REPORT f3 2016:07

IMPLICATIONS OF EU REGULATION ON SWEDISH BIOFUEL STIMULUS

Report from an f3 project

June 2016

Authors: Kersti Karltorp and Jorrit Gosens, SP Technical Research Institute of Sweden

THE SWEDISH KNOWLEDGE CENTRE
FOR RENEWABLE TRANSPORTATION FUELS

PREFACE

This report is the result of a collaborative project within the Swedish Knowledge Centre for Renewable Transportation Fuels (f3). f3 is a networking organization, which focuses on development of environmentally, economically and socially sustainable renewable fuels, and

- Provides a broad, scientifically based and trustworthy source of knowledge for industry, governments and public authorities,
- Carries through system oriented research related to the entire renewable fuels value chain,
- Acts as national platform stimulating interaction nationally and internationally.

f3 partners include Sweden's most active universities and research institutes within the field, as well as a broad range of industry companies with high relevance. f3 has no political agenda and does not conduct lobbying activities for specific fuels or systems, nor for the f3 partners' respective areas of interest.

The f3 centre is financed jointly by the centre partners, the Swedish Energy Agency and the region of Västra Götaland. f3 also receives funding from Vinnova (Sweden's innovation agency) as a Swedish advocacy platform towards Horizon 2020. Chalmers Industriteknik (CIT) functions as the host of the f3 organization (see www.f3centre.se).

The authors of the report are affiliated at SP Technical Research Institute of Sweden. The authors are grateful for the input on the industry perspective provided by Andreas Gundberg at Lantmännen Agroetanol and to Emmi Jozsa at the Swedish Energy Agency and Anna Wallentin at the Ministry of Finance for input on the perspective of Swedish authorities. Valuable comments on the report have also been received from Johanna Ulmanen at SP Technical Research Institute of Sweden.

This report shoud be cited as:

Karltorp, K and J. Gosens, (2016) *Implications of EU regulation on Swedish biofuel stimulus*, Report No 2016:07, f3 The Swedish Knowledge Centre for Renewable Transportation Fuels, Sweden. Available at www.f3centre.se.

SUMMARY

The use of biofuels in Sweden has increased dramatically during the last decade and the country is now one of the leadning member states in the European Union (EU). Sweden has ambitious national targets for the transport sector and the ambition to continue being a leading country for biofuel use. This requires policies that justify long term investment in biofuel production facilities and refueling infrastructure. However, although Swedish policy is in line with EU directives and state aid guidelines it has, at times, suffered from friction with the EU. This report sets out to give an overview of complex EU legislation and its implications for Swedish stimulus measures for biofuel development. This summary presents an overview of the EU legislations and key implications for Swedish biofuel stimulus.

The Renewable Energy Directive (RED) came into force in 2010 and sets a renewable energy target for 2020, including a target of 10% renewable energy in the transport sector. This directive also introduces sustainability criteria for biofuels. The Renewable Energy Directive was amended in April 2015 by a new directive that considers indirect land use change (iluc) and therefore is known as the 'Iluc' Directive. The EU member states have been given 24 months to introduce the new directive.

The 'Iluc' Directive introduces a cap of 7% first generation biofuels in the target for the transport sector, which implies that there is little incentive to stimulate use of biofuels above the cap. This has implications for Sweden as use of first generation biofuels is already close to the 7% cap. Thus, the 'Iluc' Directive does not provide incentive for additional support to first generation biofuels in Sweden.

The 'Iluc' Directive also introduces stricter sustainability criteria, which implies that the greenhouse gas emission threshold values are changed. For installations producing biofuels before this directive entered into force, a 50% greenhouse gas emissions savings by January 2018 is required. Installations starting production after the 'Iluc' Directive is officially published are required to meet a 60% threshold immediately. Additionally, as the name indicates, the directive introduces estimates of life-cycle emissions for 'indirect land-use change' values for different crop feedstock. Member states will have to report these values, but iluc values are not accounted for when comparing with the thresholds for greenhouse gases emissions.

The 'Iluc' Directive strives to motivate the use of second generation biofuels by defining which fuels are eligible for double counting towards the 10% target for 2020. Member states are also obligated to set a target for the use of these fuels. For Sweden, the definition of these advanced biofuels is positive as it is in line with the biofuels under development in the country. Examples are biofuels based on waste from forestry and industry, which are feedstock with a large potential in Sweden.

In Sweden, biofuel production and use is currently supported via full or partial tax reduction. Minimum energy taxation levels are set in the Energy Taxation Directive from 2003. The directive allows tax reduction on biofuels as long as it does not imply overcompensation, i.e. that producers of biofuels are compensated for more than the additional production cost compared to fossil alternatives. A revised Energy Taxation Directive was suggested in 2011, but withdrawn in 2015 since the unanimous consensus required for its adoption could not be reached. The revised directive was very much in line with the structure for energy taxation implemented in Sweden. If the revised

directive had been introduced it would probably have been easier to design a long term biofuel taxation structure in Sweden. However, given the unsuccessful but sincere attempt to find consensus on the revised directive it is not likely that a new Energy Taxation Directive similar to the revised version is adopted before 2020.

State aid must fulfil certain criteria to be authorized by the European Commission as compatible with the internal market. The 'Guidelines on state aid for environmental protection and energy 2014-2020' were adopted by the European Commission in April 2014. The new Guidelines on state aid introduce several limitations to how biofuel development can be stimulated. Support to biofuels via tax reductions, as implemented in Sweden, is considered state aid, which requires approval by the European Commission. State aid approval is only given on a temporal basis, which implies that it is difficult to construct a long-term biofuel stimulus scheme based on the current policy system in Sweden.

For biofuel stimulus in Sweden it is also of importance that, according to the state aid guidelines, a tax reduction cannot be combined with a quota obligation. This has already led to withdrawal of planned biofuel support. In November 2013 the Swedish parliament accepted a law on quota for biofuels with implementation planned to 1st May 2014. However, in June 2014 the government had to withdraw the law as the tax reduction that was suggested in combination with the quota would not receive state aid notification. Consequently, the parliament decided that the law should be abandoned.

Sweden is not the only member state that wishes to combine a quota and tax reductions on some biofuels. Both Finland and Czech Republic have introduced support schemes (quota and tax reduction) without waiting for approval from the European Commission. The Swedish government, however, seems to prefer to 'play' by the rules, which implies waiting for an approval by the European Commission before introduction of a support scheme. By acting in this way the government does not risk that the industry has to pay back support gained.

Like the Energy Taxation Directive, the Guidelines on state aid does not allow overcompensation. The process in place to avoid overcompensation can cause disruption in biofuel support schemes. The reason for this is that price variation can result in unintended overcompensation due to the time lag between rapid price variations and more seldom changes in tax reduction levels. The consequences of this can be both unintended overcompensation that results in unforeseen changes in support schemes and noncompetitive market price of biofuels.

Like the 'Iluc' Directive, the Guidelines steer away from first generation of biofuels by stating that first generation biofuels are not eligible for aid after 2020. For biofuels to be eligible for support they must be sustainable according to the criteria set up in the Renewable Energy Directive and the Iluc Directive. The guidelines also introduce limitations for operation aid for biofuel plants as no operation aid should be given to plants that started their operation before 31 December 2013 and operation aid is only allowed until plants are fully depreciated.

The challenge for future design of biofuel stimulus in Sweden is to introduce a long term support scheme that, unlike the current temporal tax reductions, does not need state aid approval. A support scheme similar to, for example, the Finnish one could be an option. Nevertheless, it is currently not clear if such a support scheme would be approved by the European Commission.

SAMMANFATTNING

Sveriges användning av biobränslen har ökat dramatiskt under det senaste årtiondet och landet är nu ett av de ledande medlemsländerna i EU. Sverige har ambitiösa nationella mål för transportsektorn och en ambition att fortsätta att vara ett föregångsland för användning av biodrivmedel. Detta kräver styrmedel som motiverar långsiktiga investeringar i produktionsanläggningar och tankningsinfrastruktur. De styrmedel som implementerats i Sverige är i linje med EU:s direktiv och stadsstödregler, men slitningar mellan Sverige och EU har förekommit. Denna rapport syftar till att ge en överblick över EU:s komplexa lagstiftning och dess konsekvenser för svenska stimulansåtgärder för biobränslen. Här presenteras en sammanfattning av EU lagstiftningen samt de viktigaste implikationerna för stimulansåtgärder för biodrivmedel i Sverige.

Förnybarhetsdirektivet (Renewable Energy Directive, RED) trädde i kraft 2010 och sätter upp mål för förnybar energi fram till 2020, inklusive ett mål om 10% förnybar energi i transportsektorn. Direktivet införde också hållbarhetskriterier för biobränslen. Förnybarhetsdirektivet ändrades i april 2015 genom ett nytt direktiv som tar hänsyn till indirekt förändring i markanvändning (eng: indirect land use change, iluc). Medlemsstaterna har fått 24 månader på sig att införa det nya s.k. lluc-direktivet.

Iluc-direktivet inför ett tak på 7% för första generationens biobränslen vilket innebär att incitamentet för att stimulera användning av biobränslen över taket begränsas. Detta får konsekvenser för Sverige där användningen av första generationens biobränslen redan ligger nära 7%. Iluc-direktivet styr alltså bort från ytterligare stöd till första generationens biobränslen i Sverige.

Iluc-direktivet inför också strängare hållbarhetskriterier, vilket innebär att tröskelvärdena för utsläpp av växthusgaser ändras. För anläggningar som producerar biobränslen före ikraftträdandet av direktivet gäller att de ska kunna uppvisa 50% besparingar av utsläpp av växthusgaser från och med januari 2018. Anläggningar som startar produktion efter direktivet offentliggjorts måste uppfylla ett tröskelvärde på 60% omedelbart.Som namnet anger medför även Iluc-direktivet att uppskattningar av livscykelutsläpp för indirekt förändrad markanvändning införs. Medlemsstaterna måste rapportera dessa värden, men iluc-värden redovisas inte i jämförelsen mot tröskelvärdena för växthusgasutsläpp.

Iluc-direktivet försöker motivera användning av andra generationens biobränslen genom att definiera vilka av dessa bränslen som tillåts att räknas dubbelt mot 10%-målet för 2020, samt genom att EU:s medlemsländer tvingas införa ett mål för användningen av dessa biobränslen. För Sverige är definitionen av avancerade biobränslen positiv eftersom den är i linje med de biobränslen som är under utveckling i landet. Exempel på detta är biobränslen baserade på avfall från skogsbruk och industri, vilket är råmaterial med stor potential i Sverige.

I Sverige stöds produktionen och användningen av biobränslen för närvarande genom att dessa bränslen helt eller delvis skattebefrias. Minimumnivåer för energiskatt anges i Energiskattedirektivet från 2003. Det tillåter skattereduktion på biobränslen så länge det inte innebär överkompensation, dvs att producenter av biobränslen kompenseras för mer än den extra produktionskostnaden jämfört med fossila alternativ. Det reviderade energiskattedirektiv som föreslogs 2011, återkallades 2015 eftersom den fullständiga enhällighet som krävdes för dess antagande inte kunde nås. Det reviderade föreslagna direktivet var till stor del i linje med den struktur för energibeskattning som Sverige tillämpar. Om det reviderade direktivet hade införts skulle det förmodligen ha varit lättare

att utforma ett långsiktigt system för biodrivmedelsbeskattning i Sverige. Men med tanke på de ihärdiga men misslyckade försök som gjorts att nå konsensus är det inte troligt att ett nytt energiskattedirektiv som liknar den reviderade versionen antas innan 2020.

Statsstöd måste uppfylla vissa kriterier för att godkännas av Europeiska kommissionen som förenligt med den inre marknaden. De nya riktlinjerna för statsstöd inom miljö och energi antogs av Europeiska kommissionen i april 2014. Dessa introducerar flera begränsningar för hur biobränsleutvecklingen kan stödjas. Stöd till biobränslen via skattesänkninga, som Sverige tillämpar, anses som statsstöd, och behöver godkännas av Europeiska kommissionen. Godkännande av statsstöd ges endast temporärt och därför är det svårt att konstruera ett långsiktigt system med nuvarande stimulansåtgärder till biobränsle.

