Low Yield II

Cumulative impact of hazard-based legislation on crop protection products in Europe

November 2019

European Crop Protection

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Foreword

Agriculture is important in Europe. The Common Agricultural Policy (CAP), which was set up to improve agricultural productivity and to ensure a secure supply of food, currently constitutes 38% of the entire EU budget. Largely as a result of the CAP, a secure and diverse supply of safe and affordable food has been achieved and rural communities have been protected. This has been a remarkable achievement in the post-World War II era.

Although the CAP has gradually shifted away from production subsidies to producer support, some stakeholders argue that it has led to an agricultural system which over-emphasises the cost-efficiency of food production for European citizens. This system relies on the availability of chemical fertilizers and crop protection products to increase plant growth whilst managing and controlling diseases and pests. Today, there are increasing societal concerns over the environmental, biodiversity and health effects of these substances. Alternative production systems are promoted as viable substitutes. Organic farming for example, has grown rapidly and the EU is now the second largest retail market for organic products after the USA.

Despite this growth, organic farmland currently makes up a modest 7.2% of agricultural land in the EU according to the institute of Organic Agriculture. Conventional agriculture remains the dominant production system and pesticides, therefore, still play a crucial role. However, as the EU has shifted from a risk-based legislation towards a hazard-based one over the last decade, a significant number of pesticides have been removed from the market while more are increasingly at risk of being phased out due to the very stringent regulatory requirements in the EU. At the same time, the introduction of viable substitutes is becoming increasingly difficult. This depletes the 'toolbox' that farmers have at their disposal to protect their crops from pests and diseases.

The socio-economic impact of this depletion has received much less attention than the environmental, biodiversity and health impacts of pesticides. Steward Redqueen was commissioned by ECPA to shed more light on impacts such as crop yields, costs of production and farmer incomes. This is the second volume of a report originally published in 2016 and looks at an additional seven countries. The EU aggregate results in this report also include the nine countries of the first volume for a total of 16 countries. Because agriculture is so intricately linked with the rest of society, we do not claim that these reports contain a complete assessment of all economic aspects of phasing out pesticides. Rather they focus on short-run farm-level effects by looking at a substantial number of staple and specialty crops using data provided by local crop experts.

The findings of this report should not be considered in isolation but rather as complementary to findings in the areas of environment, biodiversity and health. Having said that, based on extensive data and expert opinions, this report argues that phasing out 75 pesticides will cause lower yields while increasing costs of production. This will have a profound negative effect on farmer incomes. These negative impacts may well be mitigated to some extent as the best-available alternative options could be better than currently assumed by the experts. However, it could also be the case that the actual impacts, due to additional factors such as climate change and invasive alien species, have been underestimated and thus may well lead to an increase in pest pressure, in addition to accelerating resistance effects as a result of a decreased toolbox.

As was the case with the first volume, this report has also been peer reviewed by two experts from Wageningen University. These reviews as well as our response to them are available on the ECPA website. To transform the way in which European farmers ensure a steady supply of safe and nutritious food for 500 million EU consumers, it is important for policymakers and civil society to consider all the trade-offs. We hope that this report contributes to the current policy discussions concerning the need to move towards an increasingly sustainable food production model.

Steward Redqueen

Denmark

For five key staple crops, the currently available farming toolbox allows Denmark to produce an additional 1,500,000t and generate an additional €212 million value per year than if the 75 at-risk substances were not included. A restricted toolbox will also affect the economic viability of specialty crops: 78,000t of output and €9 million would be at stake. Further results include:

- In the short run for the crops in scope, Danish farmers will lose on average, 8% of their yield with a restricted toolbox;
- Variable production costs for the crops would increase by up to 9% per hectare;
- The average gross margin per hectare enjoyed by the Danish farmer will drop to 40%.
- Danish crop agriculture provides approximately 22,000 direct jobs, of which 14,200 depend on the crops covered in the study.

