo (Hull)	420
Total		**964.3**

Table 4 Summary of biodiesel and bioethanol plants in Europe (Source: Alternative Energy eTrack, 2011)

	Biodiesel		Bioethanol	
	# of plants	Combined capacity (billions litres/year)	# of plants	Combined capacity (billions litres/year)
Active	189	22.4	59	6.6
Planned	32	5.6	34	5.6
Suspended[1]	25 (17 in DE)	1.4	3	0.75

1 – Suspended plants were built between 2002-2008 and later abandoned.

Why is there such a large overcapacity?

Some overcapacity is normal and needed to allow for (seasonal) variations in demand and supply. However, from the numbers above it is clear that there is a structural overcapacity in the EU. All Member States have to comply with the 2020 targets for 10% renewable energy in transport, according to the RED. Member States are free in choosing the measures to reach that target, and especially the pathways leading to it (e.g. intermediate targets). Although the 2020 targets haven't changed, the intermediate targets have been reduced in some Member States (e.g. Germany plays a significant part) as a result of concerns over the sustainability of biofuels. As biofuels are in general still more expensive than their fossil reference, production will match demand created by the targets. As the demand on the short term has been lower than expected by biofuels manufacturers over the last few years much capacity remains unused. Biofuel mandates form a guaranteed minimum level of demand which determines the capacity utilisation rate. However, in Member States which have no biofuel mandate or which have a buy-out option[9], low capacity utilisation is also caused by high feedstock prices, since fuel suppliers will choose to pay the buy-out rather than supplying more expensive biofuels.

2.2 How large is the expected EU biofuel consumption at the end of 2017?

Answer

Biodiesel consumption is expected to be 17.3 Mtoe and bioethanol 5.9 Mtoe during 2017, according to the national renewable energy plans of the member states (NREAPs).

In order to comply with the Renewable Energy Directive, each member state had to supply national renewable energy action plans (NREAPs). Figure 4 shows the expected growth in demand for biofuels up to 2020, according to these plans. Table 5 and Table 6 show the detailed projections per member state of biofuel consumption according to these NREAPs.

[9] The option for fuel suppliers to pay a certain fee per litre of fuel as an anternative to supplying biofuels to fulfill the biofuel mandate. The UK RTFO contains a buy-out option.

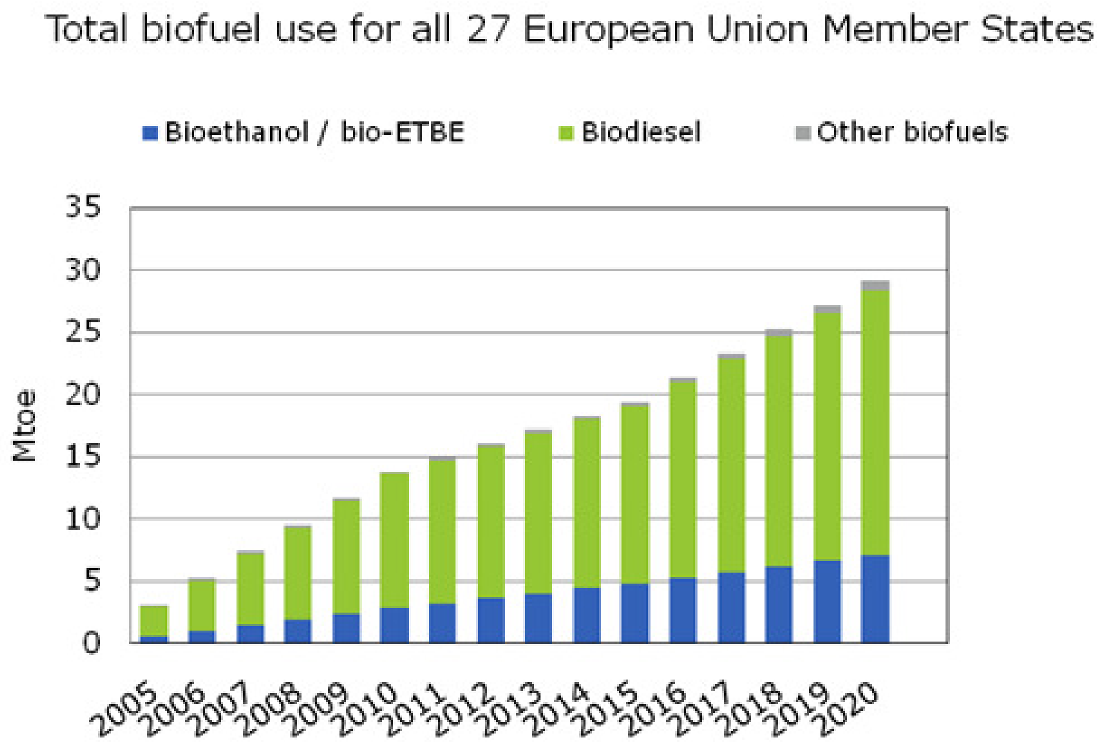

Figure 4. Projected biofuel demand in the EU up to 2020 according to National Renewable Energy Action Plans (Source: Ecofys, 2011 based on: ECN, 2010)

Table 5 Projected total bioethanol/ETBE in renewable transport [ktoe] for the period 2005-2020 according to NREAPs (Source: ECN, 2010)

	2005	2010	2015	2020	2020
	[ktoe]	[ktoe]	[ktoe]	[ktoe]	[%]
Belgium	0	37	47	91	1.2%
Bulgaria	0	0	19	60	0.8%
Czech Republic	0	50	91	128	1.8%
Denmark	0	13	95	94	1.3%
Germany	144	639	996	857	11.7%
Estonia	0	0	14	38	0.5%
Ireland	0	40	90	139	1.9%
Greece	n.a.	43	256	414	5.7%
Spain	113	232	301	400	5.5%
France	75	550	550	650	8.9%
Italy	0	148	374	600	8.2%
Cyprus	0	0	3	15	0.2%
Latvia	0	14	19	18	0.2%
Lithuania	1	13	30	36	0.5%
Luxembourg	0	5	9	23	0.3%
Hungary	5	34	106	304	4.2%
Malta	n.a.	2	4	6	0.1%
Netherlands	0	168	217	282	3.9%
Austria	0	54	61	80	1.1%
Poland	28	279	334	451	6.2%
Portugal	0	0	24	27	0.4%
Romania	n.a.	75	121	163	2.2%
Slovenia	0	4	8	19	0.3%
Slovakia	0	15	30	75	1.0%
Finland	0	70	120	130	1.8%
Sweden	144	251	358	465	6.4%
United Kingdom	18	135	692	1743	23.9%
All Member States (Total)	528	2871	**4968**	**7307**	100.0%

Assuming a linear increase in consumption from 2015 to 2020, for all member states these plans translate into a combined consumption of **5.9 Mtoe of bioethanol/ETBE in 2017.**

Table 6 Projected total biodiesel in renewable transport [ktoe] for the period 2005-2020 according to NREAPs (Source: ECN, 2010)

	2005	2010	2015	2020	2020
	[ktoe]	[ktoe]	[ktoe]	[ktoe]	[%]
Belgium	0	292	449	698	3.2%
Bulgaria	0	33	140	220	1.0%
Czech Republic	3	193	347	495	2.3%
Denmark	0	18	152	167	0.8%
Germany	1598	2790	2074	4443	20.5%
Estonia	0	1	21	51	0.2%
Ireland	1	94	209	342	1.6%
Greece	1	64	130	203	0.9%
Spain	145	1471	2169	3100	14.3%
France	328	2165	2375	2850	13.2%
Italy	179	868	1374	1880	8.7%
Cyprus	0	16	20	23	0.1%
Latvia	3	25	20	28	0.1%
Lithuania	3	42	79	131	0.6%
Luxembourg	1	37	72	193	0.9%
Hungary	0	110	144	202	0.9%
Malta	n.a.	1	1	7	0.0%
Netherlands	0	139	350	552	2.5%
Austria	35	276	309	410	1.9%
Poland	15	687	993	1451	6.7%
Portugal	0	281	405	450	2.1%
Romania	n.a.	149	242	326	1.5%
Slovenia	0	37	72	174	0.8%
Slovakia	0	67	107	110	0.5%
Finland	0	150	300	430	2.0%
Sweden	9	89	170	251	1.2%
United Kingdom	57	861	1818	2462	11.4%
All Members States (total)	2378	10956	14542	21649	100.0%

Assuming a linear increase in consumption from 2015 to 2020, for all member states these plans translate into combined consumption of **17.3 Mtoe of biodiesel in 2017.**

In addition to bioethanol/ETBE and biodiesel a small quantity of 'other biofuels' is foreseen to be consumed. In **2017 0.5 Mtoe of 'other biofuels'** is foreseen to be consumed while in **2020 0.8 Mtoe 'other biofuels'** use is foreseen.

2.3 How expensive are average biofuel installations and what are the payback times?

Answer

Typical costs for a biodiesel plant ranges from 20M to 30M Euro for a 50 ktonne installation (output). Ethanol plant costs are much higher, and range from 17M to 23M Euro for a 30 ktonne ethanol plant (output). In both cases, typical payback periods range between 5-10 years. The payback period is mostly influenced by the costs of the feedstock and market price of the products.

In order to assess the costs of biofuel production facilities, we distinguish investments in different parts of the production process of biofuels.

Vegetable oil to biodiesel:

Two process steps are normally considered to produce biodiesel:

1. Oil extraction, performed by a crusher, producing virgin oils and
2. Transesterification[10] of virgin oils from oil seeds – consisting of a two-step process.

In case biodiesel is produced from wastes/residues the following step takes place (after on-site purification of feedstocks):

1. Transesterification of oils and fats for biodiesel production from residue (low quality) feedstocks.

Sugar and starch to ethanol:

Production of ethanol from sugar and starch comprises two major process steps:

1. Production (milling/crushing[11]) of sugar holding plants like beet and cane and
2. Fermentation of sugar to ethanol and distillation.

Table 7 shows an overview of costs, scale and performance of the technologies required for the process steps mentioned above.

[10] Transestrification is the chemical process of converting virgin oils into biodiesel. An alcohol (often methanol) reacts with the triglyceride oils contained within virgin oils; this reaction is triggered by a base cathalyst (e.g. sodium hydroxide). The product from this reaction is biodiesel with glycerine as residue.

[11] Production of sugar from sugar crops (e.g. sugar beet) involves crushing, and extraction of the sugar. Production of sugar from starch crops (e.g. wheat) involves milling of the grains to obtain the starchy material, dilution and heating to dissolve the starch and conversion of the starch to sugars by hydrolysis.

Table 7 Investment data for (first-generation) biofuel plants (Adapted from: De Wit, 2011)

	Technology	Unit	Value
Biodiesel	**Oil Extraction (crusher)**[1]		
	Scale	Ktonne$_{outnput}$/year	500
	Investment costs	€	51.2 Mln
	O&M costs[4]	€ / tonne$_{output}$	26.61
	Yield of product	Tonne$_{fuel}$/ tonne$_{input}$	0.39
	By-product (oilseed cake)	Tonne$_{by\text{-}product}$/ tonne$_{input}$	0.59
	Transesterification[2] **(biodiesel production from oil seeds)**		
	Scale	Ktonne$_{output}$/year	100
	Investment costs	€	20 Mln
	O&M costs[4]	€ / tonne$_{output}$	80.60
	Yield of product[3]	Tonne$_{fuel}$/ tonne$_{input}$	1
	By-product (glycerine 80%)	Tonne$_{by\text{-}product}$/ tonne$_{input}$	0.11
	Transesterification[2] **(biodiesel production from used oil/fats)**		
	Scale	Ktonne$_{output}$/year	50
	Investment costs	€	15 Mln
	O&M costs[4]	€ / tonne$_{output}$	88.66
	Yield of product	Tonne$_{fuel}$/ tonne$_{input}$	1
	By-product (glycerine 80%)	Tonne$_{by\text{-}product}$/ tonne$_{input}$	0.10
Bioethanol	**Ethanol from sugars (eg sugar cane)**		
	Scale	Ktonne$_{output}$/year	29
	Investment costs	€	16.3 Mln
	O&M costs[4]	€ / tonne$_{output}$	232
	Yield of product	Tonne$_{fuel}$/ tonne$_{input}$	0.29
	By-product (sugar pulp & vinasses)	Tonne$_{by\text{-}product}$/ tonne$_{input}$	0.31 & 0.12
	Ethanol from starch (eg wheat)		
	Scale	Ktonne$_{output}$/year	35
	Investment costs	€	26.4 Mln
	O&M costs	€ tonne$_{output}$	263
	Yield of product	Tonne$_{fuel}$/ tonne$_{input}$	0.35
	By-product (stillage)	Tonne$_{by\text{-}product}$/ tonne$_{input}$	0.28

1– The oil extraction step is required for all biodiesel production from virgin oils. For biodiesel from used oils or fats, this step is not required.
2– Transesterification costs are lower for virgin plant oils than for facilities that can process lower quality feedstocks like used oils and fats or residual oils. Upgrades are also possible.
3 – Main input is virgin oil, but methanol is also added.
4 – O&M (Operation and Maintenance) costs exclude feedstock costs.

Data on investment and operation costs for *biodiesel* plants are based on interviews with technology providers and various sources quoted by De Wit (2011). Sources quoted by De Wit (2011) include Schope and Britschkat (2002) and Korbitz et al. (2004). The data for investment and operation costs for conventional *bioethanol* production, from sugar and starch crops, is based on various sources quoted by De Wit (2011), mainly F.O. Licht (2004) and Mortimer et al. (2004).

What are the investment costs of biodiesel plants?