För Sverige är det också av betydelse att riktlinjerna för statsstöd inte tillåter en skattereduktion i kombination med en kvotplikt. Detta har redan lett till återkallandet av ett planerat biodrivmedelsstöd. Sveriges riksdag antog en lag om kvotplikt för biobränslen i november 2013 med planerat genomförande den 1:a maj 2014. Men i juni 2014 var regeringen tvungen att dra tillbaka lagen eftersom den skattesänkning som föreslogs i kombination med kvoten inte skulle komma att få stadsstödsgodkännande. Följaktligen beslöt riksdagen att lagen skulle överges.

Sverige är inte det enda land som önskar att kombinera kvotplikt och skattesänkningar på vissa biobränslen. Både Finland och Tjeckien har infört liknande stödsystem (kvoter och skattereduktion) utan att vänta på godkännande från Europeiska kommissionen. Den svenska regeringen tycks dock föredra att invänta att ett föreslaget system får statsstödsgodkännande av Europeiska kommissionen innan det implementeras. Genom att agera på detta sätt försäkrar sig regeringen om att industrin inte måste betala tillbaka stöd, vilket kan bli fallet om ett stödsystem inte blir godkänt.

Likt Energiskattedirektivet tillåter inte riktlinjerna för statsstöd överkompensation. Att undvika överkompensation kan dock medföra oförutsedda förändringar i stödsystem för biobränsle. Anledningen till detta är att snabba prisvariationer kan leda till oavsiktlig överkompensation pga tidsfördröjningen mellan dessa och mindre frekventa förändringar i skattereduktionsnivå. Konsekvenserna av detta kan vara både oavsiktlig överkompensation som resulterar i oförutsedda förändringar i stödsystem, och icke konkurrenskraftiga priser på biobränslen.

Likt Iluc-direktivet styr riktlinjerna för statsstöd bort från första generationens biobränslen, genom att fastslå att dessa inte är berättigade till stöd efter 2020. För samtliga biodrivmedel gäller att de måste uppfylla hållbarhetskriterierna för att vara berättigade till stöd. Riktlinjerna innehåller också begränsningar för driftstöd till biobränsleanläggningar, vilket medför att inget driftstöd får ges till anläggningar som startade sin verksamhet före den 31 december 2013. Driftstöd tillåts inte heller till anläggningar som är helt avskrivna.

Utmaningen för framtida utformning av stimulansåtgärder för biobränslen i Sverige är att införa ett långsiktigt stödsystem som, till skillnad från de nuvarande temporära skattesänkningar, inte behöver stadsstödsgodkännande. Ett stödsystem som liknar exempelvis det i Finland skulle kunna vara ett alternativ. För närvarande är det dock oklart om ett sådant system skulle godkännas av Europeiska kommissionen.

CONTENTS

1 INTRODUCTION

The use of biofuels in Sweden has increased dramatically during the last decade (0) and the country is now one of the leading member states in the European Union (EU) concerning its share o biofuels in the transportation sector. In 2014, the share of biofuels in road transport in Sweden was 13% [1]. However a significant share of the consumed biofuels, and raw materials used to produce these fuels, are imported from regions outside Sweden; primarily Europe [2]. This can be compared to the target set in the Renewable Energy Directive for 2020 that requires 10% renewable energy in the transport sector [3].

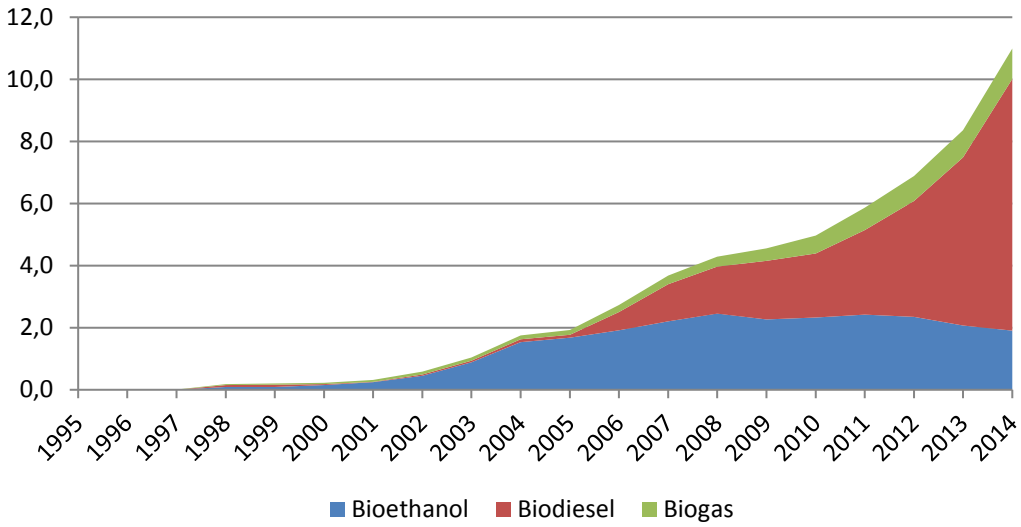

Figure 1. Biofuel use (TWh) in the Swedish transport sector.

Note: In Sweden biofuel is sold in the form of biodiesel (low and high blend), ethanol (low and high blend) and biogas (pure biogas and mixed with natural gas). The use of ethanol in Sweden took off in 2000, but since 2011 demand has decreased. Since 2005 production of biodiesel has increased rapidly. The use of biogas has also increased but at a slower pace. Source: [1]

Sweden has the ambition to continue being a leading country for biofuel development and has a priority that by 2030 the vehicle fleet should be independent of fossil fuels [4]. Sweden is also one of few countries worldwide where a high blend biofuel infrastructure and market has emerged, which is considered a necessity for attaining post-2020 EU targets for biofuels use in transport. Accomplishing this has required ambitious policies, including fiscal incentives, sufficient to justify long term investment in biofuel production facilities and refueling infrastructure.

Although Swedish biofuel policy is in line with EU policy, it has, at times, also suffered from friction with EU policy. Both the level of ambition and the stability of Swedish biofuel stimulus measures are affected by EU policy, and continue to do so. Fuel taxation and (partial) exemptions from these are, for example, subject to approval by the European Commission. In general fiscal stimulus has only been allowed if it was short term, and not too generous, considered not to overcompensate biofuels over fossil alternatives. Furthermore, the European Commission has recently adopted new guidelines on state aid, and has been pushing an overhaul of the energy tax directive, both of which severely limit individual member states' choices in providing support to biofuels.

EU legislation is complex and interpretation of its implications for policy making in Sweden is not straight forward. Therefore, the purpose of this report is to present a concise overview of complex

EU regulation and its implications for Swedish stimulus measures for biofuel development. The overview includes the Renewable Energy Directive, the 'Iluc' Directive, the Energy Taxation Directive and the guidelines on state aid for environmental protection and energy. In addition, the report also illustrate some of the friction between the European Commission and the Swedish means to support biofuel development as well as some positions on the EU regulations held by Swedish industry and authorities. An international outlook is also presented to put the Swedish system for biofuel stimulus in a European context.

Data collection for this report has been done by literature review, including EU directives and related documents, Swedish national regulations and governmental bills, various reports for example from Swedish authorities, industry association, firms and international organizations. A few interviews with representatives from industry and Swedish authorities were also conducted and had the purpose of orienting the authors and identifying relevant literature.

2 EU POLICY MEASURES WITH IMPACT ON SWEDISH BIOFUEL STIMULUS

The scope of this report includes the following EU regulations; the Renewable Energy Directive and the recently adopted amendment to this directive, the Energy Taxation Directive and the recently attempt at revision of this directive and the guidelines on state aid for environmental protection and energy. These measures set targets for renewable transport fuel and outline the boundaries for how support to reach these targets can be provided. In the following these measures will be presented briefly in order to show their connectedness (0). In this brief presentation some references will also be made to related directives and Swedish laws that are out of scope of this report, but which have some connectedness to the documents in focus. In the remainder of this section, the policy measures in focus of the report will be described in more detail and possible implications for stimulus of biofuel development in Sweden will be presented.

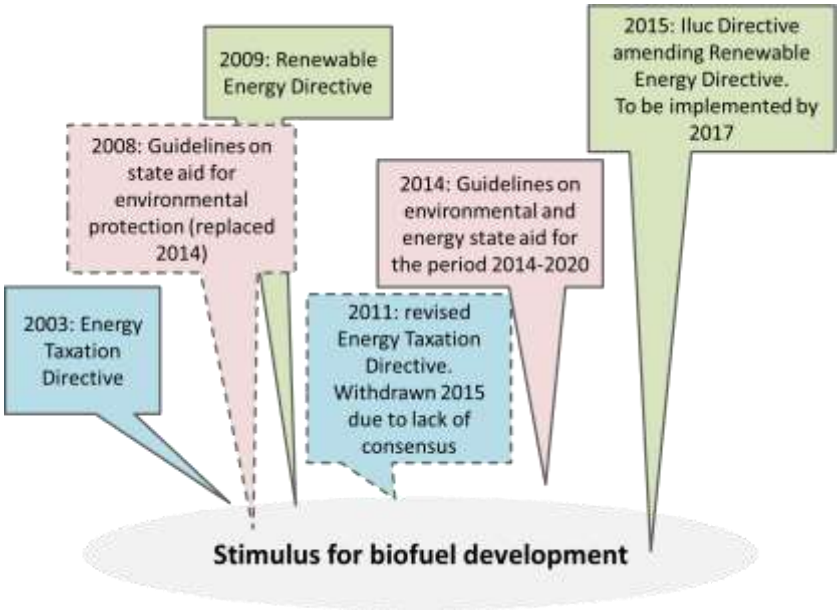

Figure 2. The development of EU policy measures affecting biofuel stimulus.

Note: This figure indicate the timeline for the introduction of the different policy instruments and what instruments that are linked to each other (marked with the same color). As indicated by the dotted line the Guidelines from 2008 and the revised Energy Taxation Directive from 2011 are not valid today (June 2016).

A first group of policies are related to renewable energy: The Renewable Energy Directive sets target for the share of renewable energy within the European Union and introduces a set of sustainability criteria [3]. The directive has recently been amended by a new directive on fuel quality and renewable energy, known as the 'Iluc' Directive, for its inclusion of indirect land use change considerations [5]. In Sweden the Renewable Energy Directive is partly implemented by 'Hållbarhetslagen', which outlines a control system for sustainability criteria. The Swedish 'Elcertifikatslagen' aims at increasing the share of renewable energy, which is also the target for the Renewable Energy Directive, but as it mainly focuses on electricity generation it is also considered out of scope of the report. The Fuel Quality Directive has some implications for the producers of biofuel, but most importantly for producers of fossil fuel and is therefore considered out of scope of this report. In

Sweden, the Fuel Quality Directive is implemented by Drivmedelslagen, but for the same reasons as the Fuel Quality Directive this is considered out of scope of the report (0).

Table 1. Key documents – Renewable energy targets and sustainability critiera.

Renewable Energy Directive - DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
'Iluc' Directive - DIRECTIVE (EU) 2015/1513 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 September amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources
Fuel Quality Directive - DIRECTIVE 2009/30/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC
Hållbarhetslagen - Lagen (2010:598) om hållbarhetskriterier för biodrivmedel och flytande biobränslen
Elcertifikatslagen - Lag (2011:1200) om elcertifikat
Drivmedelslagen (2011:319)

A second group of policies are related to energy taxation. The currently effective Energy Taxation Directive is from 2003 and seeks to harmonize energy taxes across the European Union [6]. According to the directive energy and fuels should be taxed. However, reductions and exemptions of taxation of biofuels are possible as long as it does not imply that the biofuel is overcompensated compared to the fossil fuel it replaces. Revisions to this directive has been discussed, the most recent proposal is from 2011. However it has been controversial ever since it was drafted and in the beginning of 2015 the European Commission withdrew the proposal as the consensus that is required for its adoption could not be reached. In Sweden, energy taxation is implemented by ''Lagen (1994:1776) om skatt på energi' (Table 2).

Table 2. Key documents – Energy taxation.

