

Pesticide Tax in Denmark¹

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Brief summary of the case

Denmark implemented a pesticide fee in 1972 and supplemented this with a pesticide tax in 1982 (only covering households). The fee and tax were reformed to become a general ad valorem tax covering all types of pesticide consumption (including agricultural) taking effect from 1996. In 1998, tax rates were doubled (on average). From 2013 a reformed tax was implemented, changing the pesticide tax to a tax based on environmental load. Furthermore, tax levels were increased on average. Approximately 93% of Danish pesticide use is agricultural. Expected revenue of the reformed tax is DKK 650 million annually (EUR 87 million). The full revenue is reimbursed to the agricultural sector – primarily through reduced land value tax. For many years Danish pesticide policies aimed at reducing the so-called treatment frequency index (TFI). As part of the latest pesticide tax reform, an environmental load indicator was introduced to substitute the TFI indicator. The current aim of the Danish Government is to reduce environmental load by 40% during the period from 2011 to 2016. Some main drivers for the development of the Danish pesticide tax have been the Danish green tax reforms of the 1990's and a strong norm among Danes (citizens and politicians) for having untreated tap water from groundwater sources. In general, farmers and agricultural organisations are against the pesticide tax, but the reimbursement mechanism have eased resistance. Over the years, the pesticide tax have only had small effects on pesticide use. Expectations are that the reformed tax will have more significant effects, since those pesticides with largest environmental load now face substantially higher price levels. The reformed tax will be evaluated in 2017-18. Replicability is a possibility for other Member States based on a prior assessment of which indicators are relevant for the country in question.

1 Description of the design, scope and effectiveness of the instrument

1.1 Design of the instrument

Denmark implemented a pesticide fee in 1972, at 3% of the wholesale price of pesticides, to cover administrative costs for the approval of pesticides. Additionally, in 1982, a tax at 20% of the wholesale price of pesticides approved before 1982 in packaging up to 1 litre or 1 kilogram was implemented. The tax was directed towards household consumption, not professionals which normally used larger packages of pesticides (MiT 1982; MoT 2001) and was part of a large 'tax package' aimed at financing employment initiatives, education initiatives and initiatives aimed at increasing agricultural production and employment in the so-called 'March package' (Danish Parliament 1982).

Denmark presented a first pesticide action plan in 1986, when the centre-right minority government was forced to do so by an 'alternative green majority coalition' in the Danish Parliament (Pedersen and Nielsen 2016). Besides tightening the approval procedure of pesticides, the plan aimed at a 50% reduction in the use of approved pesticides from the baseline period 1981-85 to 1997 measured by the tonnes of active ingredients sold and by the so-called treatment frequency index (TFI) equalling a TFI at 1.3. The TFI was considered a

better indicator than active ingredients as there is no direct correlation between the amount of active ingredients in a pesticide and its environmental burden (MoT et al. 2001; Danish Economic Councils 2015). TFI is calculated as the number of pesticide applications on cultivated areas per calendar year in conventional farming assuming use of a fixed standard dose (based on sales data). As a supplement to the fee and tax, a number of command-and-control and information instruments directed towards agriculture were introduced (Pedersen et al. 2015; Pedersen and Nielsen 2016 (forthcoming)). In 1994, it was assessed that the implemented instruments would reach the 50% aim for active ingredients in 1997, but not the TFI aim, and, consequently, a reform of the tax was introduced (MoT 2001 et al.; Pedersen et al. 2015). A new pesticide tax – designed as a percentage of the retail price (ad-valorem) - was implemented from 1996 which covered all pesticide users. It gradually became clear that the tax was insufficient to accomplish the policy aims and therefore, on average, the tax was doubled in 1998 (see table 1). A 1999 expert committee assessed that the economically rational level for farmers’ pesticide use corresponded to an average TFI of 1.7 which became the new overall aim for the pesticide policy (Pedersen et al. 2015).