Costs for biofuel production installations vary significantly, depending mostly on scale and feedstock type, and therefore on technology used. As an indication, a typical turnkey biodiesel plant with a production capacity of 50,000 tonnes of biodiesel per year will cost between 20 and 30 million euro. The lower end will cover the costs of a single-feedstock plant, designed to work with relatively high quality vegetable oils (pure rapeseed, sunflower or palm oil) and the higher end will deliver a multi-feedstock plant capable of converting lower quality, residual oils like used cooking oils, animal fats, and other by-products from palm oil processing like palm sludge oils, palm fatty acid distillates (PFAD) etc. In order to handle these lower quality feedstocks, more sophisticated production facilities are needed, which drives up capital costs, but allows for lower feedstock costs. Most biodiesel plants being built in recent years are multifeedstock plants capable of handling residual oils.

Furthermore, local building codes and health & safety legislation can drive up prices in certain countries, for example in the UK.[12]

What is an expected payback period for a biodiesel plant?

The operational margins of a biofuel plant are mainly driven by the feedstock prices. The annual costs of a typical biodiesel plant consist for 90% of feedstock costs and 10% capital and maintenance costs. The costs and availability of feedstocks are the main parameters determining the economic feasibility of an installation. This explains why biodiesel plants are easily shelved when feedstock prices are high. This means that feedstock costs, in addition to capacity utilisation, and to a much lesser extent capital costs are the main factors that determines payback times. Typically, the payback time of a typical biodiesel installation ranges from 5-10 years.[13]

What are the investment costs of bioethanol plants?

Capital costs of bioethanol plants are typically higher than of biodiesel plants, while ethanol feedstock costs are relatively lower compared to biodiesel feedstocks. Costs for a bioethanol plant with a production capacity of 30,000 tonnes of ethanol per year range between 17 and 23 million euro, with starch-based plants being more expensive than sugar-based plants.

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[12] Personal communications with biodiesel technology provider and Ecofys expertise

[13] Personal communications with biodiesel technology provider. In some occasions payback times have been shorter, e.g. in Germany the average pay back time in 2006 was estimated to be 3-5 years, mainly due to government tax exemptions. On the other hand, in some occasions plants have been abandoned due to overcapacity before capital costs have been paid back.

What is an expected payback period for a bioethanol plant?
Some 70 to 80% of annual costs of a typical bioethanol plant consist of feedstock costs. This makes feedstock prices a very important driver of the payback time, in addition to the capacity utilisation rate and capital costs. The payback time of a typical bioethanol installation should probably range from 5-10 years[14], where the main factors determining payback are market price of ethanol, capital costs, interest paid on capital and feedstock costs. Willingness of lenders to invest, and expected returns depend greatly on the ability of the plant to close suppliers contracts, local economic and political stability and length of government subsidies and loan guarantees, which are typically below 8 years.[15]

2.4 Where do biofuel suppliers source their feedstocks from?

Answer

The main feedstocks used for biodiesel sold on EU markets are rapeseed oil, soybean oil and palm oil. For bioethanol, the main feedstocks are sugarcane (for imported ethanol), sugar beet, wheat and maize.

There are two ways of looking at feedstock types and origins. First, one can look at the types and quantities of feedstocks used for producing biofuels in the EU, for which part of the feedstocks are imported. This gives useful information about the EU biofuel production capacity, but not on the ultimate impact of EU biofuels consumption. The second way is to look at the origin of feedstocks used for all biofuels sold on EU markets. This includes both feedstocks used for biofuel production in the EU, but also feedstocks used for biofuels produced in third countries and imported into the EU. Table 8 shows a summary for the ultimate feedstock origins of the biofuels sold on the EU market in 2008 (second way described above). It also shows the respective (direct) GHG footprint.

[14] Ecofys expert opinion
[15] Personal communications with commercial bank and ecofys expertise

Table 8. Production data and direct GHG emissions[16] of biofuels supplied to the EU market in 2008, disaggregated by feedstock type and country of origin (Source: Ecofys, 2011)

Feedstock	Country of origin	Biofuel supplied to EU market in 2008 (ktonne)	% of total biofuel supplied to EU market in 2008	Typical GHG emission of fuel (g_{CO2e}/MJ_{fuel})[17]	Weighted[1] typical GHG contribution (g_{CO2e}/MJ_{fuel})
		Biodiesel			
Rapeseed	EU	3633	34,8%	46	16,01
	USA	14	0,1%	46	0,06
	Others	549	5,3%	46	2,42
Soybeans	Argentina	267	2,6%	50	1,28
	USA	593	5,7%	50	2,84
	Brazil	384	3,7%	50	1,84
	Others	182	1,7%	50	0,87
Palm Oil	Indonesia	670	6,4%	43	2,76
	Malaysia	434	4,2%	43	1,79
	Others	17	0,2%	43	0,07
Sunflower seeds	All	139	1,3%	35	0,47
Waste oils	EU	502	4,8%	10	0,48
	USA	149	1,4%	13	0,19
	Others	11	0,1%	13	0,01
		Ethanol			
Wheat	EU	592	5,7%	44	2,47
	Others	13	0,1%	44	0,05
Maize	EU	329	3,2%	37	1,17
	Others	32	0,3%	51	0,16
Barley	EU	31	0,3%	64	0,19
Other grains	EU	92	0,9%	64	0,56
Sugar beet	EU	679	6,5%	33	2,15
Sugar cane	Brazil	459	4,4%	24	1,06
	Pakistan	53	0,5%	24	0,12
	Bolivia	30	0,3%	24	0,07
	Others	111	1,1%	24	0,25
Residues	All	235	2,3%	11	0,25
Other	All	237	2,3%	11	0,25
	Total	10.436	100%		

[16] Not including emissions from land use change
[17] RED typical GHG emission values were used and adjusted where it was clear that their use was not appropriate, e.g. the value for waste oils from the US was raised to 13 grams to take shipping emissions into account. New default values were calculated for feedstocks not included in the RED, such as barley.

1- Weighted emissions show the share of GHG emissions the biofuel/feedstock combination represents over total emissions, so a fuel with higher consumption has a higher impact.

What feedstocks were used for biodiesel sold on EU markets in 2008?

Figure 2 and Table 9 show an analysis of feedstock used for biodiesel consumed in the EU in 2008. The international trade in rapeseed (oil) is limited and most of the rapeseed used for biodiesel production in the EU actually stems from the EU (3.2 Mtoe of a total 3.7 Mtoe biodiesel equivalent). The remaining amount stems mainly from Ukraine (252 ktoe biodiesel equivalent) and Canada (121 ktoe biodiesel equivalent).

As expected, the palm oil used for EU biodiesel production (666 ktoe biodiesel equivalent) largely stems from Indonesia (459 ktoe biodiesel equivalent) and Malaysia (379 ktoe). This comes on top of the palm oil biodiesel that was produced in these countries and that found its way to EU consumption (respectively 165 and 35 ktoe biodiesel equivalent).

Similarly, of the 691 ktoe biodiesel produced from soybean (oil) in the EU, only some 82 ktoe was produced from EU soybeans. EU soybean based biodiesel especially stems from soybeans from the USA (528 ktoe biodiesel equivalent), Brazil (342 ktoe) and Argentina (238 ktoe).

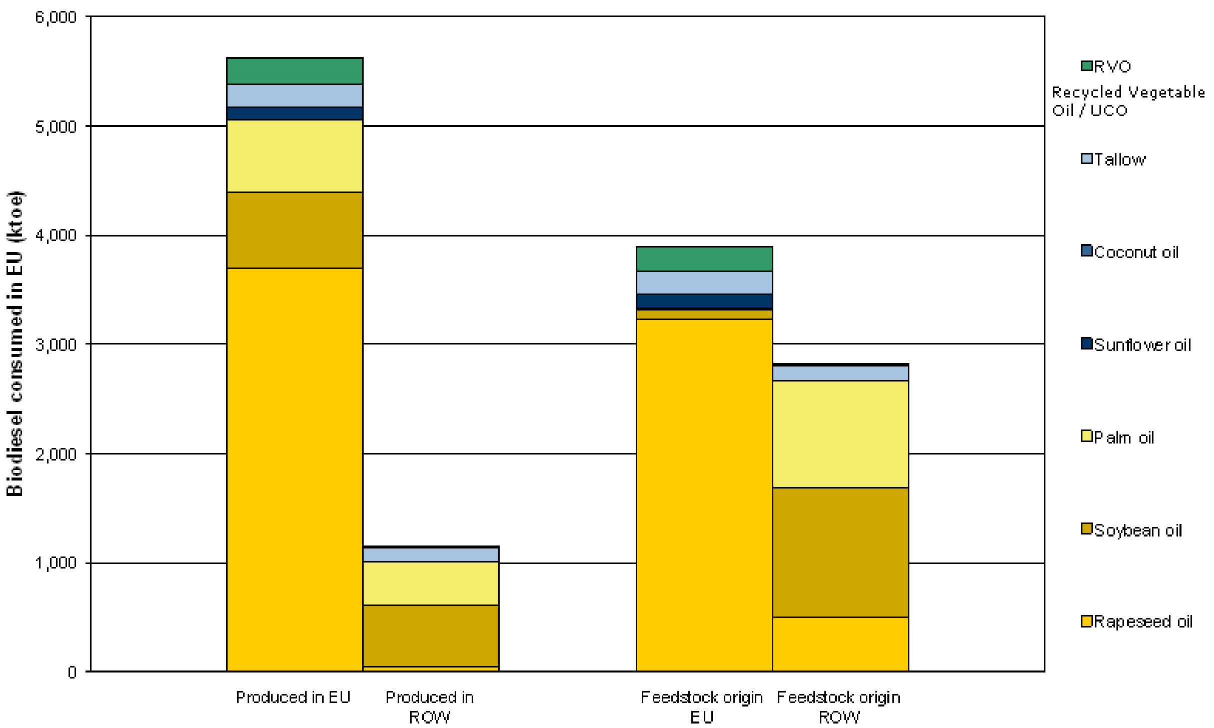

Figure 2 Analysis of feedstock used for biodiesel consumed in the EU in 2008. The left set of bars show the feedstock used for biodiesel *production* in the EU and in the Rest of the World (ROW), whereas the right set of bars shows the *ultimate origin* of these feedstocks. The graph shows that the EU produces most of its biodiesel in the EU, while a significant portion of the feedstock for that biodiesel is imported (i.e. soybean, palm oil and rapeseed) (Source: Ecofys, 2011)

Table 9. Ultimate origin of feedstock for biodiesel consumed in the EU in 2008. Expressed in volume of biodiesel (ktoe) (Source: Ecofys, 2011)

	Rapeseed oil	Soybean oil	Palm oil	Sunflower oil	Tallow	RVO	Total
EU	3,233	82	14[18]	124	212	235	**3,900**
Canada	122	18			4	6	**149**
Ukraine	252	10					**261**
USA	13	528			133		**673**
Argentina	4	238					**242**
Brazil		342					**343**
Indonesia			624				**624**
Malaysia			414				**414**
Other	111	52					**164**
Total	**3,734**	**1,269**	**1,053**	**124**	**348**	**241**	**6,770**

Table 7 shows that in 2008 58% of EU biodiesel consumption was produced from feedstocks produced in the EU while 42% of feedstocks originate from outside the EU.

What feedstocks were used for bioethanol sold on EU markets?

Table 10 shows what feedstocks were used for bioethanol produced in the EU and Table 11 shows the ultimate origin of the bioethanol feedstocks sold on the EU market. Figure 3 is a graphical representation of both sets of data.

The analysis of ethanol feedstock origin is less interesting than that for biodiesel, since the trade of maize and wheat to the EU is small in comparison with the EU production of these crops. In Figure 3, only a small amount of Argentinean and Brazilian maize becomes visible as ultimate feedstock for some 29 ktoe of EU consumed bioethanol. Furthermore, the location of the conversion is quite the same as the origin of the feedstock. The original feedstock for EU consumed bioethanol in 2008 stems from a broader range of countries, compared with biodiesel feedstocks.

[18] EU was not the ultimate origin for this feedstock, this quantity of palmoil is attibuted to come from the EU due to the methodology used, which tracked feedstock trade two import/export transactions back.

Table 10. Feedstock of bioethanol *produced* in EU Member States in 2008. For reference, 2007 and 2009 composition for the EU as a whole is presented at the bottom of the table (Source: Ecofys, 2011)

	Wheat	Maize	Barley	Rye	Triticale	Beet	Wine	Other[1]	Unknown[2]
Austria	53%	38%				9%			
Belgium	100%								
Bulgaria									
Cyprus									
Czech Republic	12%					88%			
Denmark									
Estonia									
Finland									
France	36%	16%				38%	10%		
Germany	21%	9%	5%	11%	2%	26%		4%	21%
Greece									
Hungary		36%				64%			
Ireland									
Italy						61%	39%		
Latvia	100%								
Lithuania	6%			47%	47%				
Luxembourg									
Malta									
Netherlands	100%								
Poland	33%	33%		33%					
Portugal									
Romania									
Slovakia		100%							
Slovenia									
Spain	20%	49%	9%				15%		8%
Sweden	15%		1%				2%	2%	80%
United Kingdom						100%			
EU 2008	**23%**	**18%**	**3%**	**5%**	**1%**	**25%**	**7%**	**1%**	**17%**
EU 2007	**30%**	**7%**	**7%**	**6%**	**1%**	**21%**	**7%**	**2%**	**19%**
EU 2009	**30%**	**23%**	**4%**	**5%**	**1%**	**32%**	**3%**	**1%**	
	Wheat	Maize	Barley	Rye	Triticale	Beet	Wine	Other[1]	Unknown[2]

1- Other sources for ethanol can be e.g. whey (Ireland), paper pulp (Sweden), brewery waste (Finland, Germany), or fruit waste (Germany).
2- In Germany, Spain and Sweden, part of the ethanol produced according to Eurostat statistics cannot be confirmed by industry data. It is likely that this part of the ethanol is not really produced in these countries; it may have been imported under trade codes that do not directly link to ethanol.