Energy Taxation Directive - COUNCIL DIRECTIVE 2003/96/EC, of 27 october 2003 restructuring the community framework for the taxation of energy products and electricity
Lagen (1994:1776) om skatt på energi

The guidelines on state aid also affect national biofuel policies. The Guidelines on environmental and energy state aid for the period 2014-2020 regulates in what form state aid to energy and environmental protection are compatible with the internal market pursuant to the Treaty on the Functioning of the European Union (0) [7]. The European Commission evaluates measure that member states suggested as support schemes and communicates if a measure is approved as state aid or not

considered state aid at all, which also means that it can be implemented. In this report, the document in which this is communicated is referred to as a 'notification'. Compared to the former Guidelines on state aid for environmental protection from 2008 [8] the new guidelines promote a gradual move to market-based support for renewable energy. Worth noting for the support of biofuels is that no overcompensation is allowed, meaning that a quota cannot be combined with a tax reduction, and that operating aid to first generation biofuel plants is limited in several ways. In Sweden, biofuels receive reductions of both the energy and the carbon tax which can be seen as state aid. Therefore Sweden has notified the European Commission and the current tax reductions are approved as state aid until the end of 2018 for liquid biofuels and the end of 2020 for biogas.

Table 3. Key documents – State aid.

COMMUNICATION FROM THE COMMISSION. Guidelines on State aid for environmental protection and energy 2014-2020. 2014/C 200/01
Treaty on the Functioning of the European Union

The above described instruments determine how development of biofuel can be stimulated. As the instruments affect the same matter there is also some connectedness between them. For example, the energy taxation is regulated by the Energy Taxation Directive. This directive allows reductions or exemptions of taxes on biofuels if the sustainability criteria set up in the Renewable Energy Directive and the 'Iluc' Directive are fulfilled. This is also repeated in Swedish law as the Swedish energy taxation only allows tax reductions on biofuels if the biofuel fulfil the sustainability criteria [9]. Moreover, the terms under which taxation reduction or exemption on energy is allowed is also regulated by the Guidelines on environmental and energy state aid.

2.1 RENEWABLE ENERGY DIRECTIVE AND 'ILUC' DIRECTIVE

In this section the most relevant aspects for the development of biofuels of the Renewable Energy Directive and the 'Iluc' Directive are presented, followed by a discussion on possible implications for Sweden of the amendments introduced by the 'Iluc' Directive. In this report, the term 'first generation biofuels' is used to define biofuels made from food crops, such as sugar, starch or vegetable oil. 'Second generation' or 'advanced' biofuels are biofuels made from various types of other biomass sources, such as ligno-celluloses, agriculture residues and other waste streams.

2.1.1 Renewable Energy Directive

The Renewable Energy Directive went in to force in 2010 and sets target for 2020 of 20% renewable energy in total within the European Union[1] and 10% renewable energy in the transport sector, the later target is equally set for all member states [3]. The target for the transport sector is an increase from a 5.75% target by 2010, which is mandated by the biofuels directive of 2003 [10]. To reach the 10% target, the share of fuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material may be counted twice compared to other biofuels (0). In addition, electrical road vehicle fuels by renewable energy can be counted 2.5 times.

[1] Differentiated for the member states. Sweden has a share of 49% renewables and a national target of 50%.

For biofuels to be eligible for counting towards meeting the target must meet a set of sustainability criteria, which requires that:

- Their life-cycle emissions imply a 35% CO_2 emissions savings compared to fossil alternatives. This greenhouse gas (GHG) threshold is increased to 50% by January 2017 for new units [11]. The threshold values has been reviewed with the 'Iluc' Directive, see below.
- They conform to land use requirements. This means that they cannot be grown in areas converted from land with previously high carbon stock such as wetlands or forests. Nor can they be produced from raw materials obtained from land with high biodiversity such as primary forests or highly biodiverse grasslands.

To prove that a fuel can be considered sustainable according to the above described criteria it can be certified under an officially recognized independent verification scheme approved by the European Commission.[2]

Implementation of the sustainability criteria has mainly been according to two approaches. The first one is to only allow volumes of biofuels that are certified under an approved verification scheme [9]. This is for example the case in Denmark and Holland. The second approach is to set up a national control system. Sweden has chosen the second approach and implemented a system for control of sustainability of fuels for the national market. This is implemented by law, Hållbarhetslagen. According to this law producers of biofuels have to report the amount of fuel produced and sustainability performance to the Swedish Energy Agency, who annually compiles a report on the result [12]. Biofuels that fulfil the requirements according to the law will receive a document confirming their fulfillment (so called 'Hållbarhetsbesked').

2.1.2 'Iluc' Directive

In the 'Iluc' Directive the 10% target by 2020 is maintained and added to this is a 7% cap on the use of first generation biofuels (derived from food crops) [5]. This means that consumption above this level cannot be counted towards meeting the 10% target. In addition, member states are obligated to include a target for the use of advanced fuels, for which the directive provides a 'reference' target of 0.5% [13]. Member state targets are to be set in 2017.

The directive strives to harmonize what feedstocks for biofuels that are eligible for double counting towards the 2020 target. Double-counting remains in place for biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material. A new distinction is introduced between 1) used cooking oil and animal fats and 2) feedstock for 'advanced biofuels' (0). Moreover, electrical vehicles used for road transport fueled by renewable fuel can be counted 5 times and transport by rail way fueled by renewable electricity can be counted 2.5 times towards the target [14]. As a result, the target for renewable fuel is shifted from first generation biofuels and to second generation biofuels and electric transport.

The GHG threshold values are changed to 50% CO_2 savings by January 2018, for installations producing fuels before entry into force of the adopted text. Installations starting production after the

[2] A list of recognized schemes is availabe at http://ec.europa.eu/energy/node/74

text is officially published are required to meet the 60% threshold immediately [5]. This dramatically reduces the possibility for any additional first generation biofuel capacity.

As the name indicates the directive introduces standards for life-cycle emissions including 'indirect land-use change'. A number of 'provisional estimated mean values' have been provided for different crop feedstocks, although these include very large ranges reflecting uncertainty about these emissions (0). Currently, 'iluc' values have to be reported, but are not accounted for when comparing with GHG thresholds.

The 'Iluc' Directive was decided on in April 2015 and member states have been given 24 months to implement it.

Table 4. Double-counted biofuel feedstocks.

Can be counted twice and can be counted towards meeting target for 'advanced' biofuels
• Algae if cultivated on land in ponds or photobioreactors
• Biomass fraction of mixed municipal waste[1] and bio-waste from private households[2]
• Biomass fraction of industrial waste not fit for use in the food or feed chain
• Biomass fraction of wastes and residues from forestry industries
• Straw • Bagasse
• Grape marcs and wine lees • Animal manure and sewage sludge
• Nut shells • Palm oil mill effluent, empty palm fruit bunches
• Husks • Tall oil pitch
• Cobs cleaned of kernels of corn • Crude glycerine
• Other lingo-cellulosic and non‑food cellulosic material
• Renewable liquid and gaseous transport fuels of non-biological origin
• Carbon capture and utilisation for transport purposes, if the energy source is renewable
• Bacteria, if the energy source is renewable
Can be counted twice
• Used cooking oil
• Animal fats

Notes: 1) but not separated household waste subject to recycling targets under Article 11(2)(a) of Directive 2008/98/EC; 2) subject to separate collection as defined in Article 3(11) of Directive 2008/98/EC. Source: Annex IX of the Iluc directive [5].

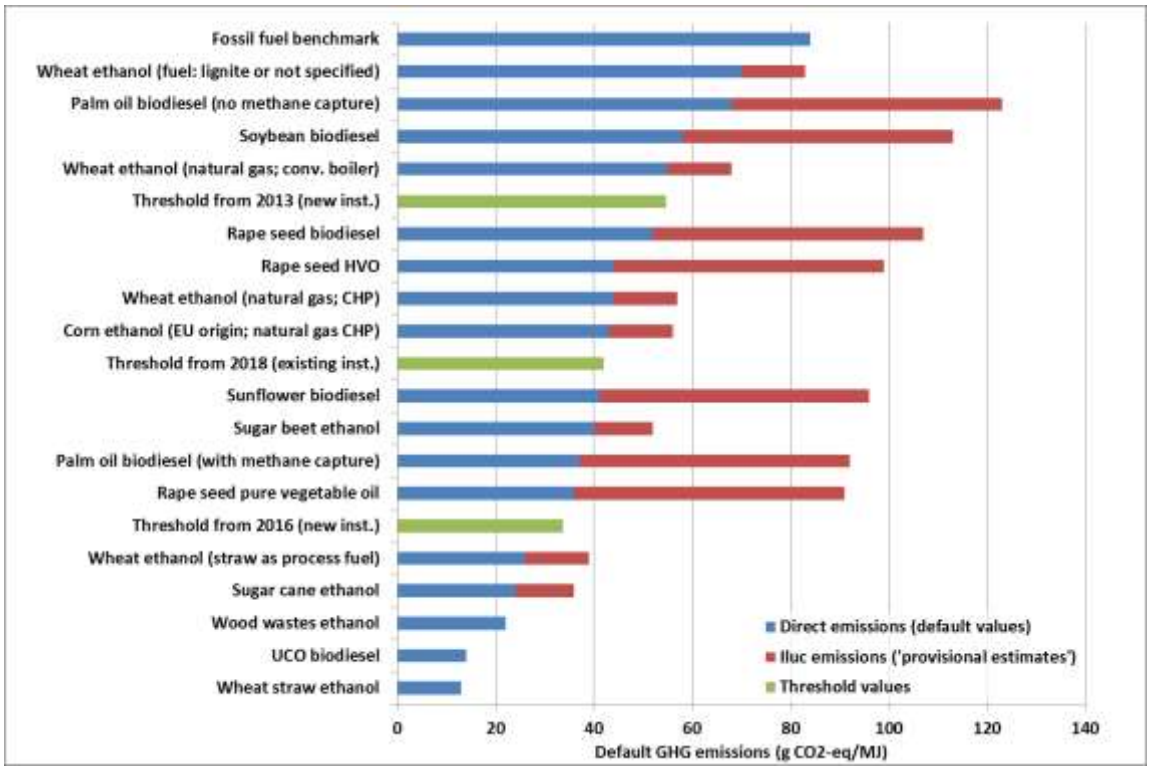

Figure 3. Default values of biofuel GHG emissions and threshold levels.

Notes: additions in brackets refer to production process and/or process fuel. Threshold values as determined in the new iluc directive. Iluc emissions are expected to be reported but are not taken into account when comparing with threshold value [5]. Default emission values from the 2009 Renewable Energy Directive [3]; note that 'default' emissions provided in the directive are higher than 'typical' emissions provided in the same text; operators can either supply detailed calculations to evidence the level of emissions for their installations, or refer to default values.

2.1.3 Implications for future development of biofuels in Sweden

The 'Iluc' Directive is not yet implemented in Swedish law, but must be so by the latest in September 2017 [9]. There are some major implications of the 'Iluc' Directive on how Sweden can support development of biofuels. First, a cap of 7% on use of first generation biofuels must be introduced. This implies that if Sweden use, for example, wheat based ethanol or rape seed biodiesel above this target it will not be eligible to count towards the 10% target [14]. In 2014, Sweden was slightly below 7% on first generation of biofuels [14]. Thus there is limited incentive to stimulate increased use of first generation of biofuels.

Second, the requirement for GHG emissions savings compared to fossil fuel is increased in the 'Iluc' Directive compared to the Renewable Energy Directive. From 2018, this means a 50% GHG savings threshold for biofuels from old production units and a 60% GHG emission savings threshold for new production units. As a result most first generation biofuels will not be eligible to be counted towards meeting the 10% target at all by 2018 (0). This means that most first generation biofuels cannot be the recipient of fiscal benefits in national support schemes starting 2018 or later.

Third, the increased importance given to renewable electricity in transport (road transport counted 5 times and railway transport counted 2.5 times) implies a reduced pressure on member states to increase the amount of biofuel to reach the 10% target for 2020.

Fourth, the 'Iluc' Directive includes a list of fuels that should be supported, defined in the Annex IX of the directive (0). Member states are also obligated to set a target for the use of advanced fuels, 0.5% is set as an indicative target. The implementation of this list will harmonize the 'playing field' for actors within the EU, however according to the Swedish Energy Agency there is still need for further definition of some of the fuels in this list [9]. For example are some lingo-cellulosic crops included both in the 7% cap and in the Annex IX, which creates confusion. Overall the list in Annex IX is positive for Sweden as it is in line with fuels under development. Examples of this are biofuels based on waste from forestry and industry, which are feedstock with large potential in Sweden. Additionally, the list in Annex IX also implies that fuels included in the feedstock mix in Sweden will be eligible for double-counting also in the future, however double counting is currently not applied in Sweden.