Table 1. Danish pesticide tax 1996-2013 (% of retail price, excluding VAT and other taxes)

Pesticide type	Tax rates (%)	
	1996-1998	1998-2013
Insecticides	37	54
Fungicides	15	33
Herbicides	15	33
Growth regulators	15	33

Source: MiT (1998) and Pedersen et al.(2015)

Continued problems in reaching the TFI aim – Denmark was very far away from reaching the aim (see below) – led the Danish Government to introduce a new environmental load indicator and a redesigned pesticide tax taking effect from July 2013. The tax level of each approved pesticide is now calculated individually through an assessment of the pesticide’s: i) human health risks (exposure of spray operator), ii) environmental load (toxicity to non-target organisms in the environment), iii) environmental fate (degradation, bioaccumulation, leaching to groundwater) (MoT 2015; Pedersen and Nielsen 2016). Consequently, some pesticides have experienced large price increases, while others have seen prices decrease. In the fifth and current pesticide action plan, the aim for the new pesticide load indicator is a 40% reduction from 2011 to 2015 (later postponed to 2016) (Pedersen and Nielsen 2016). The tax does not directly reflect the marginal external costs, as these are difficult to estimate, but tax levels are assumed to be based on best available information (Danish Economic Councils 2015). On average, tax levels were increased compared to the 1998 tax. Ex ante assessments estimated that revenue would increase from about DKK 500 million (EUR 67 million) to DKK 650 million (EUR 87 million) annually (Danish Economic Councils 2015). As with

the previous scheme, the redesigned tax has broad coverage and only insignificant exemptions (e.g. for diplomatic representations etc.) (MiT 1995b; MoT 2015).

1.2 Drivers and barriers of the instrument

The introduction of the 1996 pesticide tax, which increased the revenue significantly since the tax base was extended to agricultural use, was an element of a wider green tax reform in the 1990s (Pedersen et al. 2015). A 1993-94 government commission of civil servants from various ministries (the Dithmer Commission) put fertiliser tax and pesticide tax onto the agenda. Agricultural organisations and farmers opposed the tax (Daugbjerg and Pedersen 2004), but were not successful in attempts to avoid it. However, the agricultural lobby managed to influence the reimbursement mechanism both in the 1996 tax design, in the 1998 reform, and in the 2013 reform implying that most of the revenue is reimbursed through a percentage reduction in land value tax (Interviewee 1; Daugbjerg and Pedersen 2004; Danish Economic Councils 2015). Furthermore, agricultural interests have the majority in a board administering most of the remaining revenues (Pedersen et al. 2015). There is no interrelation between the amount of land value tax being reimbursed to the farmer and amount of pesticide tax being paid. Needless to say, the reduced land value tax is connected to land value, while the amount of pesticide tax paid depends on the individual farmer's pesticide use. Consequently, a farmer using pesticides well below average can actually have a net benefit through reimbursed land value tax and a low amount of pesticide tax.

In general, there has been relatively broad political support in the Danish parliament for reducing the use of pesticides through five different pesticide action plans over the last three decades (Pedersen and Nielsen 2016). A support which is underpinned by a strong norm among Danes for having untreated tap water from groundwater sources – a norm shared by politicians involved in the negotiations regarding the 1996 tax (Interviewee 1; Hasler et al. 2005; GEUS 2016), and which seems to have been subsequently maintained. This norm may be due to Denmark having the *prerequisite* for using solely groundwater as tap water (in contrast to other countries) and has always had this possibility. According to the Danish Water and Wastewater Association (DANVA), it is a gift for Denmark that biological circumstances and a climate with relatively low temperatures (and thereby low temperatures in the water distribution system) provides Denmark with the possibility of using untreated tap water from groundwater sources solely (Interviewee 2).

In terms of relationship with EU legislation, it is specifically mentioned in the new pesticide tax act that the act implements parts of Directive 2009/128/EC on the sustainable use of pesticides. Needless to say, the Common Agricultural Policy affects pesticide use in Denmark – one example is the 2008 EU abolishment of the requirement for 10% fallow land (Pedersen et al. 2015). All sector policies affecting the prices of crops/pesticides can reduce or reinforce the effect of the tax (ibid).

One barrier for achieving the aims in the pesticide policy through the tax has been that in contrast to ex ante assumptions, not all Danish farmers are profit optimizers since one third of the farmers are focused on optimizing physical yield and pay relatively little attention to expenses and crop prices (Pedersen et al. 2012). In general, pesticide demand for European farmers can be considered relatively inelastic (see e.g. Falconer and Hodge 2000).