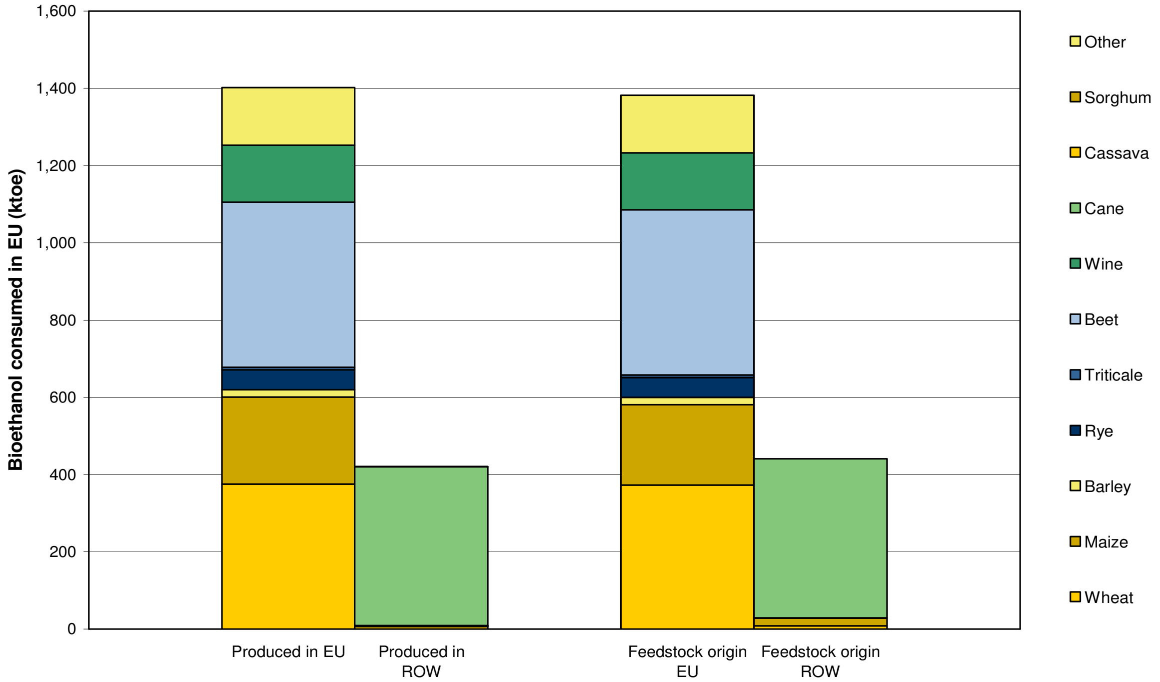

Figure 3. Analysis of feedstock used for bioethanol consumed in the EU in 2008. The left set of bars show the type of feedstock used for bioethanol *production* in the EU and in third countries, whereas the right set of bars shows the ultimate origin of these feedstock (Source: Ecofys, 2011)

Table 11. Ultimate origin of feedstock for bioethanol consumed in the EU in 2008. Expressed in volume of bioethanol (ktoe) (Source: Ecofys, 2011)[19]

	Wheat	Maize	Barley	Rye	Tritica-le	Sugar beet	Wine	Sugar cane	Other	Total
EU	373	207	20	51	7	427	148		149	**1,381**
USA	2									**3**
Norway	2									**2**
Ukraine	1	1								**3**
Argentina		12						5		**17**
Brazil		6						289		**296**
Pakistan								33		**33**
Bolivia								19		**19**
El Salvador								13		**13**
Peru								13		**13**
Egypt								14		**14**
Guatemala								11		**11**
Costa Rica								10		**10**
South Africa								2		**2**
Other	2							1		**4**
Total	**381**	**228**	**20**	**51**	**7**	**428**	**148**	**411**	**149**	**1,822**

Table 9 shows that in 2008 76% of EU bioethanol consumption was produced from feedstocks produced in the EU while 24% of feedstocks originate from outside the EU.

2.5 How flexible are EU farmers to possible changes in demand?

Answer

Around 4-5% of EU agricultural land was used for biofuel feedstock production in 2008. Biofuel crops are food crops and it is possible for farmers to revert to food crops or other cash crops should demand for biofuels be reduced. However, a possible decrease in demand for biofuel feedstocks will lead to a limited overall decrease in feedstock demand and might lead to a limited decrease in overall EU production.

The main steps in the biofuel supply chain are feedstock production, feedstock processing and biofuel production as well as transport steps. Farmers and plantations produce biofuel feedstocks, which are transported to processing installations. Biodiesel feedstocks are processed in crushing installations

[19] Note that some of the feedstock quantities in the table do not add up to the total figures given. This is due to the fact that certain feedstock volumes from various regions were close to but not exactly zero. The total figures are correct.

while processing method of ethanol feedstocks varies depending on the feedstock. Processed feedstocks are transported to biodiesel or bioethanol production installations to produce biofuels.

EU agricultural land used for biofuel feedstock production

Biofuel feedstocks are produced by farmers or plantations (outside the EU). Conventional biofuel feedstocks are crops which can also be used for food production and by-products are used for feed production.

The total gross land use associated with EU biofuel consumption in 2008 is estimated to be 7 Mha, of which 3.6 Mha in the EU and 3.3Mha in third countries (Ecofys 2011). These 7 Mha represent 4.4% of the total EU utilised agricultural area[20], which was over 159 Mha in 2010.

EU farmers can switch between food and fuel markets

Biofuel crops produced in the EU are almost always food crops. Also, EU farmers mainly produce short rotation crops which makes it much easier to shift between crops compared to for example from palm oil plantations. Farmers can switch from rapeseed to sunflower oil or other crops from one year to the next. The Common Agricultural Policy (CAP) has no influence on this flexibility. The CAP does restrict the conversion of pastureland to cropland[21], but pastureland is not used to produce biofuels. Although EU farmers are flexible to switch between food and fuel markets, a possible reduction of demand in certain feedstocks due to an EU ILUC policy will not lead to an increased demand for food products and will thus lead to an overall reduction in feedstock demand. However, as biofuel production only constitutes a relatively small share in total crop production, such an effect will be limited.

Individual farmers producing biofuel feedstocks generally have not invested in processing or production capacity. However, some cooperatives which are active in biofuel production are owned by farmers including large ethanol producers such as Tereos and Cristal Union[22] The majority of EU biofuel capacity is not owned by farmers and the majority of EU farmers have not invested in biofuel production capacity.[23]

What determines the economic feasibility of the production of a feedstock?

An important factor in determining the economic viability of biodiesel feedstock is the so-called 'oil share', which expresses the economic value of the oil that is extracted from an oil seed divided by the economic value of the meal. Note that this is different from the oil and meal yield, which represent the physical quantities extracted.

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[20] Utilised agricultural area (UAA) describes the area used for farming and includes arable land, permanent grassland, permanent crops. Source: Eurostat FSS.
[21] Personal communication with COPA-COGENA.
[22] Personal communication with COPA-COGENA, ecofys expertise. Both companies mentioned are cooperatives owned by farmers and active in bioethanol production amongst other activities.
[23] Ecofys expertise

For rapeseed, the oil share has increased from about 60% to about 80%. For soy, the oil share has also increased from about 35% to over 55% in the last few years, reflecting the increasing demand for biodiesel from these feedstocks. However, in many countries, production of biofuel feedstocks is not only driven by demand from biofuels, but also by agricultural subsidies.[24]

2.6 How flexible are processors and producers to possible changes in demand?

Feedstock processing - biodiesel

Biodiesel feedstocks are transported to crushing facilities. A distinction should be made between crushers processing soft oilseeds such as rapeseed and sunflower ('*soft crushers*') and crushers which process hard seeds such as soy ('*hard crushers*') which requires different equipment to crush seeds like soybeans.

Total EU oilseed crushing stood at 41.500 tonnes in 2010, 54% of which consisted of rapeseed crushing, 30% of soybeans and 13% of sunflower seeds and 3% other oilseeds.[25] The output of crushing facilities mainly goes to the food market and only a relatively small quantity is crushed for biofuels. Crushing of crude palm oil from fresh fruit bunches[26] takes place in Asia. Most crude palm oil is further processed Asia although some is exported to the EU where it is further processed.

Feedstock processors are flexible to switch between food and fuel markets, this is especially true for processors with good transport links, i.e. in port locations. A possible reduction of demand in biodiesel feedstocks due to an EU ILUC policy will however not lead to an increased demand for food products and might thus lead to an overall reduction in feedstock demand.

Feedstock processing - ethanol

Various ways of processing are used for different ethanol feedstocks. Sugarbeet is processed[27] in sugar processing installations that can produce sugar for both food use and ethanol production. Sugarcane ethanol is produced directly in sugar cane mills that produce both sugar and ethanol. Wheat and corn ethanol is produced directly in ethanol plants without separate processing step.

Biodiesel and ethanol production

Biodiesel feedstocks are transported from crushers to production installations where biodiesel is produced. Ethanol production more often takes place on-site with feedstock processing. EU biodiesel and bioethanol production installations are dedicated biofuel installations that cannot switch to other uses.

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[24] Personal communications with agro commodities trader
[25] FEDIOL statistics, available at: http://www.fediol.be/data/1318929878Stat%20seeds%20evolution.pdf
[26] FFB, the bunch of fruit harvested from the oil palm tree, weighing 10-50 kg containing many smaller individual fruits.
[27] Beets are sliced thinly and sugar is extracted by diffusing with hot water, after which further processing takes place.

3 Impact of ILUC policy on the EU biofuel sector

As mentioned in the introduction, grandfathering aims to protect investments in the biofuel sector by postponing the full effect of an ILUC policy measure. The grandfathering options described in section 4.1 either postpone or limit the full effect of an ILUC policy measure. Before analysing them in chapter 4 , this chapter assesses the extent to which various steps in the biofuel supply chain would need protection from an ILUC policy measure, building on the outlook of the EU biofuel sector provided in the previous chapter. While the current grandfathering clause is aimed to protect *investments* as stated in RED and FQD, it is equally important to analyse to what extent *jobs in the biofuel sector* need protection.

3.1 ILUC policy options

Various policy options are under discussion by the European Commission and all have a different impact on the biofuel sector. In this report the following three ILUC policy options are being used to analyse grandfathering options:

a) Raising the minimum required GHG-thresholds or bringing them forward in time (3 scenario's);[28]

b) Introducing crop-specific ILUC-factors in the biofuels GHG-balance with exemptions in the form of a factor of zero for low-ILUC risk biofuels;

c) Introduction of a subtarget for low-ILUC risk biofuels.

The first two ILUC policy options, (a) and (b), are included because they are most widely discussed in EU-context.[29] Policy option (c) has been proposed by the German government and is included in this report because this measure links directly to one of the grandfathering options assessed in this report. Using these three policy options to explain the functioning of grandfathering options does not mean one of them is regarded to be particularly desirable or necessarily effective in addressing ILUC.

3.1.1 Policy option A: raising/bringing forward the GHG-thresholds

With this policy option, The minimum required GHG emissions savings as laid down in RED article 17(2) and FQD article 7b(2)[2] would be raised or brought forward. The draft EC Impact Assessment assesses three options for raising of the GHG-threshold, in this report called options A1, A2 and A3:

- A1 does not raise the GHG-threshold but brings the 50% minimum required GHG-savings forward from 1-1-2017 to 1-1-2013, while keeping the existing 60% requirement for new installations.

[28] We assume the raising of the threshold to take effect in 2014 instead of 2013 as suggested in the Impact Assessment since adoption and implementation of the policy option prior to 2014 does not seem realistic.
[29] The European Commission also assesses country level solutions. These solutions fall outside the scope of this report since it does not lead to changes to the RED and FQD and a grandfathering clause to take effect.

- A2 raises the GHG-threshold to 45% for all producers and to 60% for new installations in 2013;
- A3 raises the GHG-threshold 45% for all producers and to 65% for new installations in 2013.

The raising and/or bringing forward of the GHG-threshold does not address indirect land use change but by requiring a better direct GHG-performance the chances are greater that the total of direct and indirect GHG-emissions will be lower compared to the fossil fuel comparator. The extent to which direct emission savings are required depend on the fossil comparator and the GHG default values:

- Raising the fossil fuel comparator from the current 83.8 grams CO_2eq/MJ to 90.3 grams CO_2eq/MJ as suggested in the draft European Commission's Impact Assessment equals a lowering of the thresholds with 8.4%;
- Lowering the direct GHG default emission values[30] decreases the need to achieve further direct emission savings.

In this report we assume an ILUC policy option to take effect on 1-1-2014. This means that the proposed all GHG-thresholds under B1, B2 and B3 are assumed to take effect in 2014. Following this, it can be assumed that 'new installations' as mentioned above are installations in operation from 1-1-2014 onwards.

Looking at the requirements in 2020, B1 and B2 do not lead to higher required GHG-savings while A3 requires 5% higher GHG-savings for new installations. The latter leads to better direct GHG-performance and less biofuels will be needed to meet the 2020 6% GHG-reduction target as laid down in the Fuel Quality Directive.

