

<b>Title:</b> <b>Agricultural or Forestry Tractors Exhaust Emissions - "Vineyard" Tractor Derogation Amendment</b> <b>IA No:</b> DfT00219 <b>Lead department or agency:</b> DfT <b>Other departments or agencies:</b>	<b>Impact Assessment (IA)</b>
	<b>Date:</b> 12/12/2013
	<b>Stage:</b> Enactment
	<b>Source of intervention:</b> EU
	<b>Type of measure:</b> Secondary legislation
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<b>Summary: Intervention and Options</b>	<b>RPC:</b> GREEN

Cost of Preferred (or more likely) Option				
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB on 2009 prices)	In scope of One-In, One-Out?	Measure qualifies as
£0.181m (cost)	£0.028 (cost)	Zero net cost	No	NA

**What is the problem under consideration? Why is government intervention necessary?**

The Agricultural and Forestry Tractors Emissions Directive 2000/25/EC sets a series of progressively more stringent requirements for the emissions of noxious pollutants from the exhausts of new tractors. A new, Stage IIIB standard (adopted in 2005) has been mandatory since January 2013. Development resources have been fully utilised in meeting the requirements for generic tractor engines, and there are currently no Stage IIIB or Stage IV standard engines that will fit in the exceptionally compact tractors used for work in situations such as vineyards and orchards. European Directive 2011/87/EU introduces a temporary derogation for these tractors in order to allow time for development work. Government intervention is necessary in order to give manufacturers access to the derogation because requirements relating to exhaust emissions are set in UK legislation.

**What are the policy objectives and the intended effects?**

The objective of the proposed Regulation is to ease the burdens on manufacturers of specialist "vineyard" tractors that arise in consequence of the transition to the Stage IIIB, and imminent Stage IV, emissions standard, and to assist businesses that make use of these compact tractors by ensuring continuity of supply. The regulation will transpose into UK legislation the derogation offered in European Directive 2011/87/EU, which allows specialised vineyard tractors fitted with Stage IIIA engines to continue to be sold for a further three years.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)**

The policy options considered have been the baseline of doing nothing, and the preferred option of transposing the amending Directive. Our best estimate is that the preferred option will have a small environmental cost, and that it will offer non-monetised benefits to industry that will outweigh the monetised burdens that we have calculated.

**Will the policy be reviewed? It will be reviewed. If applicable, set review date: 09/2017**

Does implementation go beyond minimum EU requirements?			No		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	<b>Micro</b> Yes	<b>&lt; 20</b> Yes	<b>Small</b> Yes	<b>Medium</b> Yes	<b>Large</b> Yes
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)			<b>Traded:</b> 0	<b>Non-traded:</b> 0.0004	

*I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.*

Signed by the responsible Minister:

Baroness Kramer

Date: 12/12/2013

**Summary: Analysis & Evidence**

**Policy Option 1**

**Description:** Transposition of the Amending Directive

**FULL ECONOMIC ASSESSMENT**

Price Base Year 2012	PV Base Year 2012	Time Period Years 14	Net Benefit (Present Value (PV)) (£m)		
			Low: -0.120	High: -0.241	Best Estimate: -0.181
<b>COSTS (£m)</b>	<b>Total Transition (Constant Price) 3 Years</b>		<b>Average Annual (excl. Transition) (Constant Price)</b>		<b>Total Cost (Present Value)</b>
Low	0.0		0.015		<b>0.172</b>
High	0.0		0.029		<b>0.344</b>
Best Estimate	0.0		0.022		<b>0.258</b>
<p><b>Description and scale of key monetised costs by 'main affected groups'</b></p> <p>The monetised costs of this measure are associated with its air quality and carbon dioxide impacts and with lost sales of exhaust after-treatment equipment. Air quality costs, which are public health costs, and carbon dioxide cost are borne by society in general.</p>					
<p><b>Other key non-monetised costs by 'main affected groups'</b></p> <p>We have identified no significant non-monetised costs associated with this measure.</p>					
<b>BENEFITS (£m)</b>	<b>Total Transition (Constant Price) Years</b>		<b>Average Annual (excl. Transition) (Constant Price)</b>		<b>Total Benefit (Present Value)</b>
Low	0.021		0.004		<b>0.052</b>
High	0.042		0.008		<b>0.103</b>
Best Estimate	0.032		0.006		<b>0.078</b>
<p><b>Description and scale of key monetised benefits by 'main affected groups'</b></p> <p>The most significant monetised benefits accrue to tractor owners and operators in terms of saved purchasing costs (that is, avoidance of the premium for purchase of Stage IIIB conformant tractors) and of saved maintenance costs as a result of not having to run on old tractors (because Stage IIIA conformant tractors can still be purchased). The scale of the monetised benefits is small overall, but is nonetheless large enough to be of significance to individual businesses.</p>					
<p><b>Other key non-monetised benefits by 'main affected groups'</b></p> <p>The principal non-monetised benefit accrues to tractor operators in terms of improved reliability and availability as a result of not running old tractors past their normal economic lifespan. This benefit is not monetised, but is likely to be of great significance to operators in some circumstances since the availability of a tractor to perform essential work at the time that it is required may be business-critical.</p>					
<b>Key assumptions/sensitivities/risks</b>					<b>Discount rate (%)</b> 3.5
<p>The key assumptions are that between forty-five and ninety tractors will be sold under the terms of the derogation, and that the three year length of the derogation will be long enough to permit development of engines meeting the Stage IIIB emissions standard that will fit in these compact tractors. Both of these assumptions are supported by industry stakeholders, and neither of them is considered, in consequence, to be high risk.</p>					