AGRICULTURE IN DENMARK

Agriculture in Denmark contributes an average of 1.2% to GDP and 2.1% to national employment.[32] The Danish agricultural sector is largely defined by animal husbandry or, more specifically, the pork industry. Of the average €10 billion per year produced by the Danish agricultural sector since 2010, nearly 40% comes from crop production.

What sets Denmark apart from other EU countries is the strict regulatory framework its crop production sector operates under. With the first pesticide action plan, introduced in 1986, the Danish government aimed to reduce pesticide usage as measured by the tonnes of active ingredients sold and a **Treatment Frequency Index (TFI).**[33] The government imposed a fee and a tax, which by 1998 was at 33% for herbicides, fungicides and growth regulators, and 54% for insecticides. The current approach, introduced in 2013, aims to reduce what is known as the pesticide load[34] and minimise overall usage. The tax level per pesticide is based on an assessment of the pesticide's impact on human health, the environment in general, and groundwater specifically. Put simply, the riskier the pesticide, the higher the tax level.[35]

Although only a rough indicator used by the EU's EEA, average pesticide sale per hectare of agricultural land in Denmark is lower than in most EU countries.[36] The stringent regulatory environment and general political and social narrative surrounding pesticide usage in Denmark is an important component of Danish crop cultivation. It is therefore important to take note of the regulatory environment the Danish farmer operates in when estimating what the effect of a restricted toolbox will be on farmers' yields and incomes.

The total average annual Danish crop production value since 2010 is approximately €3.6 billion. The crops covered in this study include five staple crops: wheat, sugar beet, potatoes, OSR and barley (spring and winter). There are also three other common crops: grass seeds,[37] rye, and maize for silage. This study covers almost two-thirds of total Danish crop production value (Exhibit 34).

DANISH FARM-LEVEL EFFECTS

The Danish farmer currently has 33 of the 75 at-risk substances in their toolbox. The availability of the 33 at-risk substances currently available in Denmark affects two key revenue and cost determinants: the yield and the production cost (Table 12).

Of the five staple crops, Danish potato farmers benefit the most from the currently available toolbox. Having a complete toolbox available

32 *EUROSTAT (2018).*

33 *TFI is calculated as the number of pesticide applications on cultivated area per calendar year (Pedersen, 2016).*

34 *The current goal for the Pesticide Load Indicator (PLI) is set at 1.96.*

35 *ENDURE (2013).*

36 *Estimates for the period 2011 to 2016 based on EUROSTAT statistics are at around 1 kg per hectare in Denmark and 2 kg per hectare on average in the EU.*

37 *These include ryegrass, perennial ryegrass, Italian ryegrass, hybrid ryegrass, red fescue and meadow grass.*

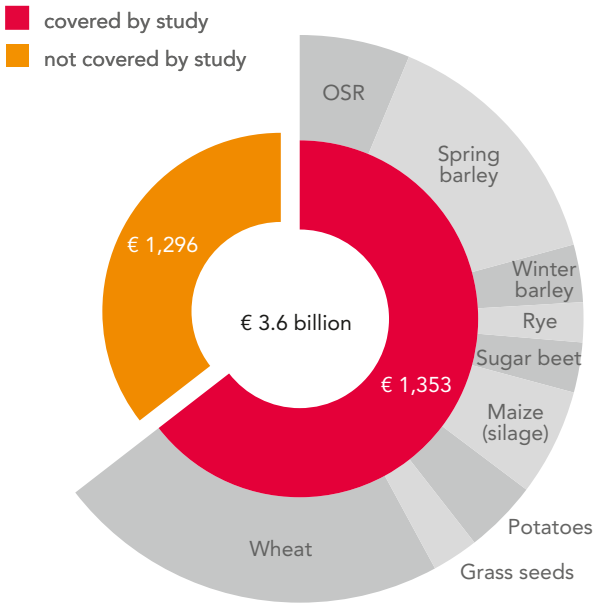

***Exhibit 20**: Danish agricultural production value (in € million)*

allows them to harvest approximately 16% more tonnes per hectare. The loss in yield faced by potato farmers is primarily driven by the low number of fungicides available to treat early and late blight. Starch potatoes in Denmark are sprayed 12–14 times per season. If fluazinam, difenoconazole and mandipropamid disappear, the remaining efficient alternatives for these substances, like cyazofamid, can only cover a part of the season. As a result, farmers would most likely have to desiccate the potatoes two to four weeks earlier, leading to a short-term yield loss between 10% and 15%, because of lack of efficient fungicides.