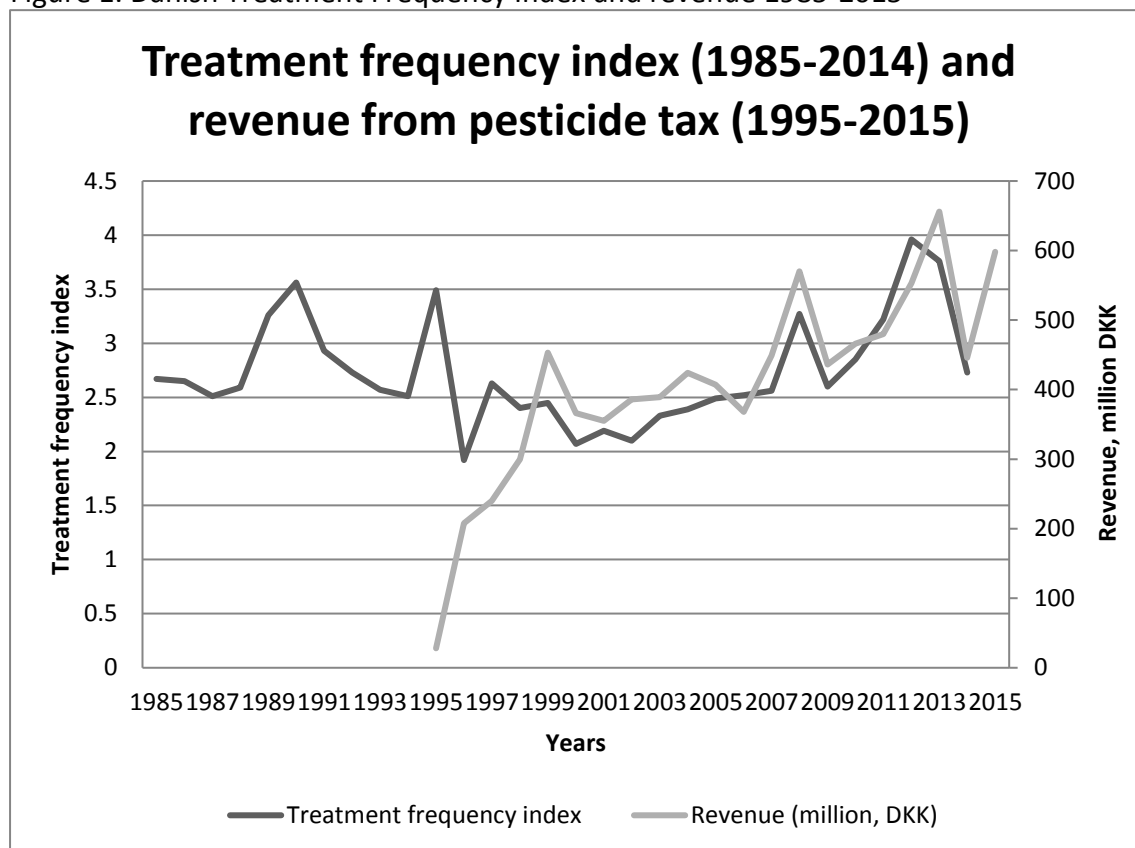
1.3 Revenue collection and use

The 1972 fee and the 1982 tax generated a total revenue of DKK 49 million annually (EUR 6 million, 1993 figures) (MiT 1995a). The 1998 tax generated an average of DKK 500 million annually (EUR 67 million, 1998 figures). Ex ante assessments estimated that revenue would increase to DKK 650 million (EUR 87 million) annually after the 2013 reform (Danish Economic Councils 2015). There has been a hoarding effect following the 2013 reform (Pedersen and Nielsen 2016) – consequently, the revenue effects will not stabilize before 2016/17 at the earliest. According to the Danish Government (2013), Danish farmers use 93% of the pesticides sold in Denmark, while the remaining 7% is used by households, forestry, municipalities, golf courses and nurseries. Tax collection is administered by tax and custom authorities (MoT 2015). The revenue from the pesticide tax is recycled to the agricultural sector – primarily through a reduction in land value taxes. After some changes in 2003, 83% was recycled as reduced land value taxes, while the remaining 17% were distributed to different activities in the sector (e.g. research) (Pedersen et al. 2015).