**BUSINESS ASSESSMENT (Option 1)**

<b>Direct impact on business (Equivalent Annual) £m:</b>			<b>In scope of OITO?</b>	<b>Measure qualifies as</b>
<b>Costs:</b>	<b>Benefits:</b>	<b>Net: Zero net cost</b>	No	NA

## Evidence Base (for summary sheets)

### References

No	Legislation or publication
1	Directive 97/68/EC (as amended) on the approximation of measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
2	Directive 2000/25/EC (as amended) on action to be taken against the emission of gaseous and particulate pollutants by engines intended to power agricultural or forestry tractors
3	Directive 2011/72/EU amending Directive 2000/25/EC as regards the provisions for tractors placed on the market under the flexibility scheme
4	Directive 2011/87/EU amending Directive 2000/25/EC as regards the application of emission stages for narrow-track tractors
5	SI 2002/1891 The Agricultural or Forestry Tractors (Emission of Gaseous and Particulate Pollutants) Regulations 2002 (as amended)
6	Air Quality Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 1990-2008; AEAT/ENV/R/3073 Prepared By AEA Technology for Defra, October 2010 (Available from <a href="http://naei.defra.gov.uk/">http://naei.defra.gov.uk/</a> .)
7	Non road mobile machinery Usage, Life and Correction Factors - AEAT/ENV/R/1895 prepared for the Department for Transport by AEA Technology plc (Available from <a href="http://uk-air.defra.gov.uk/library/reports?report_id=304">http://uk-air.defra.gov.uk/library/reports?report_id=304</a> .)
8	Air Pollution: Action in a Changing Climate - Defra March 2010 (Available at <a href="http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-pollution.PDF">http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-pollution.PDF</a> .)
9	Agriculture in the UK 2009 - Defra (available for download from <a href="http://www.defra.gov.uk/evidence/statistics/foodfarm/general/auk/latest/index.htm">http://www.defra.gov.uk/evidence/statistics/foodfarm/general/auk/latest/index.htm</a> )
10	CEMA (European Agricultural Machinery) Position Paper dated 10 <sup>th</sup> December 2010 (Available from the CEMA website at <a href="http://www.cema-agri.org/">http://www.cema-agri.org/</a> .)
11	The Motor Vehicles (Type Approval and Approved Marks) (Fees) Regulations 1999, Statutory Instrument 1999 No 2149.
12	The Motor Vehicles (Type Approval and Approval Marks) (Fees) Regulations 1999 (SI 1999 No 2149)

## **1. Introduction**

- 1.1 This Impact Assessment examines the costs and benefits of transposition into United Kingdom law of European Directive 2011/87/EU, amending the Agricultural and Forestry Tractors Emissions Directive. The amendment introduced is a delay of three years to the application of the Stage IIIB and Stage IV air pollutant emissions standards to the exceptionally compact tractors (in categories T2, C2 and T4.1 as defined in Directive 2003/37/EC) used for work in situations such as vineyards and orchards. This amendment has been adopted at a European level in recognition of the fact that there are, as yet, no engines meeting either of these emissions standards that are suitable for use in these specialised tractors.
- 1.2 The Impact Assessment considers two options. These options are not transposing the Directive (option 0), which is the baseline for our calculations, and doing the minimum required to meet our obligation to transpose the Directive (option 1).
- 1.3 The costs and benefits of the options have been monetised, as far as possible, but there are significant uncertainties in quantifying the various impacts. A sensitivity analysis which considers the effect of these uncertainties is included.

## **2. Background**

- 2.1 European Directive 2000/25/EC (as amended) (Ref 2) controls emissions of air quality pollutants from internal combustion engines for agricultural and forestry tractors. The Directive and its amendments are transposed into United Kingdom law by a series of Statutory Instruments (SI 2005 No 390, SI 2006 No 2533, and SI 2008 No 1980).
- 2.2 The Directive imposes a series of successively more stringent exhaust emission standards which are set for air quality, and ultimately for public health, reasons. The standards are set by reference to the emissions limits set in the Non-Road Mobile Machinery Directive 97/68/EC (as amended) (Ref 1). The linking of the emissions limits for tractor engines and for non-road mobile machinery engines permits engine manufacturers to sell near-identical engines into both markets, and so reduces the regulatory burden upon them.
- 2.3 The controlled air quality pollutants are hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), and particulate matter (PM). It is oxides of nitrogen and particulate matter which are now of principal concern, since the United Kingdom no longer has air quality limit exceedences for concentrations of either hydrocarbons or carbon monoxide. Carbon dioxide is not controlled as an air quality pollutant because, although it is a driver of climate change, it is not directly hazardous to health at any concentration likely to be found in the atmosphere.
- 2.4 The emission standards are usually referred to as “stages,” and the Stage IIIA standard is now in the process of being superseded by the Stage IIIB standard. In recognition of the fact that the challenges faced in meeting any emissions limit vary with the power and size of the engine, the emissions limits that are set at each stage, and their dates of application, differ for engines of different nominal powers.
- 2.5 Since January 2011 the emissions standard for newly manufactured engines for tractors in the power band from 130 kW to 560 kW has been Stage IIIB. This power band covers the most powerful tractors in manufacturers’ ranges. The Stage IIIB standard has been mandatory for engines in all power bands since January 2013, and the Stage IV standard will be mandatory for all engines above 56 kW by October 2014.