2.2 ENERGY TAXATION DIRECTIVE

The currently effective EU directive on energy taxation stems from 2003 [6]. This directive sought to harmonize energy taxes across the EU, 'primarily to avoid competitive distortions in the energy sector within the Internal Market' [15]. The directive set minimum tax levels, based on the volume of energy consumed, for energy products, including electricity, heating fuels and transport fuels. Biofuels are taxed according to the fuel it replaces [16]. Individual member states are free to set energy taxes at any level above the minimum. Article 16.1 of the directive states that member states are allowed to exempt or reduce taxes on biofuels, although 'the exemption or reduction (…) shall be adjusted to take account of changes in the price of raw material to avoid overcompensating for the extra costs involved in the manufacture of biofuels' [6]. This language is repeated and further specified in the limits imposed by the guidelines on state aid (section 2.3). The directive further states that the tax reductions ought to be removed when member states be required by Community law to comply with legally binding obligations to place on their markets a minimum proportion of (biofuels).

There has been a long running effort to revise the Energy Taxation Directive. There are many reasons for this. First, to make the energy directive more up to date with EU's ambitions in energy and climate change policies. Second, the directive must be restructured to avoid overlaps and gaps with the EU Emission Trading System (ETS). Third, as some member states are introducing a carbon tax it is preferable to introduce an EU wide tax instead to avoid a patchwork of national policies on the internal market. This would also give an improved price signal to reduce carbon emissions for sectors currently not covered by the EU ETS, which currently applies only to power and heat generation, energy-intensive industry and civil aviation. Forth, the proposal sought to remove the many exceptions and exemptions on minimum tax levels. Although the current directive sought to harmonize taxation levels, in reality it allows reductions or exemptions for a number of different fuel uses, in specific sectors, countries or other geographic areas; the description of exceptions actually makes up the bulk of the directive text. Finally, the proposal also argued that minimum tax levels were up for revision to keep up with inflation. Most countries have tax levels far above the minima, which are therefore increasingly losing relevance [15, 17].

Revisions to taxation matters are, however, challenging as it requires complete unanimity of member states. The most recent proposal, discussed since 2011 [18], has been controversial since it was drafted. According to the Swedish ministry of finance, the revised directive has been discussed by the Council 26 times since May 2011 until March 2014, but it has not been possible to decide by

unanimity, which is required for fiscal matters. Most member states agree that taxation can be divided in two components, energy content and fossil carbon. [19] The matters that have been up for discussion are; size of minimum tax level and transition periods, link between taxation and EU Emission Trading Scheme, how to handle biofuels in terms of taxation, tax reduction for diesel for professional use and tax reduction under minimum levels [19]. In the beginning of 2015 the European Commission withdrew the proposal (and it was dropped from the EC work program [11]), arguing too little progress in creating consensus among the member states.

The changes the proposed directive sought to bring about remain interesting, as they were in line with what is trying to be achieved via other instruments. The suggested revisions most relevant to biofuel stimulus were:

- Taxation should be differentiated into an energy component and a carbon component. These two parts will be combined to set an overall EU minimum tax rate.
- The carbon component of the proposal sought to introduce an EU wide minimum carbon tax levy for all sectors not covered by the EU ETS. The suggested levy would not be charged per liter, but by carbon content (specifically, €20/t of CO2 emissions; 0). Renewable fuels would be exempt from the carbon tax if they comply with the sustainability criteria defined in the Renewable Energy Directive [3] and in the Fuel Quality Directive [20]. The proposal further suggested that existing reductions in energy taxes for biofuels should be removed by 2023 at the latest.
- The energy part of the proposal stated that taxes would be set on the basis of energy content rather than volume (on a per liter basis). This would remove 'unfair competition between fuel sources and unjustifiable tax benefits for certain types of fuel compared to others' [15]. There is a strong discrimination against renewables, which are taxed at the same level per liter as the fuel they are intended to replace [15]. A liter of ethanol, for example, only has two thirds of the energy content of a liter of gasoline but would normally be charged at the same level of tax under the existing directive, unless national policy prescribes a reduction for the fuel.

Table 5. Minimum taxes in the energy tax directive and its failed proposal for revision. Sources: IPCC defaults for emission factors, tax levels from [6, 18].

	Energy content (MJ/l)	Emission factor (g/MJ)	Tax		Tax; €/liter; proposed			Current EU Minimum
			€/GJ	€/t CO2	energy	CO2	total	
Petrol	32.8	69.3	9.6	20	0.315	0.045	0.360	0.359
Diesel	35.4	74.1	9.6	20	0.340	0.052	0.392	0.330
Ethanol	21.3	0	9.6	20	0.204	0.000	0.204	0.359
Biodiesel	32.6	0	9.6	20	0.313	0.000	0.313	0.330

In Sweden the Energy Taxation Directive is implemented by 'Lagen (1994:1776) om skatt på energi'. Similar to the revised taxation directive the taxation on fuels in Sweden has an energy part and a carbon part. However, according to the Energy Taxation Directive from 2003 the energy taxation is based on volume, rather than energy content.

In 2015, the most used biofuels were HVO, FAME, ethanol and biogas [9]. The current taxation of these fuels is presented below (0), except for HVO and biogas that receive full tax exemption. In

March 2016 a suggestion for new taxation levels was presented (0), as the latest report to the Swedish energy agency had shown there was no overcompensation [21]. It is challenging to predict the level of tax reduction that is possible without overcompensating as prices on raw material is volatile (section 3).

Table 6. Swedish tax levels for main fuels (€/l) 2015 and 2016. Note: using 9.375 SEK/€. Source: [22]

Sweden	Tax (€/liter) in 2015			Tax (€/liter) in 2016		
€/l	Energy	CO2	Total	Energy	CO2	Total
Petrol	0.347	0.277	0.624	0.397	0.276	0.673
Diesel	0.196	0.343	0.539	0.251	0.342	0.593
Ethanol - Low blend	0.038	0	0.038	0.103	0	0.103
Ethanol - High blend	0	0	0	0.107	0	0.107
FAME - Low blend	0.031	0	0.031	0.231	0	0.231
FAME - High blend	0	0	0	0.126	0	0.126

Table 7. Changes in biofuel taxation in Sweden. Source: [21, 23].

Biofuel	Tax reduction as of January 1st 2016	Suggested tax reduction of March 2016
Ethanol - Low blend	74%	88%
Ethanol - High blend	73%	92%
FAME - Low blend	8%	36%
FAME - High blend	50%	63%
HVO	100%	100%
Biogas - Transport gas	100%	100%

2.2.1 Implications for future development of biofuels in Sweden

The Swedish government was supporting the suggested revised Energy Taxation Directive that was withdrawn in 2015 [16]. As described above the suggested taxation system was very much in line with the Swedish taxation system, with an energy taxation part and a carbon taxation part. The fact that consensus on the revised Energy Taxation Directive could not be reached, indicates that it is not likely that a similar framework will be in place in EU within a near future. Consequently Sweden will have to find a way to support biofuel development that is in line with the Energy Taxation Directive of 2003 and the Guidelines for state aid (section 2.3).

The most important implication of the current Energy Taxation Directive is that it allows tax reduction or exception of biofuels as long as it does not imply that the biofuel is compensated for more than its production costs, i.e. overcompensation. This is also enforced by the Guidelines on state aid. In order to make sure that no overcompensation on biofuels occurs the Swedish energy agency reports on this twice a year to the European Commission. In addition to this a requirement for tax reduction is that the biofuel fulfils the sustainability criteria of the Renewable Energy Directive, which is Sweden is proved by a so called ‘Hållbarhetsbesked’ (2.1.1).

Sweden supports biofuel via tax reduction, which is seen as state aid and requires a notification from the European Commission. The current tax reductions are approved as state aid until the end of 2018 for liquid biofuels and the end of 2020 for biogas [21]. It is, however, challenging to avoid unintended overcompensation as production cost is affected by volatile prices (section 3). In the

past, tax reduction levels have been changed frequently in order to avoid overcompensation. Currently, Sweden reports on overcompensation to the European Commission twice a year and taxation reduction levels are adjusted accordingly which results in a system that has the character of being shortsighted and difficult to predict. The Energy Taxation Directive from 2003 offers no solution to this situation.

The Swedish government expresses an ambition to introduce a more stable and long term support system. In fact, the current system (with taxation levels set in law) was an attempt to create a more stable system compared to the previous solution where taxation levels were decided on in parliament [16]. The ambition for the future includes a uniform energy tax based on energy content applicable for motor fuels and keeping the carbon tax that is based on the content of fossil carbon [16]. This is very similar to the revised Energy Taxation Directive that was withdrawn.

2.3 GUIDELINES ON STATE AID

Within the European Union state aid must fulfil certain criteria to be authorized by the European Commission as compatible with the internal market. The European Commission issues Guidelines on state aid to communicate what measures that will consider compatible with the common market and speed up authorization. The 'Guidelines on state aid for environmental protection and energy 2014-2020' were adopted by the European Commission in April 2014 and replace the former Guidelines for environmental protection from 2008, which also included rules on energy state aid [8]. In the following the key points of the two guidelines that are of relevance for the development of biofuels are presented.

2.3.1 Guidelines on state aid for environmental protection (2008/C 82/01)

The 'Guidelines on state aid for environmental protection' from 2008 [8] promoted the polluter pays principle and internalization of cost in order to increase the extent to which firms pay for the pollution they cause [24]. In principle, state aid is not compatible with these concepts, however, granting of state aid could be authorized in the form of investment and operating aid if it gave firms an incentive to invest in environmental protection. State aid could also be authorized to firms that had a relatively high financial burden in order to introduce an overall stricter environmental policy. Moreover, it is allowed to give state aid that is aimed at increasing adoption of environmentally friendly processes or technologies. An example of this is that for production of renewable energy state aid was eligible to cover 100% of the extra cost [24].

State aid should contribute to additional positive effects on the environment. Therefore, aid could only be directed towards the extra cost that was linked to achieve better environmental protection compared to options that only implied fulfilling the mandatory standard or an option that was less environmentally friendly [24]. This meant that investments that increased the level of environmental protection but were not more costly than other options were not eligible for aid. Additionally, investment aid intensity was normally less than 100% of the additional cost, as these types of investments were considered to generate other beneficial results (e.g. improved operation and image) that triggered firms to invest.

There were some cases where investment intensity could be 100%. One example is if state aid was linked to a bidding process. Another was for production of renewable energy and cogeneration

where operation aid could be granted in addition to investment aid to cover the difference between production cost and the market price (covering 100% of extra-costs) [24].

Some cases of state aid were subjected to detailed assessment even if they were granted under a scheme that was approved by the Commission. Most notably for the development of biofuels are: i) investment aid that exceeded € 5 million for per undertaking for five years and ii) operation aid for production of biofuels in sites where the resulting production exceeded 150 000 t per year [8].

2.4 GUIDELINES ON ENVIRONMENTAL AND ENERGY STATE AID (2014/C 200/01)

In April 2014, the European Commission adopted new 'Guidelines on environmental and energy state aid for the period 2014-2020' [7]. These guidelines replace the former Guidelines for environmental protection from 2008 [8]. The objectives of the new guidelines are (in line with the Europe 2020 strategy): i) to foster sustainable, smart and inclusive growth in a competitive internal market, ii) to allow the Commission to focus on cases with the biggest impact on the internal market and iii) streamline the rules and provide for faster decisions [7].

The European Commission states that public support to renewable energy has induced growth in recent years, but also caused market distortions and made consumers pay a high price for electricity. Therefore, the new guidelines promote a gradual move to market-based support for renewable energy and include detailed clarifications on state support to energy-related activities, particularly electricity generation technologies [7]. This implies that the guidelines encourage an introduction of auctioning or competitive bidding processes and that feed-in tariffs are replaced with feed-in premiums.

The guidelines identify a set of measures under which aid under certain conditions may be compatible with the internal market. From this list the most relevant measures for the development of biofuels are [7]:

- Aid for early adaption to future EU standards
- Investment and operation aid for energy from renewable sources
- Operating aid in the form of reductions in or exemptions from environmental taxes
- Aid for energy infrastructure

Notifiable aid relevant for development of biofuel is [7]:

- Investment aid: where the aid amount exceeds € 15 million for one undertaking
- Operation aid for the production of biofuel: where the aid is granted to a biofuel production installation at sites where the resulting production exceeds 150 000 tonnes ('t') per year.