1.4 Environmental impacts and effectiveness

According to the MoT et al. (2001), the 1972 fee and the 1982 tax had no effect on agricultural consumption (see above), since the tax only covered packaging smaller than 1 kilo/1 litre, and, furthermore, many of the pesticides at the time were approved after 1982 and therefore not covered by the tax (MiT 1995a). The time series of the treatment frequency index (see figure 1) suggest that neither the 1996 nor the 1998 tax managed to accomplish the aim of the pesticide policy of a TFI of 1.7. Reductions in TFI in 1996, 1998 and 2014 are probably due to hoarding effects the years before. Pedersen et al. (2015) conclude that the taxes from 1996 to 2013 had only very small effects at best.

Figure 1. Danish Treatment Frequency Index and revenue 1985-2015



Note: The TFI is a standard indicator for pesticide use, calculated as the number of pesticide applications on cultivated areas per calendar year in conventional farming, assuming use of a fixed standard dose and based on sales numbers (DEPA 2012). The figure for 1985 is an average of the years 1981-1985. For the years 1997-2013 the numbers reflect Danish Environmental Protection Agency's so-called 'new method' for calculating TFI. The change in calculation methods in the late 1990s meant that the TFI figure calculated was a bit higher (in the interval 0.7-0.27) compared to when the old method was used (see also Pedersen et al. 2015).

Sources: Treatment Frequency Index collected by Christina Bøje (DEPA) based on the agency's annual reports. The years 2007-2013 are corrected with the most recent figures from DEPA (2014) and (2015); the 1985 estimate is an average for 1981-1985 (DEPA 1998). Revenue figures from Statistics Denmark (2016).

The authors of Pedersen and Nielsen (2016) are currently involved in an Aarhus University research project for the Danish EPA evaluating the effects of the current pesticide tax (results expected 2017-18). As mentioned above, the aim in the Danish pesticide policy is that the tax, together with other policy instruments, reduces the pesticide load by 40% before the end of 2016.

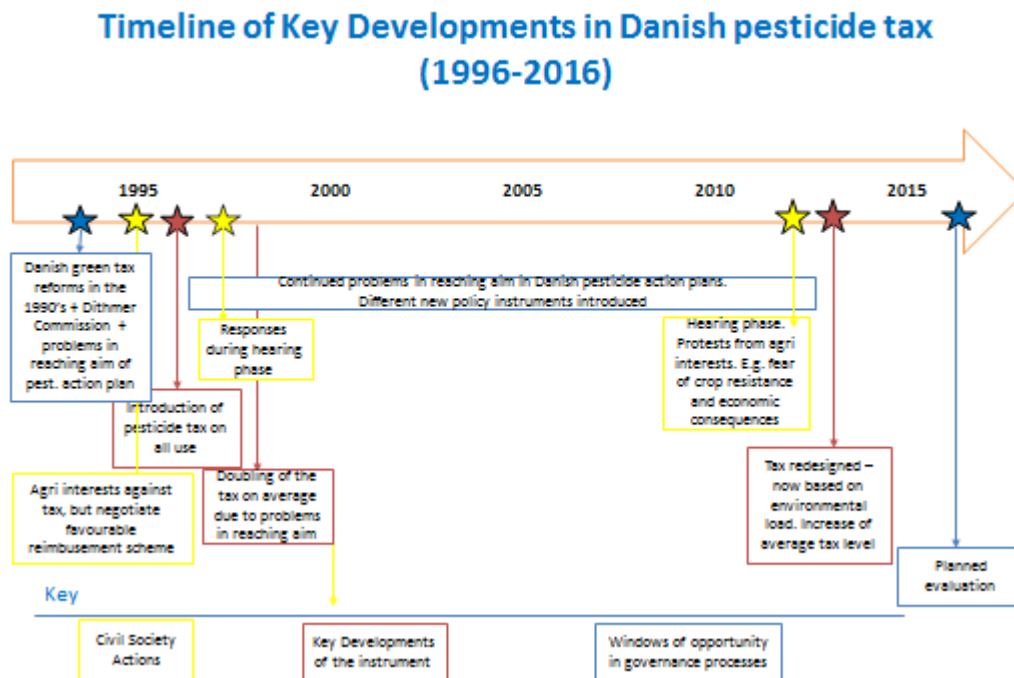
1.5 Other impacts

The pesticide tax has led to some illegal imports (Pedersen et al. 2015). As with other types of illegal behaviour the specific extent is very difficult to determine.