- 2.6 Because meeting the Stage IIIB standard requires the use of exhaust aftertreatment technologies, engines meeting this standard are larger, and somewhat heavier, than engines meeting earlier standards. It is, in addition, a feature of the aftertreatment systems that they have high surface temperatures. These larger and heavier engines will not fit into the engine compartments of the compact tractors used in vineyards and orchards. The high surface temperatures that these engines exhibit are, in addition, likely to damage plants and crops when used in a working environment where the space is so limited that these frequently brush against the sides of the tractor.
- 2.8 It is probable that engine manufacturers will be able to develop engines meeting the Stage IIIB emissions standard that are suitable for use in vineyard tractors, but none exist at present. It is for this reason that Directive 2011/87/EU, introducing a temporary derogation from the Stage IIIB standard for vineyard tractors, was adopted.
- 2.9 An amendment (Ref. 3) extending the “flexibility scheme” in the Directive, so as to reduce the burden placed upon tractor producers in general that results from their being effectively obliged to redesign their entire product ranges in order to fit Stage IIIB conformant engines, was adopted at effectively the same time as Directive 2011/87/EU. This additional amendment is the subject of a separate impact assessment (reference DfT00220) but it is our intention to use one instrument to transpose both amendments into the Agricultural or Forestry Tractors (Emission of Gaseous and Particulate Pollutants) Regulations in order to reduce costs and administrative burden.
- 2.10 Both the amendment that is the subject of this impact assessment and the parallel amendment that extends the flexibility scheme are intended to reduce the burdens upon industry. Because it is a European measure, however, it is outside the scope of the On-In-Two-Out requirement.

### **3. The proposed Regulation**

- 3.1 The proposed Regulation will amend the Agricultural or Forestry Tractors (Emission of Gaseous and Particulate Pollutants) Regulations so as to delay the applicability of the Stage IIIB emissions standard to the relevant classes of tractor. This will be done, in order to reduce costs and so far as is possible, by copying out the text of the amending Directive.

### **4. Rationale for Government intervention**

- 4.1 Government regulation specifying exhaust emissions standards for tractors was introduced in response to market failure. The market failure arises because air quality is an external cost, and engine manufacturers do not benefit from deploying technologies which will improve air quality. This results in underinvestment in those technologies.
- 4.2 Without the reduction in burden that the amendment to the Directive represents it will be impossible to type-approve and sell the specialist tractors concerned, and this will have undesirable consequences for users of tractors of this type.
- 4.3 Because the emissions standards, the dates for their application, and their scope are set in legislation, no kind of voluntary action by industry stakeholders that might produce the same effect as a change in the legislation is legally possible.

### **5. Policy Objective**

- 5.1 The intention of the measure is to reduce the burdens upon industry that arise as a consequence of a new emissions standard that requires significant design and development work, unforeseen when the standard was adopted in 2005, in order to produce engines suitable for vineyard tractors. The policy objective is to

secure the position of affected businesses, and so to maintain employment in these sectors.

## **6. Timing**

6.1 Directive 2011/87/EU was published in the official journal of the European Union on the 8<sup>th</sup> of December 2011, and was required to be transposed into UK law by the 9<sup>th</sup> of December 2012.

6.2 In view of the fact that the amending Directive reduces the burden on industry, we intended to seek the permission of the Reducing Regulation Committee to transpose it before the latest possible date if we had been able to do so.

## **7. Options**

7.1 Two options have been considered. These are Option 0, which is to do nothing and so retain the status quo, and Option 1, which is to do the minimum required to transpose the amending Directive.

7.1 Option 0 – Do nothing.

7.1.1 In this option, which constitutes the baseline against which impacts have been assessed, tractor producers would be unable to market vineyard tractors once the limited transitional flexibilities in the Directive had been exhausted, and would be unable to do so until suitable engines meeting the Stage IIIB emissions standard were developed. There would be a number of consequences of this which are discussed, and as far as possible monetised, below.

7.2 Option 1 – Transpose the Directive.

7.2.1 In this option the derogation permits the continued sale of Stage IIIA compliant tractors for a period of three years, by which time it is assumed that engine manufacturers will have developed suitable Stage IIIB compliant engines. Purchasers and operators of tractors realise benefits in terms of avoiding the costs associated with a situation in which there are no new vineyard tractors available.

## **8 Sectors and Groups Affected**

8.1 The proposed measure would directly affect producers of tractors and engine manufacturers. The United Kingdom has one producer of tractors whose product range includes tractors of the types concerned, but we believe that these tractors are not, in fact, made at the company's UK plant. United Kingdom engine manufacturers may, however, be involved in the supply of engines for these tractors.

8.2 There will be some direct impact on manufacturers of exhaust aftertreatment devices, who will lose some sales as a result of some additional Stage IIIA conformant tractors being serviceable and in use after the end of the derogation period, and so not being replaced with Stage IIIB conformant tractors at that point as the worn-out tractors that they will, for the most part, have taken the places of in the fleet would have been.

8.3 The primary impact of the measure, in the United Kingdom, however, would be the indirect impact upon purchasers and operators of tractors, and upon those businesses that supply and maintain them.

8.4 The impacts of the proposed measure upon air quality, though expected to be very small, would affect the health of the population at large. The groups within the population that are particularly vulnerable to poor air quality are the infirm, the elderly, and the young.

## 9. Summarised Impacts and Assumptions

9.1 The impacts of the proposed measure are summarised in table 1, below. The impacts have been divided into business (B), social (S), air quality (AQ), and climate change (CC) categories.