In general operating aid for renewable energy is only allowed until the plant is fully depreciated. However, in the case of biomass the investment cost might be relatively low and the operating cost higher. Therefore operation aid can be compatible with the internal market also after the plant is depreciated [25]. The guidelines have detailed criteria for when operating aid to biomass plants are allowed after depreciation, including mechanisms for monitoring so that no overcompensation occurs.

It is important to note that if the biofuel is subjected to a quota, i.e. legally binding obligations for supply or blending, no operation aid is allowed [25]. Under a quota schema it is necessary to apply the same total tax per liter of biofuels as for fossil fuels.

Additionally, for first generation biofuel operating aid can only be granted to plants that have started their operation before December 31 2013 until the plant is depreciated, but not longer than to 2020 [16].

Approval for notifiable aid hinges on a number of criteria, most notably for the development [26]:

- The stimulus measure may not benefit certain operators more than others.
- No overcompensation. Tax exemptions may only account for the difference in production costs between biofuels and fossil alternatives. Calculations on production costs have to be updated regularly, at least every year.
- Tax exemptions need to have a temporary nature. The commission may authorize measures of up to four years.

In Sweden both the energy and carbon tax can be considered environmental taxes and reductions or exemptions of these can be considered state aid [21]. Reductions of these taxes on biofuel is approved state aid until end of 2018 on liquid biofuel and until the end of 2020 on biogas [21].

According to the new Guidelines on state aid, to allow tax reductions on biofuels in Sweden it must be shown that the first generation biofuel is produced in plants that have started their production before 31 December 2013 and are not fully depreciated. The Swedish government has therefore introduced so-called production plant permit (Anläggningsbesked) [27]. All producers of biofuel (both first and second generation) must have this document to show that either production of first generation biofuel is according to what is state above or that no first generation biofuel is produced. In addition production plant permit applies both to biofuel produced in Sweden and elsewhere (if sold in Sweden). Production plant permit has been implemented in law and is valid from 1st of January 2016.

Another result of the new Guidelines on state aid is a suggested law change that will increase the transparency of what actors that receive tax reductions [28]. The proposed changes imply that information should be published, on a webpage, regarding what firms that receive tax reductions and some information on these firms. In particular, it must be shown that tax reductions are not given to firms that are under financial distress. These changes are suggested to be implemented in law by July 1st 2016.

2.4.1 Swedish cases on notified state aid

Swedish history of support for biofuels and friction with EU policy can be traced in the list of the country's rulings on state aid (0), which are found in the state aid portal[3].

[3] http://ec.europa.eu/competition/elojade/isef/index.cfm

Table 8. State aid notifications on biofuel support in Sweden.

Policy Area	Case Number	Member State	Last Decision Date	Title	
State Aid	N480/2002	Sweden	11.11.2003	Biofuels	Show details
State Aid	N112/2004	Sweden	13.03.2006	Tax exemption for biofuels	Show details
State Aid	N592/2006	Sweden	06.11.2006	Tax Exemption for Biofuels; Prolongation	Show details
State Aid	N539/2010	Sweden	17.12.2010	Amendments to the Tax Exemption for Biofuels - Sweden	Show details
State Aid	SA.35414	Sweden	16.01.2013	Changes in the Swedish Energy taxation regarding biofuels for low-blending	Show details
State Aid	SA.36973	Sweden	26.11.2013	Tax exemptions for biofuels - prolongation	Show details
State Aid	SA.36974	Sweden	26.11.2013	Changes in the Swedish Energy taxation regarding biofuels for low-blending	Show details
State Aid	SA.38420	Sweden	24.06.2014	Prolongation of tax exemptions for biofuels in Sweden	Show details
State Aid	SA.38421	Sweden	24.06.2014	Prolongation of the Swedish energy taxation of biofuels for blending	Show details
State Aid	SA.43301	Sweden	14.12.2015	Tax exemptions and tax reductions for liquid biofuels	Show details

1 to 10 of 10

As can be seen in Table 8, tax reductions on biofuels and biogas was initially approved by the Commission in 2003 [29]. This decision was modified and prolonged in 2006. During this time the 2001 Community Guidelines on State Aid for Environmental Protection have been replaced by the 2008 Community Guidelines on State Aid for Environmental Protection, which includes a definition of sustainable biofuels. Only fuels that fulfil this definition can receive support. Already with the first support systems for biofuels in Sweden, Swedish authorities had to show that the aid did not imply overcompensation to producers of biofuels, which would violate the internal market. Annual monitoring reports are sent to the Commission.

In 2010 the support to biofuels in Sweden was amended, the maximum blend level for different fuels is adjusted, e.g. 6.5% for ethanol [30]. However, as the market did not change accordingly the system for biofuel support is changed again in 2013 to better reflect the market, e.g. maximum level for ethanol blend is changed back to the previous level of 5%, [31].

The approval for support to biofuels and biogas from 2006 was valid until 2013 and therefore a new prolongation was made in 2013. In their evaluation the Commission assessed the Swedish system compared to the new (2008) Guidelines on state aid, as the old approval was based on the previous guidelines. The Commission has also assessed the compatibility of the notified measure with the internal market and comparison is made with support to biofuels in Germany and Czech Republic [32].

The support scheme was prolonged again in 2014. Initially, Sweden had intended to introduce a quota obligation for biofuels for low-level blending with petrol and diesel on 1 May 2014. The introduction of the quota obligation would have been flanked by an increase in the energy tax for biofuels which, according to the Swedish authorities, would on balance avoid any overcompensation [33]. However, the Swedish authorities have decided to postpone the introduction of the quota obligation, which leaves some uncertainty. Additionally in the past period of the support scheme, FAME has been overcompensated. To prevent this from happen again the tax level should be increased to provide a safety margin and Swedish authorities commit to report more frequently than once a year to the commission, this enables more frequent adjustments of tax levels [33]. Another adjustment made to the Swedish support scheme is that the threshold for high blend of HVO (of 15%) is abolished in order to treat high blend HVO and FAME in the same way [33].

Sweden has applied for prolonged tax reductions for biogas and biofuels again during 2015. The Commission has approved the support scheme until 31 December for 2018 for liquid biofuels and 31 December 2020 for biogas used for transport. As the Guidelines for state aid has changes since the last approval it implies that the biofuel support scheme must be adjusted to this.

2.4.2 Implications for future development of biofuels in Sweden

The effects of the new guidelines that are of most concern for the stimulus for biofuel development in Sweden are:

- According to the State aid guidelines tax reduction or exemption cannot be combined with a quota obligation. Thus, member states have to choose between a quota or full or partial tax reduction.
- For first generation biofuels there is no aid after 2020 and no operation aid to plants that started their operation before 31 December 2013. For all types of biofuel (First and Second generation) operation aid is only allowed until plants are fully depreciated [16], with some exceptions described above.
- For biofuels to be eligible for support they must be sustainable according criteria set up in the Renewable Energy Directive and amended in the Iluc Directive.
- Overcompensation is not allowed. To prove that this does not occur regular control is necessary.

Although the EU's Guidelines on state aid are general applicability to all member states, there is room for individual member states to differentiate in a number of ways. Sweden, thus, have the following choices

- A fuel blending mandate (the 10% target through other measures).
- Or to exempt biofuels from CO_2 and or energy taxes, and to what level.
- A sub-target in fuel blending mandates for e.g., diesel, petrol or gas alternatives.
- Whether to implement double-counting for waste-based biofuels in obligations to fuel distributor.
- Whether to allow trade in mandates between fuel distributors.

3 PREVENTING OVERCOMPENSATION WITH VOLATILE FEEDSTOCK PRICES

There is an obvious tension between the requirement to prevent overcompensation, which is emphasized in the Guidelines on state aid and the Energy Taxation Directive, and the desire to stimulate biofuel consumption with tax reductions. It is possible to calculate relatively reliable estimates of the production cost of both fossil and biofuel alternatives, given a known level of oil and feedstock price. From these, the maximum level tax exemption can be derived. Such an exercise is complicated, however, by the considerable price variation in both oil and agricultural feedstock (0).

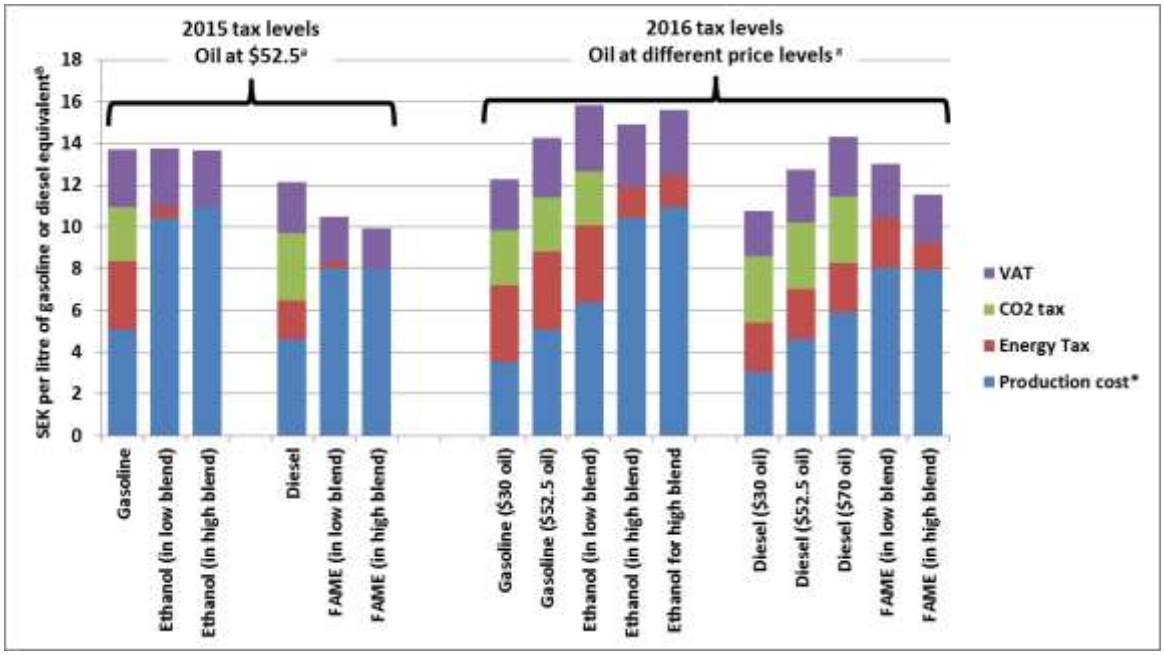

Figure 4. Prices of main fuels at different tax regimes and oil prices

Notes: a) $52.5/barrel was the average oil price over 2015 (Brent crude); during January 2016 this price has shortly fallen to as low as $30, whilst the US EIA predicts roughly $40 on average throughout 2016 [34]; b) per liter costs of biofuels have been adjusted for their energy content (ethanol adjusted to gasoline and FAME to diesel), using values of 32 MJ/l for gasoline, 21 MJ/l for ethanol, 36 MJ/l for diesel, and 33 MJ/l for FAME, as used by the EC [3]);*) Production cost is including gross margin as reported by SPBI [35], extrapolation of production cost to other oil price levels done by multiplying 2015 average production cost (exclusive of gross margin) and adding the same gross margin as averaged in 2015. Biofuel prices calculated using the method and cost levels used in documents notifying state aid by Swedish government agencies[36]; feedstock price levels of €164.5/t for feed wheat [37]; and €698/t [38]; for rapeseed oil (2015 averages, with stable prices expected in the near term [39]), consumption levels of 2.66kg wheat per liter of ethanol and 0.95 kg rapeseed oil per liter of FAME [40].Taxation levels from Swedish Tax Agency [22].

Over the last ten years, prices for wheat and maize have moved, roughly, between €120 to €250/t. Sugar beets have moved roughly between €25 and €45/t [41], and rapeseed oil between €550 and €950/t [42]. Prices for used cooking oil (UCO) and animal fat have been reported between circa €300 to €850/t [43, 44], although this variance is due in part to varying qualities (e.g., level of purity, type of contamination), as well as demand levels for biofuels and prices of competing biofuels. The price of crude oil has, over the last ten years, regularly moved between circa $50 and $130/barrel.