Impact of policy option on the EU biofuel sector

The impact on the sector depends on whether options A1, A2 and A3 is chosen and on the expected direct GHG-emission savings in 2020. Recent figures by COWI-JRC show that ethanol feedstocks are expected to reach direct typical GHG-savings of more than 60% if the fossil fuel comparator is raised to 90.3 grams CO_2eq/MJ. Direct emission savings of biodiesel feedstocks are also expected to increase. Biodiesel produced from sunflower palm oil are expected to be able to meet a threshold of 60%, but rapeseed and soy will have difficulties of still meeting the thresholds.[31]

These developments mean that a raising of the threshold to 60% or even 65% for all biofuels following options A2 and A3 respectively would lead to a situation where ethanol feedstocks would still meet the thresholds as well as biodiesel from sunflower and palm oil, while biodiesel from rapeseed and soy beans not meet the thresholds. In the case of soy, already the increase to 50% as laid down in the current RED and FQD would not be achievable. This means that rapeseed biodiesel production would be impacted by a (further) increase of the GHG-thresholds as an ILUC policy measure. Possibly a shift takes place from EU produced rapeseed biodiesel to EU produced sunflower biodiesel or palm oil biodiesel. Such a shift however would be limited since the JRC estimates

[30] the European Commission is expected to review RED Annex V and FQD Annex IV during 2012.
[31] COWI-JRC corrected coefficients, see: IFRPI 2011, p. 109

average rapeseed GHG-savings of 56% and with limited additional savings rapeseed producers can meet the raised thresholds. For example, Danish rapeseed biodiesel producers already achieve 69% direct GHG-savings.[32] No negative impacts for the EU ethanol sector are expected.

3.1.2 Policy option B: ILUC-factors with a waiver for low-ILUC risk-biofuels

Currently, the biofuel GHG lifecycle calculations in the RED and FQD directives only include *direct* GHG-emissions. An ILUC-factor is a quantity of grams CO_2/MJ added to the biofuel lifecycle GHG calculation that reflect GHG-emissions associated with land use change. This makes it more difficult for biofuel crops with high ILUC-risk to meet the required GHG-savings and would lead to a shift in the use of biofuels with relatively low indirect emissions. Each biofuel feedstock crop would get a different ILUC-factor. The draft European Commission's ILUC Impact Assessment uses a study by the Atlass consortium led by IFPRI to calculate the crop-specific ILUC-values. This modeling study, which is an update of a much debated 2010 study for the European Commission, calculates ethanol feedstock ILUC-values in a range of 7-14 grams and biodiesel feedstock ILUC values between 52-56 grams. Biodiesel is thus modeled to have considerably higher indirect GHG-emissions compared to ethanol feedstocks and biodiesel values are substantial compared to the fossil fuel comparator of 83.8grams CO_2/MJ. This means that a shift from biodiesel to bioethanol is expected. Such a shift is limited by the blend wall, the maximum quantity of ethanol that can be blended in fuels for conventional vehicles[33]

In this report, we assume that a possibility will be introduced to allocate an ILUC factor of zero if biofuels are produced with a low ILUC risk.[34]

Impact of policy option on the EU biofuel sector

As described above, the introduction of ILUC factors would lead to a limited shift from biodiesel to ethanol. This would make it more difficult for EU biodiesel producers to continue to supply biodiesel to the EU market. No negative impact for EU ethanol producers is expected.

3.1.3 Policy option C: Subtarget for low-ILUC risk biofuels

With this policy option, Member States are obliged to meet a certain percentage of the 2020 target for renewables in transport with biofuels produced with a low risk of ILUC.[35] Biofuels have a low ILUC risk if produced according to the ways mentioned in section 1.3. Biofuels not covered under the subtarget are being grandfathered. This policy option is not included in the draft European Commission's Impact Assessment on ILUC.

This policy option can only be combined with some form of grandfathering, simply because some biofuels which are not covered under the subtarget will be needed to meet the RED and FQD 2020 targets. These biofuels are automatically grandfathered. If for example the subtarget for low ILUC

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[32] UK-RFA figures:
http://webarchive.nationalarchives.gov.uk/20110407094507/http://www.renewablefuelsagency.gov.uk/yeartwo

[33] Without the need to invest in flexi-fuel technology which run on E85 (85% ethanol).

[34] See section 1.3 for examples of biofuels with low-ILUC risk

[35] See section 1.3 of this report for examples of low ILUC risk biofuels

risk biofuels would be set at 4.5% and a total of 9% biofuels is needed to meet the 2020 targets, 4.5% of 'conventional' biofuels would need to be grandfathered.

Impact of policy option on the EU biofuel sector

The impact of the introduction of a sub target for low ILUC risk biofuels depends to a large extent to the level of the subtarget. It will lead to a situation in which feedstock producers have to adopt to some extent low-ILUC risk production methods for part of the biofuel supply to the EU market, while (part of) the current production level can still be supplied to the EU market regardless of the ILUC risk. This affects both ethanol and biodiesel producers. Methods for low ILUC production can be applied equally to ethanol and biodiesel feedstocks, meaning that no shift from biodiesel to ethanol is expected. Also, low ILUC production can be applied within as well as outside the EU, so no shift from EU production to more imports is foreseen as a result of the policy option.

3.2 Overall impact of ILUC policy on the EU biofuel sector

The 2020 targets to achieve 10% renewables in transport and 6% GHG-reduction from fossil transport fuel use will not be affected by ILUC policy. This means that the EU 2020 demand for biofuels will not be affected by ILUC policy. The increase of overall EU biofuel consumption in the years up to 2020 is likely to lead to an overall increase of jobs in the EU biofuel sector. But this is the overall picture. As described above, EU ethanol production is not expected to be impacted by any of the ILUC policy options analysed in this report and is likely to experience growth in the coming years with associated job creation.[36]

The EU biodiesel sector however would meet challenges if ILUC-factors are introduced or possibly following a raising of the GHG-thresholds. As described above, the EU biodiesel industry as a whole is expected to face a decrease in demand if ILUC factors would be introduced. This effect would be stronger without the inclusion of a waiver for low-ILUC risk production which would enable EU biodiesel producers to obtain a factor of zero. A raising of the GHG-threshold is expected to not have a large impact on the sector as all feedstocks should be able to comply with the raised thresholds if additional direct GHG-savings are achieved. The introduction of a subtarget for low-ILUC risk biofuels would require an additional effort of all producers but would not lead to a shift from biodiesel to ethanol or a shift in overall EU biofuel production, provided that current EU biofuel production is exempted from the subtarget. In the next section, the level of protection for the EU biodiesel sector is analysed.

[36] Predictions are made that especially next-generation ethanol production 'could create up to a million man-years of employment in Europe between 2010 and 2020. These jobs will predominantly be in rural areas, and therefore difficult to outsource overseas', from: BNEF, Next-generation ethanol and biochemicals: what's in it for Europe? September 2010

3.3 Level of protection needed for the EU biodiesel sector

If ILUC-factors were to be introduced, the EU biodiesel sector would need some form of grandfathering. In order to determine the extent to which biodiesel production should be protected, a distinction should be made between impacts on investments and on jobs in feedstock production, processing and biodiesel production.

3.3.1 Protection for investments

Feedstock production

Section 2.5 shows that EU feedstock producers have sometimes invested in biofuel production capacity through co-operatives. Any protection required for production facilities will automatically protect these financial interests of farmers.

Feedstock crushing

Section 2.6 describes the fact that crushers can supply both the food and fuel markets and therefore enjoy a large extent of flexibility. Most EU crushing capacity is used for food uses but a decrease in biodiesel demand would not automatically lead to an increase in crushing for food markets and could lead to a limited overall slump in crushing activity. This slump might have a larger impact on inland crushers located close to biodiesel plants which they supply, compared to crushers located in port locations with good transport links which can more easily divert to food uses.

Biodiesel production

Biodiesel installations would need some protection against a potential slump in demand. As described in section 2.3, the average pay-back time for biodiesel production is 5 to 10 years. This means that if it is assumed that an EU ILUC policy takes effect from 2014 onwards, installations in operation by 2004 can be assumed to have been able to pay back investment costs. Biodiesel installations that became operational after 2004 may need protection through grandfathering. What share of current biodiesel installations would need protection? Table 2 in section 2.1 shows that in 2010 the EU biodiesel production capacity totalled 21.9 Mtonne. During 2011, this figure rose to 22.1 Mtonne. In July 2005 the EU-capacity excluding Romania and Bulgaria stood at 4.2 Mtonne.[37] This means that if a payback period of 8.5 year is assumed, some 17.9 Mtonne or around 80% of current biodiesel production capacity needs protection from grandfathering after an ILUC policy option takes effect in 2014. Of current biodiesel capacity, some 1.2 Mtonne would still need grandfathering after the end of 2017, or 5% of current biodiesel installations.[38]

3.3.2 Protection against job losses

Feedstock production

Section 2.5 shows that EU feedstock producers are flexible to shift between different feedstocks. Also, biofuel feedstocks are foodcrops so producers can shift between various end-uses. Although EU

[37] http://www.ebb-eu.org/stats.php# ; 2004 figures are only available for the EU-15. This is an estimate as real figure depends on the extent to which installations have been abandoned.
[38] Based on the EBB figure that in July 2009 the total EU biodiesel capacity stood at 20.9Mtonne, http://www.ebb-eu.org/stats.php#

farmers are flexible to switch between food and fuel markets, a possible reduction of demand in certain feedstocks due to an EU ILUC policy will not lead to an increased demand for food products and will thus lead to an overall reduction in feedstock demand. However, as biofuel production only constitutes a relatively small share in total crop production and overall global demand for food is rising, such an effect will be limited. This means that no specific protection of EU farming jobs is required.

Feedstock crushing

Crushers are capable of switching to crushing of oilseeds towards food production, which limits job losses. Crushers located in port locations with good transport links should be able to shift to crushing towards food uses. Inland crushers that are built in parallel with biodiesel plants have less flexibility to switch towards crushing oilseeds for food-uses. This might lead to some job losses and some need for grandfathering in parallel to biodiesel production installations.

Biodiesel production

Section 3.3.1 explains that in 2014 around 80% of current biodiesel installations would need protection against the introduction of ILUC-factors or raising of the GHG-targets, a figure that drops to 5% by the end of 2017, when the current grandfathering clause expires. This means that 95% of investments in current biodiesel installations are paid back at the end of 2017 when an ILUC policy option would take full effect under the current grandfathering clause and no further protection is needed afterwards. But while from an investment perspective closing down EU biodiesel production installations due to an ILUC policy measure, this could lead to job losses in the current biodiesel sector.

4 Grandfathering options assessment

In this chapter we will assess the grandfathering options listed in section 4.1. Grandfathering option 1 is the only option which would implement the current RED/FQD grandfathering clause in unchanged form, which is to grandfather all installations built until the end of 2013 until the end of 2017. All other options are either options to implement an amended version of the current grandfathering clause or options for extended grandfathering beyond 2017. From the information gathered in chapter 2 and the analysis in chapter 3 we will analyse to what grandfathering option would be best suited to protect current EU biofuel sector investments and jobs while not risking additional ILUC emissions.

4.1 Grandfathering options

The following grandfathering options are considered in this report:

1. **Grandfathering biofuel production capacity.** All biofuels supplied to the EU market per installation that is producing biofuels by the end of 2013 are grandfathered until the end of 2017. Installations are only eligible for grandfathering if their biofuels meet a minimum GHG-saving of 45%[39] and grandfathering is maximised to the installation production capacity level at the end of 2012;
2. **Grandfathering 50% of biofuel production capacity**. Similar to grandfathering option 1 but grandfathering is capped by 50% of installed capacity at the end of 2012, which roughly corresponds to current actual production levels;
3. **Grandfathering biofuel production land.** Grandfathering all biofuels produced on land that was in use for biofuel production to supply the EU market by the 1st of January 2008;
4. **A) Grandfathering 2010 EU biofuel consumption.** Combination of grandfathering option 1 followed by grandfathering (after 2017) of the 2010 EU Member State biofuel consumption as supplied to Member States per biofuel production installation in operation in 2010;
   B) Grandfathering 2010-2012 EU biofuel consumption. Similar to grandfathering option 4a but without grandfathering option 1 and grandfathering the average 2010-2012 EU Member State biofuel consumption as supplied to Member States per biofuel production installation in operation in 2010.

[39] The RED and FQD do not clarify whether the 45% refers to *direct* or to *direct plus indirect* GHG savings.

4.2 General observations concerning grandfathering

4.2.1 EU versus non EU biofuel production

All grandfathering options assessed in this report allow for the grandfathering of both EU and non-EU produced biofuels. Of all options assessed in this report, grandfathering option 3 contains relatively the most EU-produced biofuels since agricultural land is grandfathered and before 1-1-2008 most biofuels consumed in the EU were produced within the EU and biofuel imports and raw materials imports from outside the EU have increased since then.

4.2.2 Trading of grandfathering certificates

It would be interesting to offer biofuel production installations the possibility to trade grandfathered production capacity. This would enable installations eligible for grandfathering who terminate operations to sell their grandfathering rights to other biofuel production installations. Similar to the EU-ETS the total pool of grandfathering rights could be decreasing over time leading to a smooth phase-out of grandfathering. This trade would probably have to be organised at EU level to avoid a situation where 27 competing trading schemes are introduced. The trading system would have to be a worldwide trading system due to the worldwide scope of grandfathering. Under grandfathering option 1, 2 and 4 as described in more detail in section 4.3, all biofuel production installations worldwide which supply biofuels to the EU are (partly) grandfathered. This means that installations located in the very different parts in the world would have to be included in an EU grandfathering certificate trading scheme. In the cases of grandfathering options 1 and 2 which terminate in 2017 it might be relatively costly to set up a trading scheme that would be operational for just a few years. The relative costs of setting up a trading scheme would be lower if it would apply to grandfathering option 4 which continues also beyond 2017. The benefits and challenges related to trading grandfathering certificates deserve further exploration.