<b>Impacted Sector</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
Tractor Producers (not a UK impact)	Continuity of production whilst conformant engines and tractors are developed.	
Engine Manufacturers	B1 Continued sales of engines for these specialised applications assists in funding development work.	
Exhaust Aftertreatment Manufacturers		B2 Lost sales. B3 Delayed return on investment.
Tractor Purchasers and Operators	Improved availability of new tractors, leading to... B4 Reduced maintenance costs and improved tractor availability. B5 Some opportunity to purchase more cheaply.	B6 Increased fuel costs.
Public at Large	S1 Maintenance of employment and economic activity.	AQ1 Some negative health effects. CC1 Additional carbon dioxide emissions.

Table 1. Summarised Impacts of Option 1

9.2 In order to produce an assessment of the impacts of the proposed measure, a number of assumptions have had to be made both about the activities that would follow from pursuit of Option 0 (the baseline option) and those that would follow from pursuit of Option 1.

9.3 The following general assumptions are made:

- That very few tractors operate in areas of air quality limit exceedences, which are almost exclusively areas of high road traffic density and primarily in urban areas. (This assumption underlies the decision to use approximations in monetising the air quality impacts of the measure rather than to commit resources to detailed air quality impact modelling.)

- That no Stage IIIB conformant vineyard tractors would be brought to market during the three year duration of the derogation, but that development during that period would permit tractors sold thereafter to be conformant with the standard.
- That when Stage IIIB conformant vineyard tractors are developed they will demonstrate better fuel consumption than Stage IIIA tractors.

9.4 The following assumptions are made about Option 0 (the baseline);

- That, in the absence of new tractors meeting the Stage IIIB emissions standard, operators would continue to use existing tractors after they had reached the end of their economic lives, and these tractors would consequently be both more expensive to maintain and have lower reliability and availability than would normally be considered acceptable. (Avoidance of a proportion of these additional costs is one of the positive impacts of Option 1.)
- That the running-on of older tractors, rather than replacing them with Stage IIIB conformant tractors, would result in some additional air quality pollutant emissions.

9.5 The following assumptions are made about Option 1:

- That a total of between forty-five and ninety Stage IIIB conformant vineyard tractors will be sold and put into service in the United Kingdom during the period of the derogation, and that a best estimate half way between these figures adequately represents the likely outcome.
- That an eleven year period, representing the average lifetime of a tractor, will adequately capture the impacts of tractors placed on the market during the assessment period.
- That Stage IIIA conformant tractors purchased during the period of the derogation would be run on to the end of their economic lives, rather than replaced with Stage IIIB conformant tractors as soon as these became available. (This is a low risk assumption.)
- That, because there are no Stage IIIB conformant tractors available, the sale of Stage IIIA conformant tractors cannot lead to lost sales for the manufacturers of the exhaust aftertreatment devices that are required for Stage IIIB conformant tractors during the period of the derogation.
- That the existence of Stage IIIA conformant tractors sold during the period of the derogation does result in lost sales for exhaust aftertreatment device manufacturers after the end of the derogation since owners will not immediately choose to replace these tractors with Stage IIIB conformant models.
- That United Kingdom aftertreatment device manufacturers have one quarter of the market for such devices in the European Union. (This assumption has a bearing upon the impacts of the measure on them.)
- That the benefits and costs to industry will be concentrated in the first three years of the assessment period (that is, during the derogation period) whilst the air quality and carbon dioxide impacts will be spread over the full eleven years of that period (that is, over the operational life of the tractors concerned).

9.6 The assessment period for this impact assessment is fourteen years. This period represents the period necessary to capture the impact of every tractor placed on the market under the terms of the three year derogation if one

or more of them is placed on the market at the end of the derogation period and tractors are assumed to have an eleven year life.

9.7 The assumptions and impacts are explained in detail in the text that follows, where the sensitivity of the outcomes to the assumptions is also discussed.

## **10. The Key Assumptions**

### **10.1 Air quality impacts of tractors.**

10.1.1 We have assumed that only 0.34 percent of emissions from agricultural and forestry tractors occur in areas of air quality exceedences. This figure is based on the 2008 National Air Quality Emissions Inventory analysis performed by AEA Technology for Defra, which estimated that, of a total of 39,120 tonnes of emissions of oxides of nitrogen (NO<sub>x</sub>) from tractors, 110 tonnes appeared in areas with exceedences of NO<sub>2</sub> air quality limits.

10.1.2 We have calculated the air quality pollutant emissions of the tractors affected by the derogation using the information in Reference 7.

### **10.2 Number of tractors affected by the derogation.**

10.2.1 There are about 419 vineyards registered with the Food Standards Agency in the UK, and these vineyards have an average area of 3.3 hectares. Informal discussions with the industry association suggest that eighty-five percent of these vineyards, or about 360, might be large enough for the use of at least one specialised vineyard tractor to be economically viable, with the rest being worked by hand or using portable or pedestrian-controlled machinery. It is difficult to find robust data on tractor utilisation in vineyards, but there is some evidence that the industry association's informal estimate might be rather high.

10.2.2 If each of the 360 vineyards that an initial estimate would suggest might utilise a specialised tractor actually did so, and these tractors each lasted for eleven years, then sales of these tractors would be likely to be running at a rate of about thirty-three tractors per year. This figure is significantly higher than the reports of annual sales of these specialised tractors (which very probably include sales for use in orchards) which have been provided by United Kingdom suppliers of vineyard equipment and which underlie our estimate of between fifteen and thirty machines per year.