The tax has some distributional effects, e.g. land prices differ across Denmark (and therefore so does the amount reimbursed to individual farmers through reduced land value tax). Regarding the price of the pesticides, e.g. strawberry producers might experience decreasing pesticide prices after the 2013 tax reform, while potato producers might experience increasing prices due to differences in the environmental load of the pesticides these different farmers use (DEPA, undated; Pedersen et al. 2015).

2 Stakeholder engagement

Figure 2.



At the time of the introduction of the 1996 pesticide tax agricultural interests/organisations enjoyed a more privileged position than environmental interests/organisations and other groups which worked more in the periphery of the policy process (interviewee 1; interviewee 2; Daugbjerg and Pedersen 2004). Unsurprisingly, agricultural organisations and farmers objected to the tax, however, the favourable revenue recycling scheme reducing the land value tax (see above) eased implementation (interviewee 1). The Ministry of Taxation, the Ministry of Environment and the Ministry of Agriculture were all involved in negotiations on the tax design. The Ministry of Taxation preferred a tax based on toxicity of the pesticide (which would be optimal from an environmental viewpoint in contrast to e.g. a tax on amount of active ingredients), but the Ministry of Environment found it impossible to design such a pesticide tax. The Ministry of Agriculture preferred the ad-valorem-tax which was finally decided to a unit duty, since this gave some advantages to the farmers. E.g. it was positive from a farmer viewpoint, that revenues accruing from other groups (producers/importers, households, golf courses etc.) were recycled to the benefit of the agricultural sector (interviewee 1; Pedersen et al. 2015). Only organisations representing commercial use of pesticides commented on the initial proposal (MiT 1995a). At the time of discussions on the new pesticide tax in the mid-1990's, the Danish Water and Wastewater Association (DANVA), by principle, did not comment on economic acts from the parliament and was therefore probably not involved in the negotiations (interviewee 2) – this policy of DANVA was changed later in the 1990's. Apparently, the main environmental organisation – Danish Society for Nature Conservation – did not comment on the proposal either.

During the 2012 consultation process and hearing phase regarding the proposed reform of the pesticide tax, a range of different organisations responded. There were many hearing responses from interest organisations representing commercial interests (farmers, producers, importers etc.), but also responses from e.g. the Danish Water and Wastewater

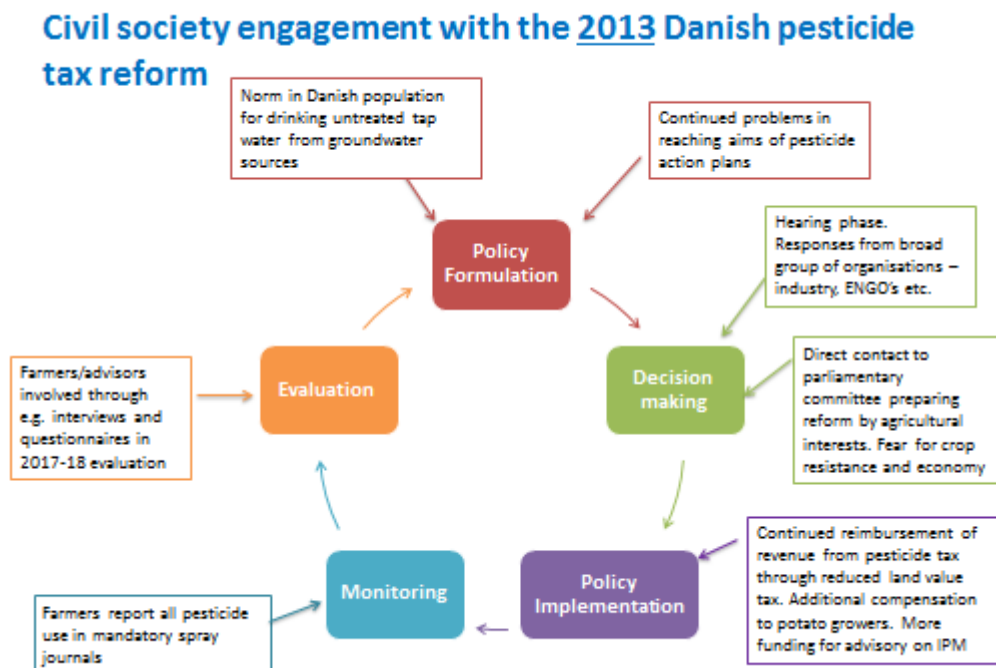
Association (DANVA) and the Danish Ecological Council. One often mentioned fear among farmer organisations, producers and importers is that the new pesticide tax will lead to resistance among some pests, because the tax narrows the supply of pesticides as those products on which the highest price increases are applied will probably be removed from the market. The Danish Golf Union complained that they have to pay the pesticide tax, but do not benefit from the recycling of revenues (MoT 2012). The Danish parliament's Tax Committee received written comments and held meetings with the main farmer organisation and the main organisation for producers/importers/suppliers. Furthermore, written comments were received from a company selling pesticides (Tax Committee 2012). The Danish Society for Nature Conservation was involved in the negotiations on the reformed tax, but did not give a response in the consultation phase (DN 2016).