This matters, because the production costs of biofuels depend strongly on the costs of feedstock. These make up circa half to two-thirds of wheat or corn based ethanol, and even 70 to 90% of FAME, HVO, or UCO biodiesels. The cost for production of gasoline and diesel depend strongly on the price of oil, although final prices to consumers are more strongly determined by tax components.

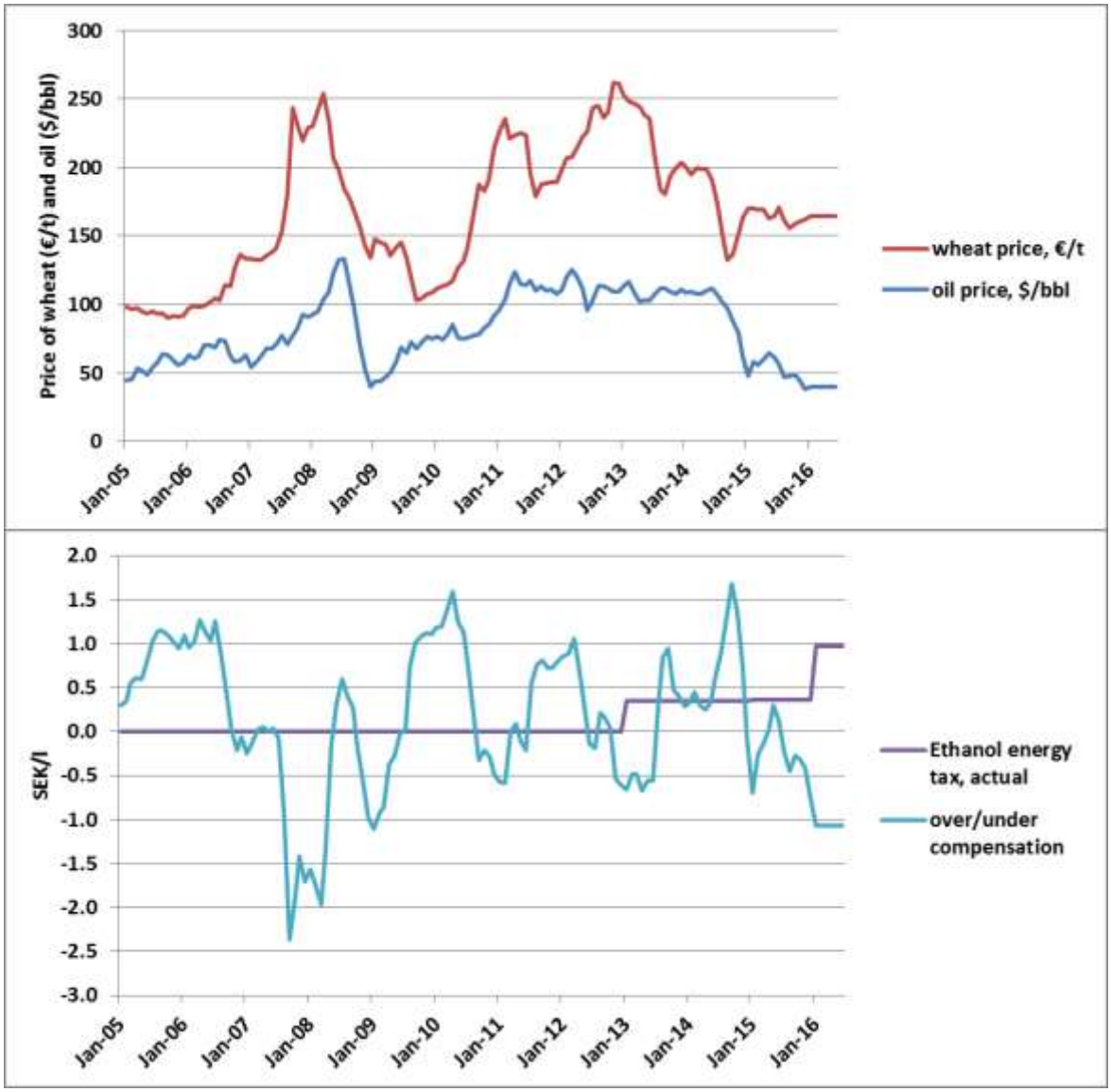

Figure 5. Volatility of oil and wheat prices and resulting overcompensation.

Notes: calculation as in 0. January 2016 and onwards are yearly average estimates, provided for comparison purposes. Sources: wheat price from EUROSTAT (feed wheat) [45], oil price from US EIA [43]; ethanol tax levels from Swedish Tax Agency [22].

There is a relation between price levels of agricultural commodities and oil. Agricultural production requires energy inputs for machinery, fertilizer production, and transport. With increasing levels of consumption of crop based biofuels, these prices also become increasingly related through demand: as oil prices increase, demand for biofuels and therefore agricultural commodities go up [46]. Although this is not an exact relation, it is very unlikely to see low prices of agricultural commodities during a period of low oil prices (0, top).

Still, it remains difficult to assess, beforehand, the level of energy taxation at which the prices of biofuels and fossil alternatives are approximately equal. First, because the direction as well as the speed with which prices will develop are rather uncertain, even in the short to medium term. For example, the EUs Joint Research Centre has compared different models and assumptions and found that predicted price levels essentially vary between historical maxima and minima (Figure 6). Further, although agricultural and energy markets are connected, the timing and extent of peaks or valleys in both are not exactly equal (0, top). Because of this, the level of taxation at which the price of biofuels and its fossil alternatives are kept equal may quickly and significantly rise or fall (0, bottom).

EU policy pushes towards second generation biofuels. Currently, for these fuels fixed (capital) costs are much higher, whilst feedstock costs (food waste, crop residues, forest industry wastes) are much lower and much less volatile. This could indicate that production costs can be more stable and easier to predict, giving less risks for over or under compensation. Notably, this situation could change for example by increasing demand for renewable feedstock.

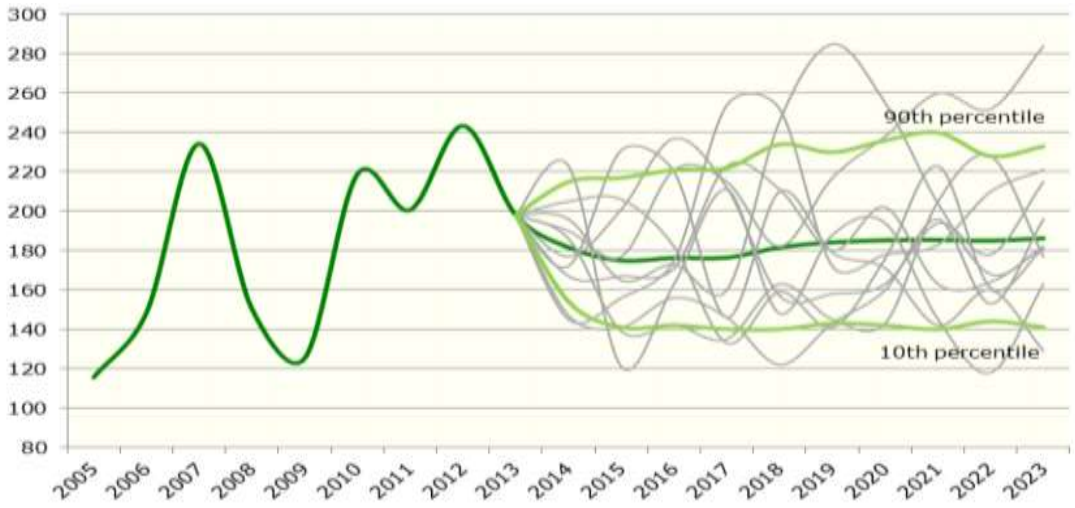

Figure 6. Historical and possible future price paths for common wheat in the EU(€/t). Source: [44].

4 SWEDISH PERSPECTIVES ON THE FUTURE STIMULUS OF BIOFUELS

This section reflects the context in which the development of national stimulus to biofuels takes place by presenting opinions held by government, industry associations and firms.

The Swedish government has stated that a more long term and stable system for biofuel stimulus is necessary [47]. Currently, biofuel development is supported by temporary tax reductions that require state aid notification. Additionally, to verify that no overcompensation occurs the Swedish Energy Agency report to the European Commission twice yearly and taxation rates are adjusted accordingly.

The Swedish government seems to seek a way forward that is combining a quota and an energy tax on energy content and carbon tax on fossil carbon [16]. In November 2013 the Swedish parliament accepted a law on quota for biofuels (Lagen 2013:984), with implementation planned to 1st May 2014. However, in June 2014 the government had to withdraw the law as the tax reduction that was suggested in combination with the quota would not receive state aid notification [48]. In November 2014 the parliament decided that the law was abandoned. Thus, the challenge is to design a system that is combining a quota and tax reductions on some fuels that is in line with the Guidelines on state aid.

Introducing a quota could represent a more stable and long term support scheme than the current system. Lantmännen Energi and BIODRIV, which represents the industry, state that a quota is an acceptable way to support low blend of biofuels, but that high blend fuels (such as E85, ED95, B100 and HVO) need to be outside such a system [49, 50]. According to these actors a quota system is best set up with different biofuel quotas depending on the fossil fuel it replaces. High blend fuels should be exempted from both energy and carbon tax at least until 2020, so that there is enough time to accurately investigate how ambitious targets and other measures that are needed to include these fuels in the quota system [49, 50]. Moreover, Lantmännen Energi and BIODRIV emphasize that if Sweden is to reach its ambitious target for the transport fleet it is important to have high blend fuels and to evaluate fuels on GHG emissions from the whole life-cycle, rather than raw material and production technology [49, 50]. The main challenge with the system suggested by these industry actors is that according the Guidelines on state aid a quota cannot be combined with tax reductions on certain fuels. Additionally, the Energy Taxation Directive from 2003 is based on energy taxation on volume and consensus among member states could not be reached on the revised proposal for energy directive that was in line with what these actors suggest. Thus, it is not likely that the Energy Taxation Directive will be revised in a near future.

Also SPBI (the Swedish Petroleum and Biofuel Institute) finds the current system unpredictable and not sufficient to support biofuel development. As an example of this they point to the situation for E85 for which overcompensation occurred in 2015 and consequently the tax was increased by the start of 2016, but at this time prices has changed and E85 is now more expensive than gasoline [51]. SPBI is in favor of a quote system, but does not express a need keep high blend fuels outside such a system [52]. SPBI point out that a positive result of introducing a quota is that the Swedish system would be more in line with other member states [52].

5 INTERNATIONAL OUTLOOK – QUOTAS ARE COMMON IN THE EU

This section gives an overview of support to biofuel development in other European counties. A common way to support the development of biofuel is with a quota, which means that a certain share of the fossil fuel shall be substituted by biofuel. 0 gives an overview of the quota system in the 17 countries that replied to a questionnaire conducted by the Swedish energy agency in 2014 [23]. Some countries have the same quota for the whole transport sector, including all or some biofuels. Others have different quotas for different biofuels. Most common is a quota for low blend ethanol and another for low blend biodiesel. In many countries the quotas are gradually increasing towards 2020 [23]. It is also common that the quotas are combined with tax reductions or exemptions. However, the overview in 0 was conducted in 2014 before the new Guidelines on state aid and the ILUC directive was introduced, so it is likely that many countries will have to review their support to biofuels.

Table 9. Examples of quota system in other European countries.