10.2.3 United Kingdom vineyards may be somewhat over-capitalised by comparison with those in areas where vineyards are more common, but the density of tractors per hectare in European and North American vineyards appears to be very much lower than the initial estimate suggests that it might be in the United Kingdom. We have seen one report on the economics of vineyard management in California which suggested that one tractor would be required for each eight hectares in cultivation, and another suggesting that about 325 litres of fuel were required to work one hectare, and so that one tractor might be able to work about sixteen hectares of vines. (This calculation is based upon the assumptions about tractor fuel usage per kilowatt-hour and about tractor utilisation that we draw from reference 7.) We have seen an article written by a vineyard manager in France, meanwhile, which claimed that each hectare in cultivation required the usage of 143 litres of diesel fuel, suggesting that a single tractor might be able to work more than thirty hectares of vines. The conditions in North American vineyards and in vineyards in continental Europe are likely to be rather different, and the conditions in United Kingdom vineyards may not resemble either of them, but all of the evidence that we have been able to gather appears to support our decision to base our analysis upon the figures from tractor suppliers.

10.2.4 Our best estimate of the costs and benefits of this measure are based upon a figure midway between the 45 and 90 tractors that represent the high and low limits of our range. (That is, upon an average of 22.5 tractors in each year.)

10.3 Maintenance premium for running a tractor beyond its economic life.

Suppliers of vineyard equipment, who also provide maintenance services, have indicated that maintenance costs for a generic vineyard tractor range from £500 to £2,000 per year. Their estimate is that these maintenance costs might rise to between £1,000 and £2,500 per year in the case of a tractor at the end of its useful life, representing an additional annual cost of £500 associated with the use of an old tractor. We have used this industry-provided figure (which represents no more than about one additional day of maintenance each year at ordinary skilled labour rates) in our analysis.

10.4 Displacement of Stage II and Stage IIIB conformant tractors.

10.4.1 As noted in section 9.5, above, because there are currently no Stage IIIB vineyard tractors available, sales of Stage IIIA tractors under the terms of the derogation cannot displace sales of Stage IIIB tractors. The Stage IIIA tractors sold under the terms of the derogation do, however, delay sales of some Stage IIIB tractors once Stage IIIB tractors become available. This is because the Stage IIIA tractors are still serviceable when Stage IIIB tractors become available, and their owners find themselves under no real pressure to replace them.

10.4.2 The sale of additional Stage IIIA conformant tractors during the period of the derogation reduces emissions of air quality pollutants during the period of the derogation. This is because the additional Stage IIIA conformant tractors displace older, worn-out, tractors which we have assumed will be Stage II conformant (although they may well be older). After the period of the derogation the additional Stage IIIA conformant tractors are disadvantageous from an air quality point of view. This is because these tractors are still quite new, and their owners are not under the pressure to replace them with Stage IIIB conformant tractors that they would have had they simply run-on older tractors. We have estimated and aggregated these effects in order to produce our final air quality impact figures.

10.4.3 Where a Stage IIIA conformant tractor delays the sale of a Stage IIIB unit there will be a loss experienced by the manufacturers of the exhaust aftertreatment device that would have been part of the Stage IIIB conformant unit. The purchaser of the Stage IIIA conformant tractor, however, achieves a saving approximately equivalent to the differential in price between the two different tractor models. We have estimated both of these effects.

10.5 Savings to tractor purchasers.

10.5.1 For the purposes of this impact assessment we have used a figure for the saving accruing to a purchaser who is able to delay purchase of a Stage IIIB conformant tractor which we have generated on the basis of our calculation of the value of an exhaust aftertreatment device for a tractor of the assumed average power of a vineyard tractor. The calculated value of the average aftertreatment device is £704.

In order to produce the value that we have for an average exhaust aftertreatment device, in aid of both this impact assessment and the impact assessment for transposition of Directive 2011/72/EU, we have performed a fairly detailed analysis of the powers of tractors sold and the relationship between tractor power and the cost of exhaust aftertreatment. This analysis is not reproduced here. It is reproduced as an annex to the impact assessment for transposition of Directive 2011/72/EU.

## 10.6 Costs to aftertreatment manufacturers.

10.6.1 We have assumed that United Kingdom aftertreatment device manufacturers have one quarter of the European market for such devices. This figure is based upon informal discussions with stakeholders in the sector. It is a high proportion, but it reflects the current strong position of the UK industry in this sector.

10.5.2 We have used the same figure as the basis of our estimate of the value of lost business to manufacturers of exhaust aftertreatment devices as we have used as the basis of our estimate of the savings to purchasers, although this may result in a slight over-valuing of those losses.

10.5.3 It follows from our assumption that UK manufacturers have one quarter of the aftertreatment device market that the losses to those manufacturers in the UK market will be one quarter of the savings that accrue to purchasers of tractors (because one quarter of the tractors purchased at a lower price would otherwise have been fitted with devices made by UK manufacturers.)

## 11 **Monetised Costs**

### 11.1 AQ1 - Air quality costs.

11.1.1 We have estimated the air quality impact of the extended flexibility scheme using emissions factors drawn from Reference 7. Our best estimate is that the extended scheme would result in a reduction of 0.15 tonnes in emissions of NO<sub>x</sub>, and an increase of 3.16 tonnes in emissions of Particulate Matter when aggregated over the fourteen year period of this assessment. (That is, an average of 13.6 fewer kilogrammes of NO<sub>x</sub> and 287 additional kilogrammes of PM per year).

To put these figures in context, the annual emissions from all sources in the UK in 2008 were 1,400 kilo-tonnes of NO<sub>x</sub> and 130 kilo-tonnes of PM (Reference 6). The additional emissions from these vineyard tractors are probably insignificant in the context of the impact of these pollutants upon public health and the ongoing challenge of complying with legally binding air quality objectives for NO<sub>x</sub> concentrations.