4.2.3 GHG abatement costs

In a recent paper by ICCT[40], the carbon abatement costs of biofuels are estimated, i.e. the costs to prevent the emission of 1 tonne GHG by using biofuels. The ICCT estimated default GHG abatement costs for biofuels by taking the assumed costs per MJ of biofuels compared to fossil fuels and assuming a default GHG-emission saving by biofuels of 50%. Using a cost estimate of the UK Department for Transport, ICCT assumes biofuel costs of €0.01/MJ compared to fossil fuels and calculates the carbon abatement costs of one tonne of GHG by using biofuels of €250 if only direct GHG-emissions are taken into account. Next, the ICCT calculates in its paper that without ILUC policy, biofuels have average GHG-savings of 5%; this would increase the average biofuel carbon abatement costs to €2500. According to the ICCT, the various ILUC policy measures under discussion lead to an average GHG-savings between 5% and 50% with corresponding GHG abatement costs. This exercise indicates that the more biofuels are grandfathered and thus exempted from ILUC policy measures, the higher the biofuel carbon abatement costs are.

[40] International Council for Clean Transportation, Indirect Land Use Change in Europe – considering the policy options (Washington, November 2011).

4.2.4 No grandfathering

The current RED and FQD directives contain a grandfathering clause. In theory it might be possible for the EU legislator to delete this grandfathering clause after the publication of a Commission proposal on ILUC. This would mean that the ILUC policy measure would take effect earlier and if an effective policy measure is introduced, no additional ILUC emissions associated with an increase in EU demand for biofuels will occur. However, not allowing any grandfathering might (depending on the policy option and its effectiveness) harm current investments and jobs in the EU biodiesel industry as described in sections 3.2 and 3.3.

4.3 Grandfathering option description

In this section we describe each grandfathering option and their background. Each description contains the following points:

1. General description and background;
2. Quantity of biofuels covered by grandfathering;
3. Types of investments that will be protected (production installation, processing installation etc.);
4. Ease of implementation by MS policy makers and verification;
5. Risk of allowing additional ILUC to occur after 31 December 2013, assuming an effective ILUC policy measure takes effect from 1-1-2014;[41]
6. Overall assessment: can the grandfathering option be combined with any of the possible ILUC policy analysed in this report and does the grandfathering option offer sufficient protection of current investments and jobs in the EU biofuel industry while avoiding the risk to additional ILUC emissions?

Grand fathering Option 1	All biofuels supplied onto the EU market per installation producing biofuels by the end 2013 are grandfathered until the end of 2017, provided a minimum GHG-saving of 45% is achieved. Grandfathering of eligible installations is capped to 2012 **capacity**.

1. General description and background

This is the grandfathering clause as included in RED and FQD.[42] In this clause the following is covered by grandfathering: the capacity of biofuels production installations used to produce biofuels for the EU market until the end of 2017. Only biofuels from installations producing biofuels by the end of 2013 are covered. Also, only biofuels with a total (direct) GHG-saving of at least 45% are covered by

[41] Whether or not additional ILUC takes place depends on the extent to which grandfathering takes place but also on which specific policy option is chosen. By increasing the GHG-thresholds for example, the risk of additional ILUC taking place is not effectively tackled since the measure only focuses on direct GHG emissions.
[42] Article 19, paragraph 6 of directive 2009/30/EC and article 7d, paragraph 6 of directive 98/70/EC as amended by directive 2009/28/EC. See also footnote 1.

this grandfathering option. Production installations can be eligible for grandfathering regardless whether they are located within or outside the EU. Grandfathering per production installation is maximised to the production capacity at the end of 2012.

2. Quantity of biofuels covered by grandfathering

The maximum grandfathering equals the total installed biofuel production capacity by end 2012 of installations producing biofuels by end 2013. This means that, following on EU biofuel capacity provided in section 2.1, more than 28 Mtonne of current EU biofuel capacity including 22Mtonne of biodiesel capacity is grandfathered.

In reality however, the total quantity of biofuels covered by grandfathering is lower and equals the sum of the annual quantity of biofuels consumed in the EU in the years 2014-2017 provided they achieve 45% GHG savings. Based on the aggregated NREAP trajectories 84 Mtoe of biofuels[43] is expected to be grandfathered during this four-year period as is shown in the figure below. This quantity has to be regarded as a high estimation because biofuels produced from installations built in 2014-2017 as well as biofuels consumed in 2014-2016[44] with a GHG-saving of 35-45% are excluded from grandfathering.

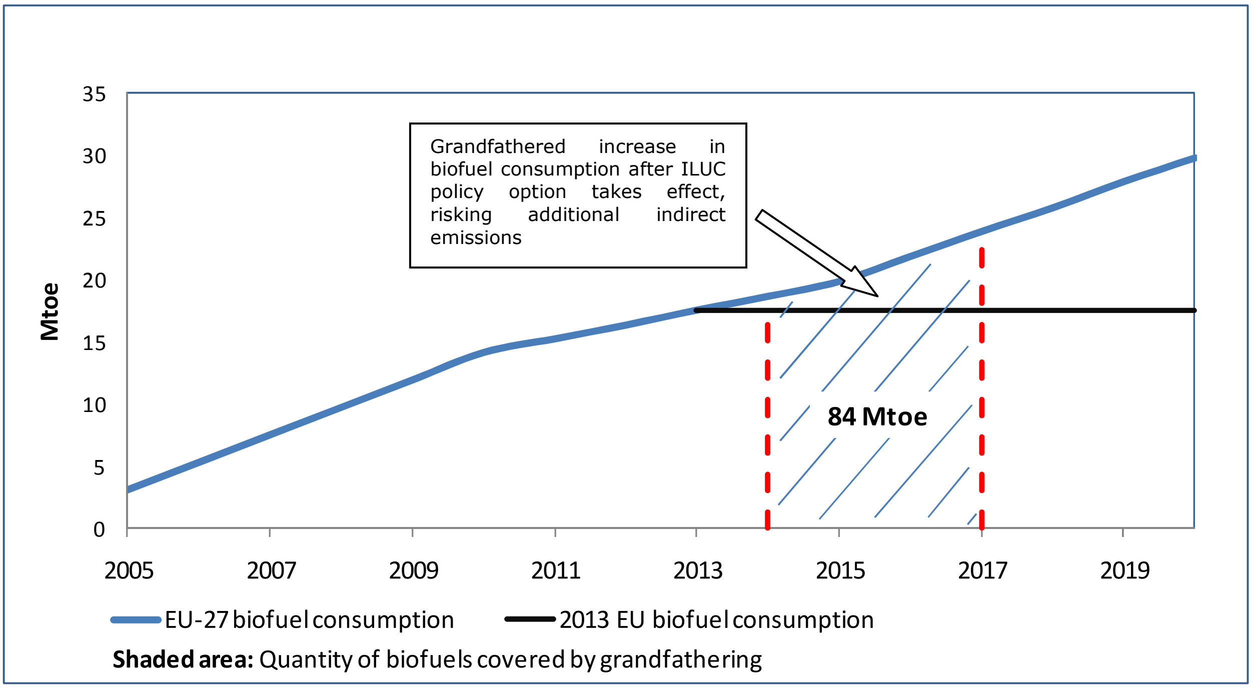

Figure 5 – Quantity of biofuels covered by grandfathering option 1

[43] 18.6 MTOE in 2014, 19.8 MTOE in 2015, 21.8 MTOE in 2016 and 23.8 MTOE in 2017

[44] In January 2017 the GHG-threshold is raised to 50%, meaning that during 2017 all biofuels consumed in the EU from existing installations are above 45% GHG-saving and are grandfathered.

3. Types of investments protected by grandfathering

Biofuel production installations that are in operation by end 2013 are protected until end of 2017, provided their biofuels meet a minimum GHG-saving of 45%;

- Biofuel production installations that come into operation between 2014-2017 are not covered by grandfathering;
- All processing installations supplying grandfathered production installations are also protected. Note that different from production installations, processing installations in operation after 2013 are also grandfathered.

4. Ease of implementation by MS policy makers and verification

In order to implement and ensure compliance with grandfathering option 1, Member States need to require economic operators to report the quantity of grandfathered biofuels. Fuel suppliers source their biofuels from various production installations, often on the basis of one-year contracts. With this grandfathering option they would have to ask their suppliers for a statement that their biofuels are grandfathered. The following additional information to travel through the supply chain:

- From 2014-2017: statement from biofuel producer that its installation has been producing biofuels before the end of 2013;
- In 2014-2016 statement that the biofuel meets a GHG-reduction of 45% instead of 35%. During the year 2017 a reduction of at least 50% is required, following the current RED/FQD;

In addition, verification of the claim above is needed in context of the overall independent audit. Grandfathering option 1 is relatively easy to implement and the additional information required would be relatively easy to verify for an independent auditor. We could imagine Member States authorities to publish lists of biofuel production capacities in operation by the end of 2013 which can be used by verifiers.

5. Risk of allowing additional ILUC to occur beyond 1-1-2014

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

Under grandfathering option 1, there is a large risk of additional ILUC being caused after the ILUC policy measure is assumed to take effect on the 1^{st} of January 2014 and the end of 2017. This risk stems from the fact that biofuel production *capacity* (capped at end 2012 capacity) rather than *production* is grandfathered and with current EU production capacity the entire EU 2020 target can be achieved. All increase in biofuel production for the EU market and associated ILUC is therefore grandfathered up to the end of 2017, meaning all additional ILUC caused by the EU demand for biofuels in the period 2014-2017 will not be addressed. The additional ILUC allowed to occur is shown in figure 5 as the shaded area between the 2013 EU biofuel consumption line and the 2014-2017 EU biofuel consumption line and equals 13 Mtoe of biofuels.

For illustration purposes, we will estimate the indirect emissions associated with this 13 Mtoe of biofuels in the period 2014-2017. The 13 Mtoe could be divided between 10.4 Mtoe biodiesel and 2.6 Mtoe ethanol if in 2020 the biodiesel versus ethanol mix would remain at its 2008 level of 80 versus 20% (see section 2.1). If it is assumed that 10% of biodiesel would come from wastes and residues with no ILUC, 9.4 Mtoe (393.56 PJ) of biodiesel and 2.6 Mtoe (108.86 PJ) of ethanol would be grandfathered beyond the EU 2013 biofuel consumption level and leading to additional ILUC. The IFPRI 2011 ILUC-values (see section 3.1) could be used to determine the indirect GHG-emissions associated with these quantities of biofuels, assuming 11 grams CO_2/MJ indirect emissions for ethanol feedstocks and 54 grams for biodiesel feedstocks.

Also, additional ILUC could take place if biofuel production installations start to use different feedstocks (e.g. due to market dynamics including price developments) with a higher risk of indirect emissions. On the other hand, installations could also shift to feedstocks with a lower risk of indirect emissions, leading to a decreased risk of additional ILUC taking place, although this does not seem likely without an ILUC policy option in place.[45]

A gradual phase-out of grandfathering option after 2017 would be possible, for example by restricting grandfathering to 75% of biofuels covered under grandfathering option 1 in 2018, 50% during 2019, 25% during 2020 and termination of grandfathering from 2021 onwards.

6. Overall assessment

The EU biodiesel industry potentially needs grandfathering to protect current investments and jobs. The preferred grandfathering option protects current investments and jobs as long as necessary without risking additional ILUC emissions after 1-1-2014 when an ILUC policy option is assumed to take effect.

Grandfathering option 1, the current RED and FQD grandfathering clause, could be combined with all three ILUC policy options analysed in section 3.1. It would effectively protect current investments in the biodiesel sector but might still allow for job losses after its termination by the end of 2017, since if biodiesel installations have to end operations this leads to job losses, even though the investment costs might already be earned back. The grandfathering option does lead to additional ILUC-emissions in the period 2014-2017 but if an effective ILUC policy option is introduced, no additional

[45] In addition, possible additional ILUC could be caused by phase-out of biofuels with 35-45% GHG saving, depending on what the effect will be, assuming the increase in biofuel quantity following the NREAP-trajectory is a given. Either (1): feedstocks previously used to produced biofuels with 35-45% GHG saving are now used in upgraded production installations and meet the 45% threshold. This does not lead to additional ILUC. Or (2): feedstocks previously used to produced biofuels with 35-45% GHG saving are no longer used for biofuel production. The phased-out biofuels are replaced by biofuels from other feedstock suppliers. This could lead to additional ILUC if the LUC associated with the new feedstock has higher LUC-emissions compared to the feedstocks that were previously used.

ILUC emissions take place between 2018-2020. In order to optimally protect jobs in the EU biodiesel sector, some form of extended grandfathering beyond 2017 is necessary. If grandfathering option 1 was to be extended until after 2017, this would lead to even more additional ILUC-emissions. In effect this means that an effective ILUC policy will be postponed and that all the target would be met with the existing biofuel capacity. For this reason (extended) grandfathering option 1 is suboptimal.

Grand fathering Option 2	50% of biofuel production **capacity** per installation producing biofuels by the end of 2013 is grandfathered until the end of 2017, provided a minimum GHG-saving of 45% is achieved. Grandfathering of eligible installations is capped to 50% of 2012 **capacity**.

1. General description and background

This grandfathering option is a variation on the current RED/FQD grandfathering clause. Covered by grandfathering is 50% of biofuel production capacity per installation until the end of 2017. Only biofuels from installations producing biofuels by the end of 2013 are covered. Also, only biofuels with a GHG-saving of at least 45% are covered by the grandfathering option. This grandfathering option results from the notion that, looking at the situation in the EU, by the end of 2010 roughly 50% of biofuel production capacity was used.[46] The idea behind option 2 is that grandfathering 50% of production capacity in effect grandfathers the entire 2010 EU biofuel consumption. Indirect Land Use Change that occurred in the past is thus grandfathered while future ILUC by increased EU biofuel consumption is subject to ILUC policy. As in option 1, production installations can be covered by grandfathering regardless whether they are located within the EU or in third countries.

2. Quantity of biofuels covered by grandfathering

50% of biofuel production installation capacity is grandfathered. As described above, the total quantity of grandfathered biofuels roughly equals the EU biofuel consumption in 2010. This would equal (based on aggregated NREAPs) 14.1 Mtoe of biofuels grandfathered annually (56.4 Mtoe over a four-year period), as is shown in figure 6 below.