Due to concerns raised in the consultation phase over economic consequences for Danish potato growers, another tax (tax on stain products) was reduced as a compensatory measure and, additionally, part of the revenue from pesticide tax was moved to the so-called Potato Tax Fund (MFAF 2012).

In general, many farmers feel that pesticide taxes are unfair and represent a burden on their income despite the reimbursement mechanism (Pedersen et al. 2012; 2015).

3 Windows of opportunity

Figure 3



Civil society engagement in pesticide taxes 1995-2016:

Policy formulation: The 1990s Danish green tax reforms and a strong preference among citizens and policymakers in favour of untreated tap water based on groundwater sources opened a window of opportunity to reform and extend the tax from 1996 to cover not only

household, but also commercial pesticide use. Subsequent reforms in 1998 and 2013 have increased average tax rates.

Decision-making: The Danish decision-making processes regarding the amended tax in 1996, 1998 and 2013 have involved a range of different ministries (in particular ministries of taxation, environment and agriculture). Stakeholders representing agriculture, producers/importers, environmental organisations have been involved through meetings in parliamentary committees, consultation processes, hearings etc. Agricultural organisations do not support the tax, but the reimbursement mechanism (see above) has probably increased their acceptance. Expert committees have also been involved (Pedersen et al. 2015; Pedersen and Nielsen 2016).

Policy implementation: During implementation of the five different Danish pesticide action plans other policy instruments have also been introduced. For instance there has often been a focus on information/advisory from agricultural advisories (Pedersen and Nielsen 2016). Agricultural interests have the majority in a board administering a share of revenues not recycled via reductions of land value taxes (Pedersen et al. 2015).

Monitoring: Denmark has a range of different monitoring programmes – e.g. to implement EU directives on nitrate, groundwater and water framework (Danish Nature Agency 2015). It is mandatory for farmers to make individual spray journals.

Evaluation: The reformed pesticide tax (2013) is currently under evaluation in a project funded by the Danish EPA, among others by Pedersen and Nielsen (2016). The evaluation is e.g. based on qualitative interviews with agricultural advisors and pesticide producers/importers, and a quantitative questionnaire to a large group of Danish farmers. Pedersen et al. (2012) analyse how well farmer decision rationales match the incentives in Danish pesticide policy. Pedersen et al. (2015) contains a review over the effects before the 2013 tax reform.

4 Insights into future potential/reform

4.1 Actual Planned reforms and stakeholder engagement

None. The redesigned tax took effect from July 2013. There will be an evaluation of the tax in 2017-2018.

4.2 Suggestions for future reforms – instrument design and civil society engagement

None

4.3 Suggestions for replicability

Eurostat only collects data on sold amounts of active ingredients in the Member States which is not an adequate indicator (see above) – making comparisons of pesticide loads across Europe infeasible. There is a need to develop better pesticide indicators (Pedersen et al. 2016).

Over the years, other European countries (e.g. Norway, Sweden, Finland, Italy, France) and some North American states have also introduced pesticide levies/taxes (Pedersen et al. 2015; Böcker and Finger 2016). The average Danish tax level seems to have been substantially higher than in other countries (OECD and EEA 2014). Needless to say, sometimes levies/taxes have been repealed – e.g. the Finnish pesticide fee have been repealed in 2007 (OECD 2009). Like the reformed Danish tax, the current Norwegian tax is based on environmental load. However, there are some substantial differences in the design: whereas the Danish tax is calculated individually for each pesticide, pesticides in Norway are divided into only seven tax categories (Böcker and Finger 2016).

Replicability of the Danish pesticide tax is a possibility for other Member States based on a prior assessment of which indicators are relevant for the country in question.

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