11.1.2 We have monetised the air quality impacts using the damage cost method, which estimates the value of the damage that additional emissions have on public health. This is the current established Government methodology for the assessment of the air quality impacts of measures, and is the basis for the estimates reflected in the summary sheets. **Our best estimate is that the cost of these increased emissions is £129,530** at present value. The present value air quality cost ranges from £86,360 to £172,710.

11.1.3 In producing the monetised present value for the air quality impacts we have used the current values and discount rates agreed across government and published by the IGCB.

### 11.2 CC1 - Carbon dioxide costs

11.2.1 Our best estimate is that the derogation will lead to a total of 445 tonnes of additional carbon dioxide emissions over the lifetimes of the tractors placed on the market under its terms, or an average of approximately 31.79 tonnes per year over the assessment period. **The additional carbon dioxide emissions have a present value of £22,890**, with a range running from £15,260 to £30,520.

### 11.3 B2 - Costs to industry of lost aftertreatment sales

11.3.1 Lost sales to exhaust aftertreatment device manufacturers are transient costs which are all concentrated at the end of the three year derogation period.

These costs consist of the value of the aftertreatment devices required for a number of Stage IIIB conformant tractors exactly the same as the number of Stage IIIB derogated tractors in use during the eleven year period of the assessment.

- 11.3.2 Our best estimate of the present value **cost of the derogation to aftertreatment device manufacturers** in the United Kingdom resulting directly from transposition of the amending Directive into UK law is **£7,140**, with a range running from £4,760 to £9,520.

These costs are based upon the delayed sales occurring as a result of transposition, which will be lost sales in the United Kingdom.

- 11.3.3 The delayed sales entail some delay on return on investment (impact B3) but, in the context of the very few sales occurring in the UK, this cost may be assumed to be genuinely negligible.

#### 11.4 B6 – Additional fuel costs

- 11.3.4 There are **additional fuel costs** associated with the additional carbon dioxide emissions. Our best estimate is that these costs have a value of **£98,520 at present value**. This translates into an additional cost of approximately £3.10 per week for each tractor purchased under the terms of the derogation.

We have counted the additional fuel cost as a burden upon industry in this assessment although the decision to purchase a Stage IIIA tractor made available under the terms of the derogation, rather than to run-on an older tractor whilst waiting for Stage IIIB vehicles to appear, is a purely voluntary one.

It is normal practice to count the costs of voluntary actions that only become available to economic actors as a result of the removal of a regulatory constraint as burdens upon those actors imposed by the action of Government. Tractor operators who choose to accept the additional fuel costs will only do so, of course, because they place a higher value upon one of the non-monetised benefits discussed in Section 13, below than upon those costs.

## 12 **Monetised Benefits**

### 12.1 B4 - Reduced maintenance costs for tractor operators.

- 12.1.1 Monetised benefits accrue to tractor purchasers and operators in terms of the saving in maintenance and repair costs. These benefits are accrued during the period of the derogation, when the possibility of replacing a worn-out tractor would not otherwise exist. **Our best estimate of the benefit of reduced maintenance and repair costs is £48,930 at present value, with a range running from £32,620 to £65,240.**

### 12.2 B5 – Reduced costs for tractor purchasers

- 12.1.2 The savings to tractor purchasers only occur in the period following the derogation, when the possibility of purchasing a more expensive Stage IIIB conformant tractor actually exists. The savings occur because the fact that the purchaser has been able to purchase a Stage IIIA tractor during the period of the derogation, rather than run-on an old tractor, has the incidental benefit of saving him from having to purchase a new tractor at the end of the derogation. Like the costs to after-treatment device manufacturers, these savings are related to the number of derogated tractors in use at the end of the derogation period.

- 12.1.3 Our best estimate is that **the saving to tractor purchasers**, which is a transient benefit occurring at the end of the derogation period, **has a present value of £28,590**, with a range running from £19,060 to £38,120.

	<b>Low Impact (45 tractors)</b>	<b>Best Estimate</b>	<b>High Impact (90 tractors)</b>
<b>Costs</b>			
Air quality Impacts	-£86,360	-£129,530	-£172,710
Carbon dioxide impacts	-£15,260	-£22,890	-£30,520
Additional fuel costs	-£65,680	-£98,520	-£131,360
Lost Aftertreatment Sales	-£4,760	-£7,140	-£9,520
<b>Benefits</b>			
Saved Purchasing Costs	+£19,060	+£28,590	+£38,120
Saved Maintenance Costs	+£32,620	+£48,930	+£65,240
<b>Impact upon Industry<sup>1</sup></b>	<b>-£18,760</b>	<b>-£28,140</b>	<b>-£37,510</b>
Present Value Cost	-£172,060	-£258,100	-£344,120
Present Value Benefit	+£51,680	+£77,520	+£103,370
<b>Overall Impact (Net Present Value)</b>	<b>-£120,380</b>	<b>-£180,560</b>	<b>-£240,750</b>

Table 2 Summary of Monetised Impacts of Option 1 at Present Value  
(Benefits shown positive.)