Country	Quota level	Quota based on	Biofuel tax	Other support
Belgium	6%	Volume	-	
Denmark	5,75%	Energy content	Energy tax	Biofuels are exempted from carbon tax
Finland	6-20%	Energy content	Energy tax, carbon tax	Biofuels have a 50% carbon tax reduction. HVO and other advanced fuels have a 100% carbon tax reduction. Only fuel producers that produce more than 1mn l per year must fulfil the quota.
Greece	7%	Volume	Excise tax	
Ireland	6,383%	Volume	Excise tax, carbon tax	Option to buy-out for 45 cent per l.
Croatia	Bioethanol: 16,2-16,3ktoe Biodiesel: 55,6-121,6ktoe Other: 0-5,1ktoe		Excise tax	Low blend biofuel and pure biofuel are exempted excise tax. Quota only for low blend
Malta	4,5-10%	Energy content	Excise tax	Biofuel based on marine biomass and used cooking oil are exempted from tax.
Norway	From 2014 10%	Volume	Carbon tax, road tax	Biofuels are exempted from carbon tax. Road tax is reduced; 50 % for biodiesel, 100% for high blend bioethanol and biogas.
Poland	7,1-8,5%	Energy content	Excise tax	
Slovakia	4,5-8,5%	Energy content	Tax based on content of mineral oil	Two levels of tax on fossil fuel. Producers that fulfil the quota get the lower tax level.
Spain	Biodisel: 4,1% Biofuel for blend in gasoline. 3,9% Total: 4,1%	Energy content	Hydrocarbon tax at regional and national level. National level include excise tax	Hydrocarbon tax differs for different fuels. For biofuels the tax level is the same as for the fossil fuel they replace.
Great Britain	4,987%	Volume	Tax per liter fuel	
Germany	Biodiesel and bio-fuels for low blend in gasoline 6,25%	Energy content	Energy tax	Biofuels that are above the quota have a tax exemption.
Czech Republic	Bioethanol: 4,1%, Biodiesel: 6%	Volume	Excise tax	Quota only for low blend. B100, B30 and E85 have an exemption on excise tax.
Hungary	Bioethanol and biodiesel: 4,9%		Excise tax	E85 exempted from excise tax
Estonia	5-10%	Energy content	Excise tax	Biogas has an exemption on excise tax
Austria1	5,75-8,45%	Volume	General tax	Tax reduction on low blend fuels and tax exemption on pure biofuels.

Note: 1 Austria does not have a quota but an 'obligation to substitute', which requires that fuel suppliers have to substitute a certain volume of fossil with biofuel. In contrast to a quota this can be offered to customers in the form of pure fossil fuel as long as pure biofuel of certain volume is also offered. Source: [23].

5.1 COMPARISON OF SWEDISH TAX EXEMPTIONS AND FINNISH QUOTA

The biofuel goals set within EU target two transitions; away from crop based fuels and towards high-blend markets, as low blend solutions would never allow consumption levels of very far over 10% volume of all fuel. A somewhat simplistic dichotomy is that the former goal could be realized most easily with ambitious quotas including double-counting, whereas the latter is most easily realized with strong tax exemptions. Good examples reflecting these divergent paths are the Finnish and Swedish market developments, summarized in 0.

Table 10. Biofuel policies: comparison of Finland vs. Sweden.

	Finland	**Sweden**
Biofuel % (2015)	8%	13%+
Policies	Mandate: 8% in 2015; 20% by 2020 Double counting ~20% tax exemption (exempt from CO2 tax component, not excise tax)	No mandate No double counting ~100% tax exemption Minimum 1 ren. fuel per station Tax benefits on flex-fuel cars
High blends	Marginal	EU leader
Advanced biofuels	EU leader	Smaller extend compared to Finland

Both countries are near the top when considering current biofuel consumption, as a percentage of all motor fuels; Sweden is number one by a large margin [53]. Developments in Finland have taken of somewhat later than in Sweden, but that market is one of the fastest growing markets in the EU [53]. In the EU, Finland is one of the leaders in implementing advanced biofuels, whilst Sweden is the only market with a significant high blend market share.

The Finnish success is thanks in large part to the ambitious quota (based on energy content); up to 8% already in 2015, and a 20% target for 2020 recently adopted [54]. As shown in 0 the same quota applies for all biofuels. Ethanol blends are allowed in 5% or 10% v/v; with the latter recommended only for vehicles from 2001 or newer. Ethanol energy content is approximately 66% of that of gasoline, so even the 8% target of 2015 pushes fuel distributors to double-counted fuels in order to meet mandate targets whilst staying below the blend wall. This strong focus on second generation biofuels has already resulted in investment in production capacity. St1 biofuels has 7 fuel plants; 5 running on bread, bakery and/or brewery wastes, one running on municipal bio based waste, and another one starting production 2016, running on forestry industry wastes. Combined production capacity is 23 Ml. UPM has recently started producing ethanol from tall oil, a waste product from paper pulping, in a plant with a capacity of 115 Ml. Neste Oil produces 215 Ml bio-diesel annually in Finland and has further production capacity in the Netherlands and Singapore. The feedstock used is circa 2/3 used cooking oils and animal fats, and 1/3 palm oil; the aim is to be running on 100% waste oils and fats by 2017 [55]. Although a number of fuel distributors have made high blend ethanol (E85) available to consumers, demand is lacking. Ethanol is exempt from CO_2 taxation (16.3 €ct/l of petrol). It is not exempt from energy taxes, which is 51.2 €ct/l of petrol or 33.6€ct/l of ethanol (an equal level when accounting for the differing energy content of the two fuels). This means pump prices to consumers are higher, and few consumers have been willing to invest in flex fuel vehicles, which are more expensive to purchase as well.

The Finnish system is nearly the exact opposite of the Swedish system with its lack of quota (and double counting) but strong tax incentives, which have meant that pump prices to consumers of high blend ethanol (E85) have regularly been lower than those for petrol (even when correcting for energy content; see also **Fel! Hittar inte referenskälla.**). This, and further fiscal benefits for 'environmental cars', which include flex fuel vehicles, and an obligation to fuel distributors to offer at least one environmental fuel at each filling station, has enabled a strong growth of the high blend ethanol market. Second generation biofuels, on the other hand, have not taken of to the same extent in Sweden as they have in Finland. However, several types of second generation biofuels are produced. St1 has recently opened a 5 Ml ethanol plant based on bread and bakery waste, and Lantmännen Agroetanol, a Swedish biofuel producer, is feeding an existing wheat based ethanol refinery with similar wastes as well. Sweden's most advanced bio-refinery is the Domsjö plant in

Örnsköldsvik. This plant was developed by SEKAB as a pilot to demonstrate the potential of using forestry industry wastes into fuel. SEKAB initially had plans to expand the pilot plant to more commercial sizes, but opted to sell the plant to SP Processum, which continues to run tests at pilot scales today. The difficulty of realizing commercial value of waste-based ethanol in a market that does not differentiate between first and second generation ethanol proved difficult. Production of biogas both via fermentation and gasification has increased in Sweden. The two largest facilities are Jordberga Biogas (fermentation) and GoBiGas (gasification). Finally, since 2011 Preem produce HVO from tall oil, which is sold in Sweden.

5.2 BIOFUEL STIMULUS SCHEMES AND THE GUIDELINES FOR STATE AID

A member state must notify the European Commission and receive an approval before a new state aid or amendments to existing state aid can be become effective. In addition, the state aid cannot be permanent. Since 28 of April 2014 when the new Guidelines on state aid was introduced and until today (June 2016) 9 state aid cases has passed their decision date (0).

However, some of the cases in the below figure are decisions on cases that was initiated before the implementation of the new State aid guidelines. For example, the case with Spain regards the bio-fuels scheme that was approved by the European Commission in 2006. The Commission raised doubts as Spain may have overcompensated beneficiaries in 2010. The case included in 0 is the positive decision from the Commission after having received additional information from Spain. This means that no changes to the Spanish system has been done after the new Guidelines on state aid was introduced [56]. The case in Lithuania in 2014 is also a result of an investigation by the Commission that suspected that the country did not implement the scheme in compliance with decisions of the Commission. The investigation ends with a positive decision. On the Lithuanian case from 2016 no information is provided in the database. The German case regards support to gaseous biofuels and gaseous biomass heating fuels that the country informed the Commission about in 2012. It was approved by the commission in 2014.

Table 11. Cases on state aid from 2014 until June 2016.

Policy Area	Case Number	Member State	Last Decision Date	Title	
State Aid	SA.18042	Spain	09.07.2014	Tax exemption for biofuels	Show details
State Aid	SA.18832	Lithuania	11.06.2014	Biofuel - Environmental Protection	Show details
State Aid	SA.33313	Lithuania	25.01.2016	Excise duty reduction for biofuels	Show details
State Aid	SA.34412	Germany	09.07.2014	Tax exemption for gaseous biofuels, gaseous biomass heating fuels and landfill and sewage gases	Show details
State Aid	SA.38420	Sweden	24.06.2014	Prolongation of tax exemptions for biofuels in Sweden	Show details
State Aid	SA.38421	Sweden	24.06.2014	Prolongation of the Swedish energy taxation of biofuels for blending	Show details
State Aid	SA.39654	Czech Republic	17.11.2015	Multi-annual support to biofuels for transport	Show details
State Aid	SA.42776	Finland	16.12.2015	Support to the St1 biofuels plant	Show details
State Aid	SA.43301	Sweden	14.12.2015	Tax exemptions and tax reductions for liquid biofuels	Show details

1 to 9 of 9

Two cases are of interest for Sweden. One case is Finland, which has a support scheme very similar to the one proposed by the Swedish government in 2014. However, a public version of this decision is not yet available. As a quota system in combination with tax reductions for biofuels is already

introduced (0) it can be assumed that Finland has submitted a pre-notification, but that the European Commission has not yet made a decision on this. A negative decision from the Commission could make the Finnish industry actors obligated to repay.

Another case is the biofuel support scheme in Czech Republic. The notified measure from 2015 is a prolongation of an existing scheme previously approved by the European Commission [57]. The aid is granted in the form of an excise duty reduction for high concentration biofuel blends4 in proportion of their biofuel content [57]. Biogas and advanced biofuels are not currently available for commercial use in the Czech Republic, but are in principle eligible for support.

This case is of interest for Sweden as the Czech Republic is combing the tax reduction with a quota (0). The rational for approving this system under the Guidelines on State aid for environmental protection and energy 2014-2020 is shown in the following quotes [57]:

- The Czech Republic confirms that all biofuels that are subject of support are sustainable pursuant to the Guidelines for state aid.
- The Czech authorities confirm that of the biofuel production plants in the Czech Republic to benefit from support, none will be depreciated by 2020.
- The Czech Republic also commit that installations producing first generation biofuels that start operating after 31 December 2013 will not benefit from the aid measure.
- The notified measure will result in aid being granted to pure and high-percentage biofuels that are also subject to a binding supply or blending obligation. However, in respect of FAME/RME and ethanol, the maximum economic benefit derived from the supply obligation is lower than the average support required as of 1 July 2015. In the case of vegetable oil and biogas, the Czech authorities explain that these biofuels have not yet been supplied onto the Czech market and are not expected to be until 2016. Thus, the Czech Republic has demonstrated that aid is limited to sustainable biofuels that are too expensive to come on the market with a supply or blending obligation only. Hence, and taking into account that the planned amendment to Act No. 201/2012, the notified measure will increase the level of environmental protection (paragraph 114 EEAG).

The decision is as follows: The European Commission regrets that the Czech Republic put the measure into effect, in breach of Article 108(3) of the Treaty on the Functioning of the European Union. However, it has decided, on the basis of the foregoing assessment, not to raise objections to the aid on the grounds that it is compatible with the internal market pursuant to Article 107 (3) (c) of the Treaty on the Functioning of the European Union [57 p. 16]. Thus, the scheme can continue, but a result of the fact that the scheme was put in place before it had received a notification from the Commission is that industry actors have to pay back part of the tax reductions that they have received. This is done by adjusting future tax levels to compensate for too low tax levels in the past.

[4] The following biofuels are to be supported: FAME B10010, vegetable oil, MDF B30, ethanol E85, ethanol E95 and biogas.

6 THE FUTURE FOR BIOFUEL STIMULUS MEASURES IN SWEDEN

Current EU directives, particularly recent amendments, and guidelines on state aid have a direct impact on Sweden's biofuel stimulus and the country's ability to fulfil its ambitious targets for the transport sector. This report aims to give an overview of the complex EU legislation and its implications for Swedish stimulus measures for biofuel development. The key findings of the report are presented here.

In the coming year (mid-2016 to mid-2017) Sweden will have to implement the 'Iluc' Directive, but all details of what this will mean for biofuel stimulus are not yet known. However, the 'Iluc' Directive sends clear signals that already can be presented.

The 'Iluc' Directive steers away from additional support to first generation biofuels in Sweden. There are two reasons for this. First, the 'Iluc' Directive introduces a cap of 7% on use of first generation biofuels in the target for the transport sector, which implies that there is little incentive to stimulate use of biofuels above the cap. In Sweden the use of first generation biofuels is already close to the 7% cap, which gives little incentive to additional support. Second, the 'Iluc' Directive also introduces stricter sustainability criteria, which implies that the greenhouse gas emission threshold values are changed. For installations producing biofuels before the directive entered into force a 50% greenhouse gas emissions savings by January 2018 is required. Installations starting production after the directive is officially published are required to meet a 60% threshold immediately. This dramatically reduces the possibility for additional first generation biofuel capacity in Sweden and elsewhere in the EU.