An increase in capacity between 2010 and 2013 can lead to an increase in the quantity of biofuels covered by grandfathering under this option. On the other hand, several factors can lead to a higher or lower quantity of biofuels covered under this grandfathering option. The quantity of grandfathered biofuels can be <u>higher</u> than 56.4 Mtoe if:

- Capacity of biofuel production installations increases between 2010 and end 2012, which is likely to happen;

[46] See section 2.1, at the end of 2009 the capacity utilisation rate was 40% for EU biodiesel and 64% for EU bioethanol installations and the biodiesel to ethanol ration was 80/20%. This means that by end 2009 44.8% of EU biofuel production capacity was used. The utilisation rate increased in 2010 and we can assume a 50% average utilisation rate by the end of 2010.

- The capacity utilisation rate for EU biodiesel production was 40% in 2009 and increased to 45% in 2010 (9816 tonne production and 21.904 tonne capacity).[47] This means that 1314 additional tonnes of increased biodiesel production after 2010 can be grandfathered.

The quantity of grandfathered biofuels can be lower than 56.6 Mtoe if:

- Biofuels produced from installations built in 2014-2017 as well as biofuels consumed in 2014-2016[48] have a GHG-saving of 35-45%;

Not all ethanol production will be covered since the EU capacity utilisation rate for ethanol was 64% in 2009. This means that 22% (= 0.41 Mtoe) of 2009 EU ethanol production would not be grandfathered. Different from ethanol, EU biodiesel production installations generally have a capacity utilisation rate below 50% and therefore biodiesel production would benefit more from this grandfathering option than ethanol production. However, ethanol has according to the IFPRI study lower ILUC footprint and would largely be able to meet the GHG threshold even if ILUC factors are included (i.e. the impact on the sector from introducing ILUC would be limited).

It should be noted that the capacity utilisation rate of installations outside the EU which produce for the EU market can be different from the EU utilisation rates. Lower utilisation rates would give them a benefit over EU installations since there's more space for additional production before the 50% capacity grandfathering limit is reached. On the other hand, higher utilisation rates would mean that not all production would be covered under the grandfathering option. The effect of non-EU production installations is however rather limited since only around 16% of biofuels consumed in the EU in 2009 were produced outside the EU, as shown in section 2.3, figure 2.

[47] EBB figures

[48] In January 2017 the GHG-threshold is raised to 50%, meaning that during 2017 all biofuels consumed in the EU from existing installations are above 45% GHG-saving and are grandfathered.

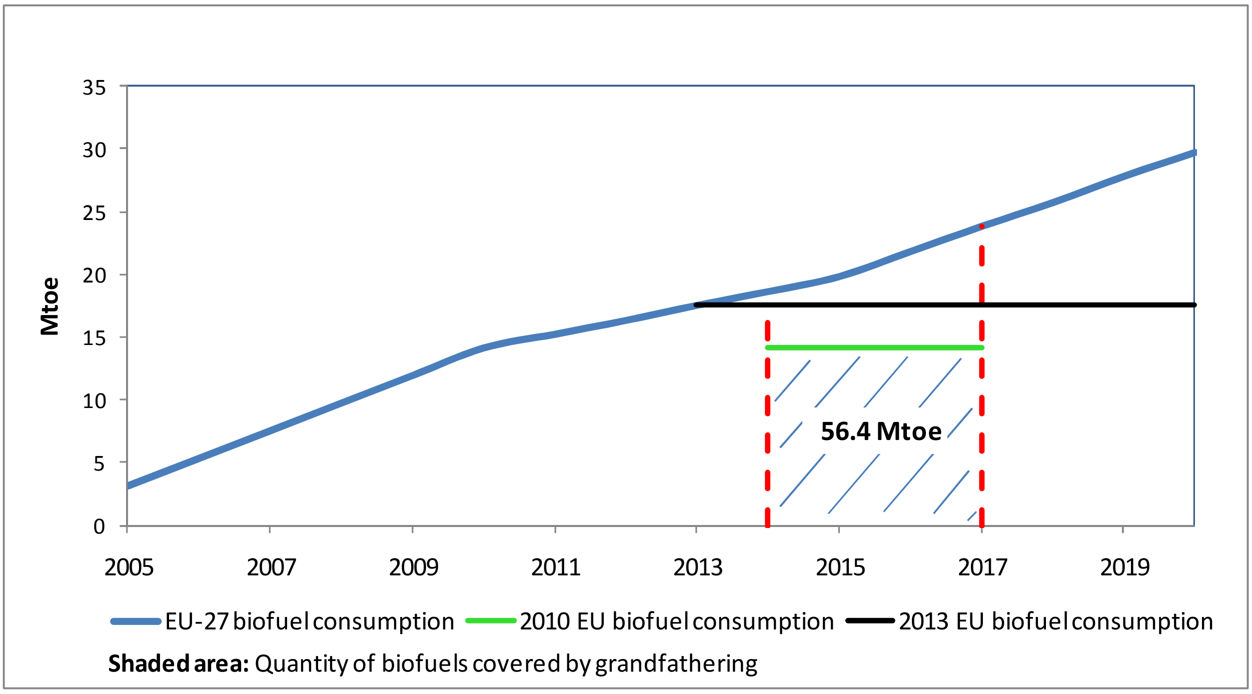

Figure 6 – Grandfathering option 2

3. Types of investments protected by grandfathering

- Biofuel production installations that are in operation by end 2012 are protected until end of 2017, provided their biofuels meet a minimum GHG-saving of 45%;
- Biofuel production installations that come into operation during 2013 are protected until end of 2017 with a GHG-threshold of 35%;[4]
- Biofuel production installations that come into operation between 2014-2017 are not covered by grandfathering;
- All processing installations supplying grandfathered production installations are indirectly also protected. Note that different from production installations, processing installations in operation after 2013 are also grandfathered. Given the structure of the market, where processing installations are mostly constructed in parallel to biofuel production installations, it is to be expected that mostly existing processing installations will benefit from grandfathering.

4. Ease of implementation by MS policy makers and verification

Grandfathering option 2 is relatively easy to implement and verify, equal to grandfathering option 1. See under grandfathering option 1 for more details.

5. Risk of allowing additional ILUC to occur beyond 1-1-2014

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

Under grandfathering option 2, the risk of additional ILUC being caused between 2014 and 2017 due to grandfathering is limited. Grandfathering roughly equals the 2010 EU biofuel consumption level and increases in biofuel consumption from 2011 are not covered by grandfathering. This means that, as can be seen in figure 6, no grandfathering takes place after an ILUC policy option is assumed to take effect at 1-1-2014. Similar to grandfathering option 1, additional ILUC could take place if biofuel production installations start to use different feedstocks with a higher risk of indirect emissions. On the other hand, installations could also shift to feedstocks with a lower risk of indirect emissions, leading to a decreased risk of additional ILUC taking place.

6. Overall assessment

The EU biodiesel industry potentially needs grandfathering to protect current investments and jobs. The preferred grandfathering option protects current investments and jobs as long as necessary without risking additional ILUC emissions after 1-1-2014 when an ILUC policy option is assumed to take effect.

Grandfathering option 2 could be combined with all three ILUC policy options analysed in section 3.1. It roughly protects the average current EU biofuel production level. Looking at the EU biodiesel sector the grandfathering option protects 5% more capacity above the 2010 average capacity utilisation of 45% in 2010, meaning that 1314 tonnes of additional biodiesel production after 2010 are grandfathered. Table 2 in section 2.1 however shows that the capacity utilisation rate varies a great deal. Estonian capacity utilisation for example, stood at 2% in 2010 and Hungarian capacity utilisation at 94% in the same year. Grandfathering 50% of capacity offers chances for Estonian biodiesel installations while limiting production in Hungarian installations. From the point of view of *protecting investments* this may not be a problem since Hungarian installations probably have a payback time much shorter than 10 years due to their high utilisation rate. From the point of view of *protecting jobs* however, grandfathering 50% of capacity might lead to job losses in Hungarian installations.

Grand fathering Option 3	Grandfathering all biofuels produced on land that was in use for biofuel production to supply the EU market by January 2008

1. General description and background

This grandfathering option is proposed by the Öko-Institut.[49] Covered by grandfathering are biofuels produced from feedstocks on land that was already in use for biofuel production for the EU market by the 1st of January 2008. This option grandfathers feedstock cultivation and has no clear termination date. The quantity of biofuels covered by this grandfathering option is limited to the quantity of biofuels that can be produced on a geographically fixed area of agricultural land.

The 1-1-2008 cut-of date is the same as the existing RED/FQD cut-of date direct land use change and is proposed by Ökö-Institute under the assumption that EU biofuel consumption before this cut-of date did not lead to ILUC, mainly because Ökö-Institute assumes:

- All biofuels produced *in the EU* until late 2008 do not cause ILUC since they were produced on set-aside land, a category of land that is no longer obligated for farmers under the CAP since the CAP health check at the end of 2008;
- Biofuel imports from *outside the EU* were just 10% by end 2007, with varying risks of LUC, so 90% of EU biofuel consumption was produced on ILUC-free set-aside land.

Both assumptions can be questioned as it is questionable whether all biofuel feedstock production in the EU before 2008 took place on set-aside lands and 42% of biodiesel feedstocks and 24% of bioethanol feedstocks of biofuels consumed in the EU in 2008 were imported from outside the EU.[50] In any case, any indirect emissions associated with biofuel production on grandfathered agricultural land took place in the past since this land was already in use for biofuel production before 2008.

2. Quantity of biofuels covered by grandfathering

All biofuels that are produced from land that was in use by the 1st of January 2008 to produce biofuels for the EU market are grandfathered, regardless whether within or outside the EU. In 2008 3.6Mha of EU agricultural land was used for biofuel production, while outside the EU, 3.3Mha of land was used in 2008 for biofuel production for the EU market. This means that in worldwide around 7 million hectares would be eligible for grandfathering ILUC associated with EU biofuel production.[51] The quantity of biofuels grandfathered roughly equals the 2007 EU biofuel consumption, which was 7.5 Mtoe. Between 2014 and 2020 a total of 52.5 Mtoe of biofuels is estimated to be grandfathered.

[49] Öko-Institut, *Sustainable biofuels? Some thoughts and data on the iLUC issue in the EU 27. Informal paper* (Darmstadt, August 2011).
[50] These figures reflect the ultimate feedstock origin as pictured in section 2.3 of this report, the 2007 figures presumably will not differ widely from these figures.
[51] See section 2.5 of this report. The quoted figures are 2008 rather than 2007 figures but show the order of magnitude.

The grandfathered quantity could be somewhat higher due to yield increase per hectare or somewhat lower if land eligible for grandfathering has been taken out of production after January 2008.

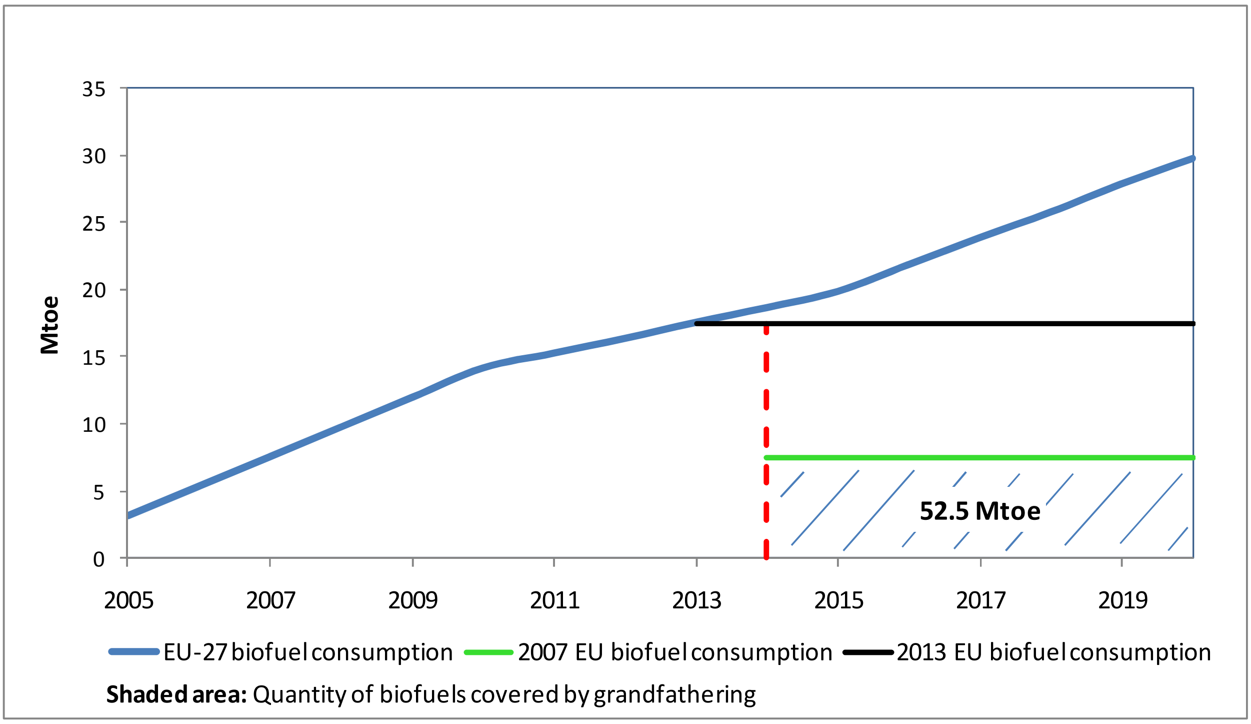

Figure 7 –grandfathering option 3

3. Types of investments protected by grandfathering

All biofuel feedstock processing and biofuel production installation investments are protected when using feedstocks from grandfathered agricultural land, regardless of whether they are current or new investments. All future investments in production capacity are potentially grandfathered if they can source biofuel feedstocks from grandfathered land. In this grandfathering option, the feedstock market decides which installations will be grandfathered to what extent.