### 13 Non-Monetised Costs and Benefits

- 13.1 Some small benefits accrue to engine manufacturers because they are able to continue to sell Stage IIIA conformant engines in the power ranges required for vineyard tractors. These continued sales assist their businesses directly, and assist them in funding the development work required in order to bring Stage IIIB vineyard tractor engines to market.
- 13.2 By permitting continued sales of vineyard tractors the measure stabilises the businesses of companies involved in their sale and maintenance. It might be imagined that, without the derogation, an increase in maintenance work on tractors being run past the ends of their economic lives would make up for lost income from sales. The extent to which a business would be able to redeploy resources from its sales and marketing efforts into maintenance, however, would be likely to be limited.
- 13.3 There are non-monetised benefits to owners of vineyard tractors associated with the potential loss in output due to unreliability and unavailability of an older tractor. (Unreliability and unavailability are, strictly, separate issues. Unreliability may render the tractor unavailable at any moment. Higher

<sup>1</sup> Our monetised estimates of the impact upon industry suggest there will be a net cost to business. However we anticipate that the benefits that we have not been able to quantify and monetise will outweigh these costs (see paragraph 13.4), such that overall, there will be a zero net cost to business.

maintenance requirements, meanwhile, will render the tractor unavailable in a more predictable way.) Unreliability and reduced availability are likely to involve greater business risks for the limited number of operators in the United Kingdom than to they do to operators in continental Europe since the market for these specialised tractors is unlikely to be large enough to support a significant hire sector.

13.4 Whilst there is insufficient evidence to permit us to monetise these benefits, they will evidently outweigh, for any operator who chooses to purchase a tractor made available as a result of the derogation, the costs to business that we have been able to quantify and monetise.

13.5 We have identified no significant non-monetised costs that are associated with this measure.

#### **14. Risks, Assumptions, and Sensitivities**

14.1 The key assumptions underlying this Impact Assessment are outlined in Section 9 and section 10, above.

14.2 The cost assumptions are drawn from the documents referenced, and supplemented by information provided by industry stakeholders and by the technical assessment of the Department's engineers.

14.3 We have identified the assumption about the number of Stage IIIA compliant tractors made available under the terms of the derogation as being particularly important from the point of view of the monetised impacts. We have, in consequence, tested a range for these assumptions and the results of these sensitivity tests are reported in the text above and the summary in Table 2.

14.4 Whilst varying the assumption about the number of tractors involved makes a large difference to the air quality impacts of the measure in percentage terms, these impacts remain very small in absolute terms relative to total emissions.

14.5 Estimates of annual sales of vineyard tractors in the UK are based on reporting from suppliers of vineyard equipment who have not been able to provide exact figures for these sales. We have, however, been able to confirm that the figures provided are not unrealistic.

14.6 The incremental maintenance cost is based on approximate maintenance costs for a generic vineyard tractor provided by industry stakeholders. These costs are significantly lower than those reported for tractors of this category in an assessment made for the European Commission, but we have chosen to use the figures provided to us. The fact that our costs are lower than those reported elsewhere allows us to be confident that they do not lead to an overestimate of the benefits of the policy option.

14.7 Although we may be fairly confident that the estimates of sales available to us include sales of vineyard tractors for all applications where they are used, we have obtained no data relating specifically to their use in orchards or fruit farms. There is no available data on the use of narrow-track tractors in orchards. (This was also the case for the European Commission's Impact Assessment.)

14.8 There is a risk that the three year period of the derogation will not be long enough to permit development of the technology required to permit production of Stage IIIB conformant vineyard tractors. The period set, however, reflects the expectations of engine manufacturers at then time that the measure was being negotiated, and this risk is not considered high.

14.9 The risk that some operators might make use of the period of the proposed derogation to stockpile Stage IIIA compliant vineyard tractors in order to avoid the expected higher costs of Stage IIIB complaint machines has been

considered, but has been dismissed. This behaviour would involve investing in a high-value capital asset, and then storing it for some years before getting any return on the investment that had been made. The tractors concerned, in addition, would have depreciated significantly in value and would be well beyond their warranty periods by the time that they were required for use. It is highly unlikely that any small or medium sized business would be able to finance stockpiling Stage IIIA compliant tractors in this way, even if doing so appeared desirable.

## **15 Social Cost and Benefits**

- 15.1 Transposing the Directive will support fruit production as well as the growing niche business of viticulture in the United Kingdom, and so will support both rural employment and economic diversity. The negative health effects associated with the increase in emissions of air quality pollutants will be very small indeed.

## **16 Costs and benefits to firms of different sizes**

- 16.1 Owners and operators of vineyard tractors will almost all be small businesses. Dealers and maintainers of tractors will almost all be either small or medium-sized businesses. The benefits of the measure are not expected to accrue disproportionately to firms of any particular size in the sector.

## **17 Human Rights and Justice**

- 17.1 The possibility that the proposed measure might impinge on human rights in the areas of privacy, property, freedom to choose and practice a profession, and the right to a fair hearing have been considered. We do not believe that the Directive will impinge on these or other human rights.
- 17.2 The current agricultural and forestry tractor enforcement regime is administered entirely, or almost entirely, without recourse to the courts. It is not anticipated that the proposed derogation for vineyard tractors would either increase or decrease the work of the courts. In consequence, no impact on the legal aid budget is anticipated.

## **18 Sustainable Development**

- 18.1 A sustainable development impact check has been performed using the current Defra pro-forma. The impact of the proposed amendment on sustainable development is expected to be negligible.

## **19 Greenhouse Gas Assessment**

- 19.1 The proposed measure is likely to have an impact on emissions of carbon dioxide (CO<sub>2</sub>). Because the Stage IIIA conformant tractors that are sold under the terms of the derogation are unlikely to have the same fuel consumption characteristics as either older tractors or the Stage IIIB tractors that will eventually appear. When they initially enter into service the Stage IIIA tractors will have an impact upon carbon dioxide emissions because they will, for the most part, displace older tractors from the fleet. The Stage IIIA tractors will continue to have an impact upon carbon dioxide emissions after Stage IIIB tractors have become available. This is because operators who have purchased them to replace older, worn-out, tractor will feel under no pressure to replace them with Stage IIIB tractors as they would have done if they had chosen to run-on the older vehicles.