Additionally, as the name indicates the 'Iluc' Directive introduces estimates of life-cycle emissions for 'indirect land-use change' values for different crop feedstock. Member states will have to report these values, but iluc values are not accounted for when comparing with the thresholds for greenhouse gases emissions. Hence, so far this is only an administrative task with limited implications for Sweden.

On the positive side, the 'Iluc' Directive strives to motivate use of second generation biofuels by defining what fuels are eligible for double counting towards the 10% target for 2020. Member states are also obligated to set a target for the use of these fuels. For Sweden, the definition of these advanced biofuels is positive as it is in line with the biofuels under development.

Since biofuel production and use in Sweden is currently supported via full or partial tax reduction another directive with implications for biofuel stimulus is the Energy Taxation Directive. Minimum energy taxation levels are set in the Energy Taxation Directive from 2003. The directive allows tax reduction on biofuels as long as it does not imply overcompensation. A revised Energy Taxation Directive was suggested in 2011, but withdrawn in 2015 since the unanimous consensus required for its adoption could not be reached. The revised directive was very much in line with the structure for energy taxation implemented in Sweden. If the revised directive had been introduced it would probably have been easier to design a long term biofuel taxation structure in Sweden. However, given the unsuccessful but sincere attempt to find consensus on the revised directive it is not likely that a new Energy Taxation Directive similar to the revised version is adopted before 2020.

The new Guidelines on state aid were adopted by the European Commission in April 2014 and introduce several limitations to how biofuel development can be stimulated. Support to biofuels via tax reductions, as implemented in Sweden, is considered state aid, which requires approval by the European Commission. State aid approval is only given on a temporal basis, which implies that it is difficult to construct a long-term biofuel stimulus scheme based on the current policy system in Sweden.

Additionally, like the Energy Taxation Directive, the Guidelines on state aid does not allow over-compensation. Avoiding overcompensation can cause disruption in biofuel support schemes. The reason for this is that price variation can result in unintended overcompensation due to the time lag between rapid price variations and more seldom changes in tax reduction levels. For Sweden, the consequences of this can be both unintended overcompensation that results in unforeseen changes in support schemes and noncompetitive market prices of biofuels.

Like the 'Iluc' Directive, the Guidelines steer away from first generation of biofuels by stating that first generation biofuels are not eligible for aid after 2020. For biofuels to be eligible for support they must be sustainable according to the criteria set up in the Renewable Energy Directive and the 'Iluc' Directive. The guidelines also introduce limitations for operation aid for biofuel plants as no operation aid should be given to plants that started their operation before 31 December 2013 and operation aid is only allowed until plants are fully depreciated.

For biofuel stimulus in Sweden another important implication of the Guidelines on state aid is that a tax reduction cannot be combined with a quota obligation. This has already led to withdrawal of planned biofuel support in the form of a law on quota for biofuels with implementation planned to 1st May 2014. However, the government had to withdraw the law as the tax reduction that was suggested in combination with the quota would not receive state aid notification.

Sweden is not the only member state that wishes to combine a quota and tax reductions on some biofuels. Both Finland and Czech Republic have introduced support schemes (quota and tax reduction) without waiting for approval from the European Commission. In the Czech case it has not been appreciated by the European Commission, who required the Czech Republic to adjust future taxes on biofuel in order to compensate for previous tax reductions. Finland is still waiting for a decision from the European Commission.

The Swedish industry's opinion on a future support scheme is quite clear. A quota system, as in many other European counties, is preferred. However, tax reduction to support the development of high blend fuels is also requested and this combination is hindered by the Guidelines on state aid. The Swedish government seems to prefer to play by the law, which implies waiting for an approval by the European Commission before introduction of a support scheme. By acting in this way the Swedish government does not risk that the industry has to pay back support gained. Thus, the challenge for the Swedish government is to design a biofuel stimulus scheme that is long term and unlike the current temporal tax reductions, and therefore does not need state aid approval.

REFERENCES

1. Energimyndigheten, *Energiläget i siffror* 2016.
2. Martin, M. et al. Reviewing the Environmental Implications of Increased Biofuel Consumption in Sweden, Report No 2016:08, f3 The Swedish Knowledge Centre for Renewable Transportation Fuels, Sweden. Available at www.f3centre.se. 2016.
3. European parliament and council, *DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC*. 2009.
4. Regeringen Miljö- och energidepartementet, *Regeringens proposition 2008/09:162 En sammanhållen klimat- och energipolitik. Klimat.* 2008.
5. European parliament and council, *DIRECTIVE (EU) 2015/1513 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 September amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.* 2015.
6. European council, *DIRECTIVE 2003/96/EC of 27 october 2003 restructuring the community framework for the taxation of energy products and electricity.* 2003.
7. European Commission, *Communication from the commission - Guidelines on State aid for environmental protection and energy 2014-2020 (2014/C 200/01).* 2014.
8. NOTICES FROM EUROPEAN UNIONINSTITUTIONS AND BODIES - COMMISSION, *Community guidelines on state aid for environmental protection (2008/C 82/01).* 2008.
9. Energimyndigheten, *Systemet för hållbarhetskriterier i Sverige - En utvärdering av regelverkets praktiska tillämpning. ER 2015:21*. 2015.
10. Directive 2003/30/EC of the European Parliament and of the Council, *of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.* 2003.
11. European Commission, *Commission Work Programme 2015 - A New Start. Annex II - COM(2014) 910 final.* 2015.
12. Energimyndigheten, *Hållbara biodrivmedel och flytande biobränslen under 2014. ET 2015:12*. 2015.
13. European Commission. *http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/land-use-change*. 2016.
14. Energimyndigheten, *Energiläget 2015*. 2015
15. European Commission, *MEMO/11/238 Revision of the Energy Taxation Directive – Questions and Answers.* 2011.

16. Wallentin, A., *The Swedish taxation of fuel - Energy and CO2 taxation*, in *Swedish Ministry of Finance*. 2015: International seminar BioDriv, 17 November 2015 Stockholm.

17. European Commission, *The EU Emissions Trading System (EU ETS) factsheet http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf.* 2015.

18. European Commission, *Proposal for a COUNCIL DIRECTIVE amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. COM(2011) 169/3 2011.* 2011.

19. Wallentin, A., *Vad händer i förhandlingarna om EU:s energiskattedirektiv? Presentation at Medlemsseminarium om EU och energigaserna Energigas Sverige, Stockholm den 31 mars 2014, By Anna Wallentin Ministry of Finance.* 2014.

20. Directive 2009/30/EC of the European Parliament and of the Council, *of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC.* 2009.

21. Regeringen Finansdepartementet, *Promemoria: Sänkt skatt på biodrivmedel*. 2016.

22. Skatteverket, *Skattesatser på bränslen och el under 2016. (https://www.skatteverket.se/download/18.3810a01c150939e893f1eadd/1453119112352/el%2Bbranslen.xls).* 2016.

23. Energimyndigheten, *Marknaderna för biodrivmedel 2014 - Tema: HVO, ER 2014:27*. 2014.

24. European Commission, *MEMO/08/31 State aid: guidelines on state aid for the environment - frequently asked questions.* 2008.

25. Justice and environment, *New Guideline on Environmental and Energy State Aid for 2014-2020 - Legal Analysis.* 2014.

26. European Commission, *Modification to the Swedish tax exemption on biofuels for low-blending. C (2013) 266 final. Ruling in the state aid registry.* 2013.

27. Regeringen Miljö- och energidepartementet, *Regeringens proposition 2015/16:38 Anläggningsbesked för biodrivmedel.* 2015.

28. Regeringen Finansdepartementet, *Regeringens proposition 2015/16:159 Vissa statsstödskrav på bränsleskatteområdet*. 2015.

29. Europeiska Kommissionen, *Statligt stöd N 480/2002 - Sverige: Punktskattelättnad för koldioxidneutrala drivmedel.* 2003.

30. European Commission, *State aid No N 593/2010 (Sa.31782) Sweden Amendments to a tax exemption for biofuels.* 2010.

31. Europeiska Kommissionen, *Statligt stöd nr SA.35414 (2012/N) - Sverige Ändringar i det svenska skatteundantaget för biodrivmedel till låginblandning.* 2013.

32. European Commission, *State aid No SA.36973 (2013/N) - Sweden Tax exemption for biofuels - prolongation.* 2013.

33. European Commission, *State aid No SA:38421 2014/NN - Sweden The Swedish Energy taxation regarding biofuels for blending - prolongation.* 2014.

34. US EIA, *Short term energy outlook, https://www.eia.gov/forecasts/steo/report/prices.cfm.* 2015.

35. SPBI, *Swedish transport fuel statistics (http://spbi.se/statistik/).* . 2016.

36. European Commission, *C(2014) 4350 final regarding State aid No SA.38421 2014/NN – Sweden 2014.* 2014.

37. European Commission, *EU market prices for representative products - vegetal products (http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/monthly-prices/index_en.htm).* 2016.

38. IMF, *IMF Primary Commodity Data; Rapeseed oil, crude, fob Rotterdam, US$ per metric ton.* 2016.

39. OECD - FAO, *Agricultural Outlook 2015-2024.* 2015.

40. Bernesson, S., *Life cycle assessment of rapeseed oil, rape methyl ester and ethanol as fuels - a comparison between large- and smallscale production. Swedish University of Agricultural Sciences, Department of Biometry and Engineering. Report nr 2004:01.* 2004.

41. Ecofys, *Trends in the UCO market.* 2013.

42. Bäckman S., J.S., *Identifying the driving forces behind price fluctuations and potential food crisis. University of Helsinki, Department of Economics and Management, Discussion Paper n:o 35.* 2009.

43. US EIA, *Europe Brent Spot Price FOB (Dollars per Barrel) (RBRTE) (http://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.htm).* 2016.

44. Development/JRC-IPTS, D.A.a.R., *Prospects for Agricultural Markets and Income in the EU 2013-2023.* 2013.

45. European Commission Agriculture and rural development. *EU prices for selected representative products*. 2016; Available from: http://ec.europa.eu/agriculture/markets-and-prices/price-monitoring/monthly-prices/index_en.htm.

46. Bäckman, S. and J. Sumelius, *Identifying the driving forces behind price fluctuations and potential food crisis*, U.o. Helsinki, Editor. 2009: Discussion Papers N:o 35.

47. Romson, Å., M. Andersson, and I. Baylan, *Letter to the Commissioner for Climate Action and Energy, Commissioner for Economic and Financial Affairs, Taxations and Customs and Comissioner for Competition, 23 October 2015, M2015/03618/KI*. 2015.

48. Energimyndigheten, *Marknaderna för biodrivmedel 2015 - Tema: Förnybara flygbränslen, ER 2015:31*. 2015.

49. BIODRIV, *BioDriv:s positioner för utformandet av framtida mål och styrmedel för biodrivmedel, 2015-09-10*. 2015.

50. Lantmännen Energi, *Lantmännen Energis positioner för utformandet av framtida mål och styrmedel för biodrivmdel, 2014-12-23.* 2014.

51. SPBI, *SPBIs svar på promemoria om sänkt skatt på biodrivmedel, http://spbi.se/wp-content/uploads/2016/03/Remissvar-Sänkt-Skatt-på-biodrivmedel-Fi-2016_01004_S2-RE2016004.pdf*, in *www.spbi.se*. 2016.

52. SPBI, *News letter November 2015.* http://newsletter.paloma.se/webversion/default.aspx?cid=796&mid=322961, 2015.

53. Eurobserver, *Biofuels barometer* 2015.

54. Focus on Finland, *Biofuel boom driven by ambitious targets; online news article; http://focus.finland.fi/biofuel-boom-driven-ambitious-targets/.* 2015.

55. USDA Foreign Agriculture Service, *EU Biofuels Annual 2015.* 2015.

56. European Commission, *COMMISSION DECISION of 9.7.2014 ON THE MEASURE / AID SCHEME / STATE AID SA.18042 (2013/C) (ex MX 17/2009) (ex NN 61//2004).* 2014.

57. European Commission, *State aid SA.39654 (2015/NN) Multi-annual support to biofuels for transport.* 2915.