4. Ease of implementation by MS policy makers and verification

In order to implement grandfathering option 3, Member States need to require economic operators to report and demonstrate the quantity of grandfathered biofuels. The following additional information to travel through the supply chain:

- From 2014 onwards: a statement that the biofuel feedstock cultivation took place on land that was already in use for biofuel production for EU consumption by January 2008.

In addition, verification of the claim above is needed in context of the overall independent audit.

Implementation grandfathering option 3 is relatively easy, but ensuring compliance will be difficult. While it is relatively easy to establish whether or not agricultural land was already in production by January 2008 since this is also already relevant in the context of the current RED/FQD sustainability criteria, it's more difficult for feedstock producers to prove that their land was used to produce biofuels before 1-1-2008, since often it is unknown to them for what end-product their feedstocks was used. It will be even more difficult to establish whether the biofuels produced from agricultural land worldwide that was already in use for biofuel production before 1-1-2008 ended up being consumed within the EU.

Ensuring compliance would be considerably easier if *all* land used before 1-1-2008 to produce biofuels would be eligible for grandfathering, regardless of the question whether or not the biofuels were used for EU consumption. This approach would mean that a much larger area of agricultural land would be eligible for grandfathering, probably to such an extent that the entire EU 2020 biofuel consumption level could be produced from grandfathered agricultural land. This would mean any EU ILUC policy measure would have no effect. While it can be argued that biofuel production from land that was already in use for biofuel production before 1-1-2008 should be considered ILUC-free because the LUC occurred in the past, allocating all of this land towards EU biofuel consumption would lead to increased ILUC associated with biofuel consumption in countries outside the EU.

5. Risk of allowing additional ILUC to occur beyond 1-1-2014

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

Grandfathering option 3 has no risk of additional ILUC being caused, because only existing land for biofuel production is grandfathered and all new land use for biofuels will be subject to an ILUC policy measure. This is illustrated in figure 7 by the grandfathered quantity of biofuels being at a lower level than the line indicating the EU 2013 biofuel consumption. Effectiveness in preventing ILUC is high, assuming an effective ILUC policy.

6. Overall assessment

The EU biodiesel industry potentially needs grandfathering to protect current investments and jobs. The preferred grandfathering option protects current investments and jobs as long as necessary without risking additional ILUC emissions after 1-1-2014 when an ILUC policy option is assumed to take effect.

Grandfathering option 3 could be combined with all three ILUC policy options analysed in section 3.1. The grandfathering option 3 is the most restrictive in terms of quantity of biofuels covered and would offer insufficient protection to investments and jobs in the EU biodiesel sector. In addition, the grandfathering option is difficult to verify compliance with. On this basis, grandfathering option 3 does not seem a viable option.

Grand fathering Option 4a	Combination of option 1, followed by extended grandfathering of the 2010 EU Member States biofuel consumption level. After 2017, biofuel installations in operation in 2010 are eligible for grandfathering of their installation's 2010 biofuel production.

1. General description and background

This grandfathering option is proposed in a non-paper by the German government in combination with a subtarget for low-ILUC risk biofuels as a policy measure,[52] but could also be combined with a raising of the GHG-thresholds or the introduction of ILUC-factors. The grandfathering option consist of two parts. Firstly, the existing RED/FQD grandfathering clause will be in place (grandfathering option 1 in this report). Secondly, after termination of grandfathering option 1 at the end of 2017 continued grandfathering takes place. This continued or extended grandfathering after 2017 is limited to the 2010 EU biofuel consumption per Member State. In the German proposal, Member States have to apply at the European Commission for extended grandfathering of their 2010 consumption levels. The increase in biofuel consumption since 2010 is to be produced with a low-ILUC risk. Covered by extended grandfathering are biofuel production installations in operation by end 2013 regardless whether located within or outside the EU; extended grandfathering after 2017 is maximised at production installations' 2010 production levels.

The 2010 consumption level is determined per Member State on the basis of reporting according to article 4, paragraph 1 of directive 2003/30/EC (the 2003 EU biofuel directive). This amount is not divided over individual production installations; all eligible production installations can supply grandfathered biofuels up to the total amount available per Member State.

2. Quantity of biofuels covered by grandfathering

Total grandfathered quantity equals all biofuels grandfathered under grandfathering option 1 (84 Mtoe) plus the 2010 EU biofuel consumption (14.1 Mtoe) during the years 2018-2020. This leads to a total of 126.3 Mtoe of biofuels covered under grandfathering during the period 2014-2020.

[52] German non-paper on an additional sustainability criterion to avoid indirect land use change (iluc) related to biofuels and bioliquids (Bonn, 13 October 2011).

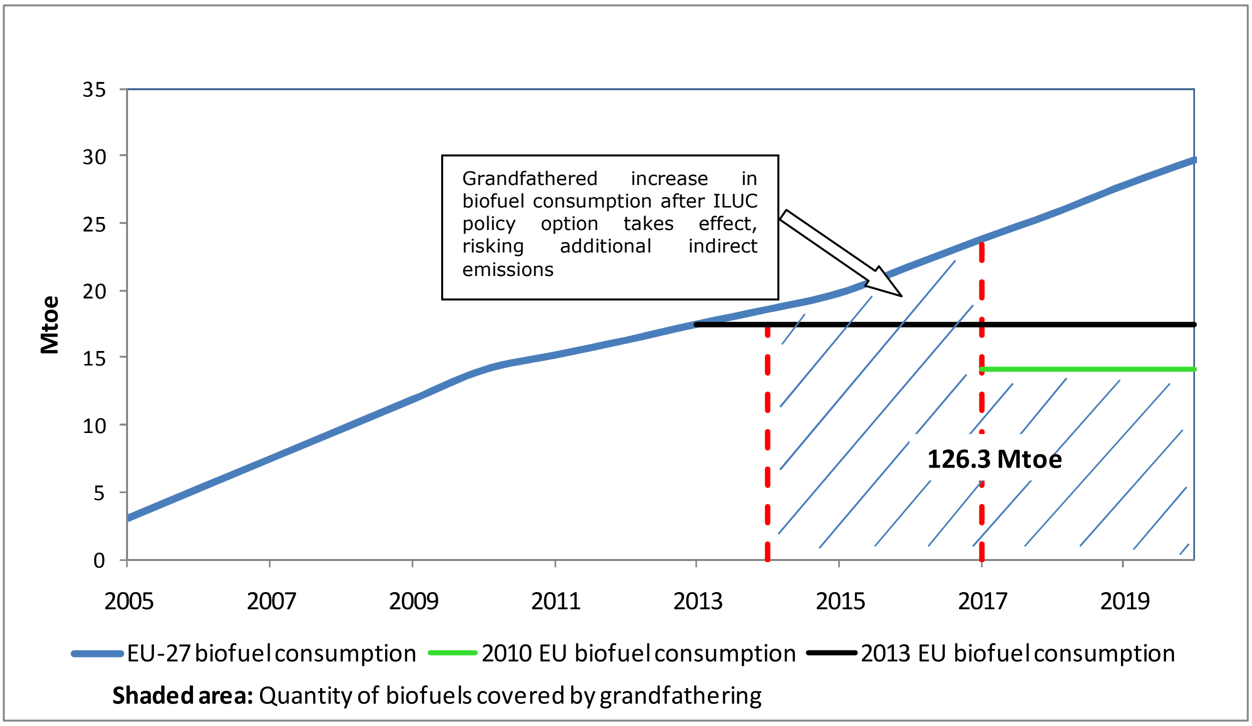

Figure 8 – Quantity of biofuels covered by grandfathering option 4A

3. Types of investments protected by grandfathering

Investments in biofuel production installations in operation by the end of 2013 are eligible for grandfathering up to the end of 2017 following grandfathering option 1. Subsequently, investments in biofuel production installations in operation by end 2013 are protected up to their 2010 production levels. Investments in processing installations are protected to the extent to which they supply grandfathered production installations.

4. Ease of implementation by MS policy makers and verification

In order to implement grandfathering of option 4, Member States need to require economic operators to report the quantity of grandfathered biofuels. The following additional information to travel through the supply chain:

- From 2014 onwards: a statement that the biofuel has been produced in an installation already in operation in 2010;
- A statement that the batch of biofuels does not exceed the 2010 level of production level of the installation destined for the EU market.

In addition, verification of the claim above is needed in context of the overall independent audit.

Implementation grandfathering option 4 is relatively easy. It will be more difficult to ensure compliance. It is relatively easy to establish whether or not a biofuel production installation was already in production in 2010. It's slightly more difficult to establish what quantity of biofuels a specific production installation supplied to the EU market in 2010. Usually, biofuel producers sell their product to fuel suppliers who decide to sell the biofuel within the EU or in a third country. In addition, it needs to be verified whether the biofuels sold as grandfathered biofuels do not exceed the quantity of grandfathered biofuel the installation is entitled to based on its 2010 production.

5. Risk of allowing additional ILUC to occur beyond 1-1-2014

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

The risk of additional ILUC being caused by grandfathering option equals the risk of additional ILUC being caused by grandfathering option 1. The reason for this is that after 2017 only existing production is grandfathered and all additional biofuel consumption is subject to ILUC policy. The risk of additional ILUC to occur is pictured in figure 8 as the shaded area between the line indicating the EU 2013 biofuel consumption level and the EU overall 2005-2020 biofuel consumption trend line

In addition, similar to grandfathering options 1 and 2, additional ILUC could take place if biofuel production installations start to use different feedstocks with a higher risk of indirect emissions. On the other hand, installations could also shift to feedstocks with a lower risk of indirect emissions, leading to a decreased risk of additional ILUC taking place.

6. Overall assessment

The EU biodiesel industry potentially needs grandfathering to protect current investments and jobs. The preferred grandfathering option protects current investments and jobs as long as necessary without risking additional ILUC emissions after 1-1-2014 when an ILUC policy option is assumed to take effect.

Grandfathering option 4 can be combined with any of the ILUC policy options described in section 3.1. It covers the largest quantity of biofuels and offers optimal protection to investments and jobs in the EU biodiesel sector. However, the grandfathering option does lead to substantial additional ILUC-emissions in the period 2014-2017, which does not make a suboptimal grandfathering option.

Also, the 2010 cut-off disadvantages installations with technical issues that year. A solution for this might be to grandfather the *average* production per installation in the years 2010-2012.

Grand fathering Option 4b	Grandfathering the 2011 biofuel consumption as supplied to EU Member States. Biofuel installations in operation in 2010 are eligible for grandfathering of their installation's average 2010-2012 biofuel production

1. General description and background

This Grandfathering option is a variation on grandfathering option 4a. Option 4a protects investments and jobs in the EU biofuel sector in an optimal way but it does risk additional ILUC emissions between 1-1-2014, when an ILUC policy option is assumed to take effect and as a result the grandfathering option takes effect, and 31-12-2017, when the level of grandfathering is lowered from grandfathering the total biofuel production capacity to the 2010 EU Member State biofuel consumption level. In order to combine sufficient protection for the EU biofuel sector without risking additional ILUC emissions after 1-1-2014, grandfathering option 4b is introduced.

Under grandfathering option 4b, the 2011 EU Member State production level is grandfathered. Biofuel production installations in operation in 2010 are eligible to supply Member States with grandfathered biofuels. Grandfathering per installation is maximised to their average 2010-2012 production level.

2. Quantity of biofuels covered by grandfathering

Where grandfathering option 4a covers 126.3 MTOE of biofuels, grandfathering option 4b covers 106.4 MTOE of biofuels supplied to the EU market between 1-1-2014 and 2020. Figure 7 illustrates this.

3. Types of investments protected by grandfathering

See grandfathering option 4a

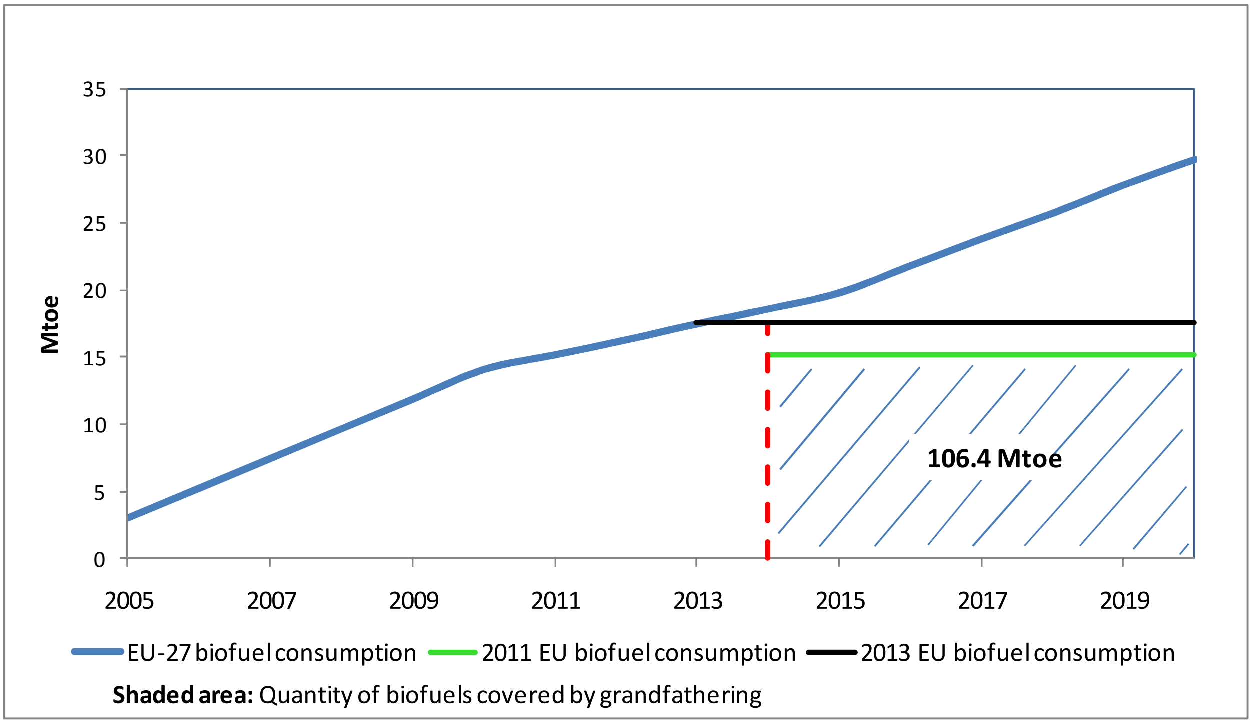

Figure 8 – Quantity of biofuels covered by grandfathering option 4B

4. Ease of implementation by MS policy makers and verification

Identical to grandfathering option 4a after 2017, no issues concerning implementation or verification have been identified.