There is evidence that Stage IIIB compliant tractors in general will have somewhat better fuel consumption than Stage IIIA tractors, and our assessment of the carbon dioxide impact is based upon an assumption that Stage IIIB conformant tractors in this specialised sector will demonstrate a five percent

better fuel consumption than equivalent Stage IIIA tractors. This is a more modest fuel consumption improvement than is expected from generic tractors, but it is highly likely that the compromises that are required in the design of these very compact tractors will prevent some or all of the improvements seen in generic tractors from being realised.

Our best estimate, as noted above, is that the derogation will lead to a total of 445 tonnes of additional carbon dioxide emissions over the lifetimes of the tractors placed on the market under its terms, or an average of approximately 31.79 tonnes per year over the assessment period. If the actual fuel consumption of Stage IIIB compliant vineyard tractors were, in the event, to be the same as that of Stage IIIA vineyard tractors than there would be no additional carbon dioxide emissions occurring as a result of this measure.

- 19.2 Our estimate, on the basis of the figures in Reference 7 and the data that we have on the size of the UK tractor fleet, is that the UK fleet of agricultural and forestry tractors, of which vineyard tractors are a very small part, produces approximately 43 kilotonnes of CO<sub>2</sub> annually.

## **20. Health Impacts**

- 20.1 Air quality emissions are controlled because of the impact of poor air quality on public health. The health impacts of the proposed measure are expected to be small because the measure produces only a very small addition to the sum of the United Kingdom's emissions of air quality pollutants, and the additional emissions appear almost entirely in areas where there are no exceedences of air quality pollutant concentration limits, and away from centres of population.

## **21 Equality Issues**

- 21.1 An assessment has been made of the impact of the implementing measures on race, disability, gender, and transgender equality and of their impact on different ethnic and religious groups and others having particular moral or philosophical beliefs. This assessment is held on file by the Department.
- 21.2 The assessment found that the measure was without impact in terms of equality, apart from possible very small negative impacts on the very young and the old.
- 21.3 Because the very young and the old are particularly vulnerable to the health problems that flow from poor air quality, these two sectors of the population are of particular concern in the context of a measure that would somewhat delay planned improvements in air quality. The health impacts of the small delays envisaged, even on these more vulnerable groups, however, should be very small because the overall changes in emissions of air quality pollutants associated with the delays are very small, and the emissions appear in areas not subject to exceedences of air quality pollutant limits.

## **22 Rural Proofing**

- 22.1 The proposed derogation is of interest to rural communities and rural businesses because it should reduce the risks to business associated with the continued use of tractors that are beyond their normal economic lives. By facilitating the purchase of new vineyard tractors, the measures may assist in sustaining the market for second-hand tractors, and so assist smaller businesses and new entrants to the market.

## **23 Competition Assessment**

- 23.1 The sectors affected by the measure are primarily owners and operators of specialised vineyard tractors, and those involved in the distribution and maintenance of these machines. The proposed amendment to the flexibility

scheme is not expected to have a significant impact on competition in general, since its effect will apply equally across the market.

23.2 Transposition of the amending Directive will not create higher costs for new manufacturers or for new rural businesses than for existing ones.

23.3 The changes in the market associated with transposition are too small to have any measurable effect on raw material process or other sectors of the economy.

## **24 Wider impacts**

24.1 The social and environmental impacts of the proposed derogation, together with its impacts on industry, have been addressed above. The amendment is not expected to impact on any wider matters which have not been addressed.

## **25 Enforcement, Sanctions and Monitoring**

25.1 Nothing in the proposed amendment would necessitate any changes to existing sanctions, or to enforcement and monitoring procedures.

## **26 Summary and Recommendation**

26.1 The European Union has adopted a new Directive (2011/87/EU) which introduces a three year derogation for the specialised compact tractors used in vineyards and orchards from the requirement to meet the Stage IIIB emissions standard set in the Agricultural or Forestry Tractors Emissions Directive (2000/25/EC). The derogation has been introduced in recognition of the fact that there are currently no engines meeting the Stage IIIB emissions standard that will fit in “vineyard” tractors. Its aim is to reduce the burden upon, and difficulties faced by, businesses in the sector that would otherwise arise as a result of the transition to the new emissions standard.

26.2 The best estimates are that there are between three and four hundred “vineyard” tractors, which are also used in orchards and fruit farms, in the United Kingdom fleet, and that the total number of tractors affected by this derogation would lie between forty-five and ninety.

26.3 Our best estimate is that the measure produces an overall monetised cost to industry of about £28,140 at a combined environmental cost of about £152,420, and so has a net monetised cost of about £180,560 over the fourteen year period of the assessment. Although the measure is not cost beneficial in terms of its monetised impacts, those monetised impacts are very small.

26.4 Our analysis suggests that the measure is disadvantageous to business in monetised terms across the full range of variation that we have modelled. The derogation is nonetheless supported by most industry stakeholders, and it is reasonable to assume that this is because of the value that they put upon the non-monetised benefits that it offers.

26.5 **Our recommended course of action is to transpose the amending Directive on the grounds that the non-monetised benefits that it provides in terms of support to small companies in rural communities outweighs the small monetised costs.**

## **27 Post Implementation Review**

27.1 This measure is time-limited. A statutory five year review will be included in the transposed legislation, however, in accordance with Better Regulation principles.