5. Risk of allowing additional ILUC to occur beyond 1-1-2014

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

Grandfathering option 4b does not grandfather the expected increase in EU biofuel consumption after 1-1-2014 when an ILUC policy option is assumed to be introduced. This means that, provided the policy measure is effective, no additional ILUC will be caused as a result of this grandfathering option.

6. Overall assessment

Grandfathering option 4b can be combined with any of the policy options described in section 3.1.

Grandfathering option 4B does not increase the risk of additional ILUC emissions beyond 1-1-2014 when an ILUC policy option is assumed to take effect. And it offers sufficient protection to the EU biofuel industry, provided installations with extremely low capacity utilisation in 2010-2012 are offered some additional protection to allow them to earn back their investment costs.

The grandfathering option covers biofuel production installation’s 2010 production level, which means that installations encountering technical issues in 2010 are disadvantaged. By taking a 3-year production average this risk is limited. By grandfathering biofuel production installations 2010-2012 average production level up to 2020, installations have sufficient protection to earn back investments and protect current industry jobs. Looking at table 2 in section **Error! Reference source not found.**, the production or capacity utilisation varies widely across the EU. This means that for example French, Swedish, German, Finnish and Hungarian installations with high capacity utilisation are grandfathered for their high production levels. On the other hand, installations with extremely low capacity utilisation such as average Estonian, Bulgarian and Greek installations, and possibly also Slovenian, Spanish and UK installations might face difficulties in earning back investments. For this reason it might be appropriate to set a minimum level of grandfathering, of for example 30% of capacity utilisation per installation. If designed in such a way, grandfathering option 4B would be an attractive grandfathering option that protects investments and jobs sufficiently while avoiding the risk of additional ILUC emissions beyond 1-1-2014, provided an effective ILUC policy measure is introduced.

5 Conclusions

Grandfathering is aimed at protecting current investments and jobs in biofuel production installations against additional rules and obligations following a possible ILUC policy. This would give the biofuels sector time to adapt to the ILUC policy measure. The RED and FQD directives contain a grandfathering clause that covers all production capacity in operation by the end of 2013. This grandfathering clause terminates at the end of 2017 after which an ILUC policy measure would take it full effect. Currently, in the absence of an ILUC policy measure in the RED or FQD the grandfathering clause has no impact, but if the European Commission publishes a legislative proposal to address ILUC grandfathering in the directives, grandfathering will become part of the policy debate in Brussels.

To what extent does the EU biofuel sector need protection against ILUC policy?

The level of protection required depends on the ILUC policy option chosen. In this report three ILUC policy measures are discussed:

a) Raising the minimum required GHG-thresholds or bringing them forward in time (3 scenarios)

b) Introducing crop-specific ILUC-factors in the biofuels GHG-balance with exemptions in the form of a factor of zero for low-ILUC risk biofuels; [53]

c) Introduction of a subtarget for low-ILUC risk biofuels.

If under policy option a) the ultimate minimum required GHG-thresholds for all biofuels compared to fossil fuels would be raised from the current 50% to 60% or even 65%[54], ethanol feedstocks would still meet the GHG-requirements as well as biodiesel from sunflower and palm oil, while biodiesel from rapeseed and soy beans not meet the thresholds. This would lead to a shift from EU produced rapeseed biodiesel to EU produced sunflower biodiesel or palm oil biodiesel or to ethanol. No negative impacts for the EU ethanol sector are expected. Equally, policy option b) would make it more difficult for biodiesel producers to supply the EU market. Policy option c) is not expected to lead to a decrease in demand for EU produced biofuels, but to the requirement to demonstrate low ILUC risk for part of the biofuels supplied to the EU market.

The 2020 targets to achieve 10% renewables in transport and 6% GHG-reduction from fossil transport fuel use will not be affected by ILUC policy. This means that the EU 2020 demand for biofuels will not be affected by ILUC policy. The increase of overall EU biofuel consumption in the years up to 2020 is likely to lead to an overall increase of jobs in the EU biofuel sector. But this is the overall picture. While the EU ethanol production is not expected to be impacted by any of the ILUC policy options and is likely to experience growth and job creation in the coming years, the EU biodiesel sector would face challenges if the GHG-thresholds are raised or ILUC-factors introduced.

[53] See section 3.1 for a describtion of low-ILUC risk biofuel production

[54] Options B2 and B3 in the draft European Commission's ILUC Impact Assessment

Combining ILUC-factors with exemptions for low-ILUC risk production (leading to an ILUC factor of zero) would cushion but not eliminate the negative impacts for the EU biodiesel sector.

This means the EU ethanol sector does not need protection against ILUC policy while the biodiesel sector does need protection through grandfathering. As shown in section 3.3, current investments in biodiesel production need protection up to the end of 2017 while extended protection is needed in order to protect current jobs in the sector. The level of grandfathering needed to provide this protection has to cover the current biodiesel production level up to 2020.

Grandfathering options

This report assessed the following grandfathering options:

1 **Grandfathering biofuel production capacity.** All biofuels supplied to the EU market per installation that is producing biofuels by the end of 2013 are grandfathered until the end of 2017. Installations are only eligible for grandfathering if their biofuels meet a minimum GHG-saving of 45%[55] and grandfathering is maximised to the installation production capacity level at the end of 2012;

2 **Grandfathering 50% of biofuel production capacity**. Similar to grandfathering option 1 but grandfathering is capped by 50% of installed capacity at the end of 2012;

3 **Grandfathering biofuel production land.** Grandfathering all biofuels produced on land that was in use for biofuel production to supply the EU market by the 1st of January 2008;

4 **A) Grandfathering 2010 EU biofuel consumption.** Combination of grandfathering option 1 followed by grandfathering (after 2017) of the 2010 EU Member State biofuel consumption as supplied to Member States per biofuel production installation in operation in 2010;

B) Grandfathering 2010-2012 EU biofuel consumption. Similar to grandfathering option 4a but without grandfathering option 1 and grandfathering the average 2010-2012 EU Member State biofuel consumption as supplied to Member States per biofuel production installation in operation in 2010.

It is assumed that grandfathering takes effect on 1-1-2014 when an ILUC policy option takes effect. Grandfathering options 1 and 2 grandfather biofuels *capacity* rather than production, although option 2 only grandfathers 50% of capacity which in effect means a grandfathering of current biofuel production level. As the overview of the EU biofuel sector in chapter 2 shows, there is currently sufficient production capacity in the EU to completely produce the EU 2020 RED and FQD targets. This current overcapacity means that all increases in EU biofuel consumption in the years 2014-2017 would be grandfathered under grandfathering option 1.

Grandfathering option 3 grandfathers agricultural land historically used for biofuel production towards the EU market. All agricultural land worldwide used before 1-1-2008 to produce biofuels for

[55] The RED/FQD do not clarify whether the 45% refers to *direct* or to *direct plus indirect* GHG savings.

consumption in the EU would be grandfathered. Roughly some 3.6 Mha of land within the EU and 3.3 Mha of land outside the EU would be eligible for grandfathering.

Grandfathering option 4A consists of two parts. First grandfathering option 1, the current RED/FQD grandfathering clause, is in place in the period 2014-2017. Subsequently, from 2018 onwards the 2010 production level of biofuel production installations would be grandfathered.

Grandfathering option 4B is similar to option 4A but does not include the current grandfathering clause. Under grandfathering option 4b, the 2011 EU Member State production level is grandfathered. Biofuel production installations in operation in 2010 are eligible to supply Member States with grandfathered biofuels. Grandfathering per installation is maximised to their average 2010-2012 production level.

All grandfathering options cover both EU and non-EU biofuel production installations or agricultural land. Grandfathering option 3 has grandfathers the largest relative share of biofuels since it limits grandfathering effectively to 2007 EU biofuel consumption and since then, imports of biofuels from outside the EU have increased considerably.

The various grandfathering options lead to different quantities of biofuels being grandfathered:

Table 122. Quantities of biofuels covered under various grandfathering options (Mtoe)

Grandfathering option	Grandfathering period	Mtoe of biofuels covered
1	2014-2017	84
2	2014-2017	56.4
3	2014-2020	52.5
4A	2014-2020	126.3
4B	2014-2020	106.4

Risk of additional indirect GHG-emissions being grandfathered

The extent to which grandfathering risks additional ILUC emissions depends on:

- The effectiveness of the ILUC policy option in avoiding indirect emissions from biofuels supplied to the EU market, and
- The extent to which grandfathering covers an increase in EU biofuel consumption after the policy option is assumed to take effect in 1-1-2014.

Of the grandfathering options analysed in this report, grandfathering option 1 risks additional ILUC emissions as it grandfathers some 13Mtoe of increased EU biofuel consumption in the years 2014-2017. Grandfathering option 4 leads to equal additional emissions because it assumes the current grandfathering option to take effect. After termination of the current grandfathering clause it allows for extended grandfathering of the 2010 production level which does not lead to further ILUC emissions since emissions associated with the 2010 production level occurred in the past. The other grandfathering options grandfather a lower quantity of biofuels than the 1-1-2014 consumption level and therefore do not lead to additional ILUC emissions, provided an ILUC policy option is introduced that effectively tackles ILUC.

Ease of implementation and verification

All grandfathering options are relatively easy to implement into national legislation. Also, grandfathering options 1, 2 and 4 are relatively easy to demonstrate and verify compliance with, since grandfathering is directed to biofuel production installations from which information can be passed on easily and further down the chain and be verified. It will be more difficult to demonstrate and verify compliance with grandfathering option 3. While it is relatively easy to establish whether or not agricultural land was already in production on 1-1-2008 since this is also already relevant in the context of the current RED/FQD sustainability criteria, it will be more difficult for feedstock producers to prove that their land was used to produce biofuels before 1-1-2008, since often it is unknown to them for what end-product their feedstocks will used. It will be even more challenging to establish whether the biofuels produced from agricultural land that was in use for biofuel production before 1-1-2008 ended up being *consumed within the EU*.

Which grandfathering option would be most suitable?

The EU biodiesel industry potentially needs grandfathering to protect current investments and jobs. This report assessed four grandfathering options. The preferred grandfathering option:

- Protects current investments and jobs as long as necessary. Protecting current investments requires grandfathering current production levels.[56] Protecting current jobs requires grandfathering of current production levels up to 2020.
- Does not risk additional ILUC emissions after 1-1-2014 when an ILUC policy option is assumed to take effect.

Which grandfathering meets these objectives to the largest extent?

Grandfathering options 1 leads to additional ILUC emissions beyond 1-1-2014, while protecting current investments in the biodiesel sector. The termination in 2017 but might still allow for job losses after its termination by the end of 2017. Extending the grandfathering option beyond 2017 would offer protection to jobs in the biodiesel sector but in effect postpones the ILUC policy option to take effect and leads to large additional ILUC. From the point of view, grandfathering option 1 is a suboptimal solution.

Grandfathering option 2 protects current investments to a large extent but might still lead to job losses beyond 2017, akin to grandfathering option 1. Although the grandfathering option does not

[56] If grandfathered is implemented at installation level ideally the average production of 3 years is grandfathered to make sure installations with technical issues in one year are still covered.

risk additional ILUC emissions beyond 1-1-2014 if an effective ILUC policy option is introduced, the grandfathering option is suboptimal, since some grandfathering beyond 2017 seems appropriate.

Grandfathering option 3 is the most restrictive in terms of quantity of biofuels covered and is difficult to verify compliance with. On this basis, grandfathering option 3 does not seem a viable option.

Grandfathering option 4A protects current EU biodiesel investments optimally while also protecting current jobs in the biodiesel sector through extended grandfathering after 2017. However, the grandfathering option does lead to additional ILUC emissions beyond 1-1-2014, for this reason this grandfathering option is suboptimal.

Grandfathering option 4B does not increase the risk of additional ILUC emissions beyond 1-1-2014 when an ILUC policy option is assumed to take effect. And if it offers sufficient protection to the EU biofuel industry since it offers grandfathering of current the current biofuel production level beyond 2017. Protection of investments and jobs is only sufficient if installations with extremely low capacity utilisation in 2010-2012 are offered some additional protection to allow them to earn back their investment costs. This could be done by setting an overall minimum level of capacity utilisation that can be grandfathered.

Overall, it can be concluded that grandfathering option 4B is best suited to protect the interests of the EU biofuel sector and if combined with an ILUC policy option that effectively addresses ILUC[57] ensures no ILUC emissions will take place beyond 2017.

[57] As described in section 3.1, a raising of the GHG-thresholds would address *direct* GHG-savings and not target *indirect* GHG-emissions.

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