Danish maize farmers by comparison, face much lower yield losses without the availability of the 33 substances. While the loss of glyphosate will impact maize cultivation, it is expected that farmers will rely on mechanical ploughing for control of thistles and other perennial weeds. It is estimated that because of the already stringent regulations on pesticide usage and the high level of research into non-chemical alternatives, switching to mechanical weed control will have a relatively smaller impact on yields.

However, the loss of glyphosate from the Danish farmer's current toolbox is an important driver of cost changes. For cereals, the loss of glyphosate will lead to an increase in costs of at least €48 per ha. The higher costs are the result of farmers having to resort to non-chemical alternatives, such as mechanical weeding, to manage perennial weeds and the drying of grain.

***Table 8**: Short-term yield and variable cost changes* [36]

Crop	Ex-farm price	Yield			Production Cost		
		Yield WITH	Yield Change	Yield WITHOUT	Cost WITH	Cost Change	Cost WITHOUT
	(€/t)	(t/ha)	(Δ %)	(t/ha)	(€/ha)	(Δ €/ha)	(€/ha)
SUGAR BEET	48	60.7	−15%	51.5	1,144	164	1,308
POTATOES	99	41.1	−16%	34.4	2,383	422	2,806
GRASS SEEDS	1,117	1.5	-5%	1.4	595	−8.7	586
OSR	383	3.8	−10%	3.4	740	83	822
WHEAT	175	7.2	−14%	6.2	564	17	581
WINTER BARLEY	169	6.1	−5%	5.8	508	68	576
SPRING BARLEY	176	5.5	−6%	5.2	464	68	532
RYE	161	5.9	−3%	5.7	486	52	537
MAIZE (SILAGE)	34	33.8	−1%	33.5	890	13	903

38 *This data is provided by the experts.*

Danish potato farmers also face notably higher costs, however this in large part driven by considerably more expensive chemical alternatives. It is estimated that alternatives currently available for the treatment of late blight will increase costs by €393 per ha. Grass seed farmers on the other hand, face a cost decrease. This is because while some alternative chemical treatments are more expensive, the farmer saves costs on seed treatment.

In addition to short-term yield effects, a restricted toolbox leads to the development of long-term additional resistance. The long-term resistance effects on crop yields can vary between a 2% reduction in yield for grass seeds and a 19% loss of production for OSR.

With the current toolbox at their disposal, Danish farmers are able to operate with a positive gross margin, ranging from an average 22% per hectare for maize (for silage) farmers to an average 64% for grass seed farmers (Exhibit 21).[39]

A restricted toolbox will, however, drive down revenues and increase costs, placing pressure on the annual profitability of the Danish farmer. Despite the loss of the 33 substances, all farmers will still be able to operate with a gross profit. Danish grass seed farmers face the smallest per hectare gross margin loss, from 64% to 62%, whereas potato farmers face the highest per hectare gross margin loss, from 41% to 18%. Or, in other words, a gross profit loss of 64% per hectare (Table 8).

A stable ex-farm price is assumed when analysing the yield and cost changes on farmer incomes. However, the loss of substances can also affect the quality of the harvested crop. A loss of quality can subsequently impact the ex-farm price. The loss of triazoles for spring barley means that the proportion of small grains will increase. These small grains are not suitable for malting; the experts estimate that approximately 5% of the malting barley area will receive a lower price. Similarly, the loss of triazoles will impact the oil yield of the OSR crop and reduce the baking quality of bread rye and wheat.

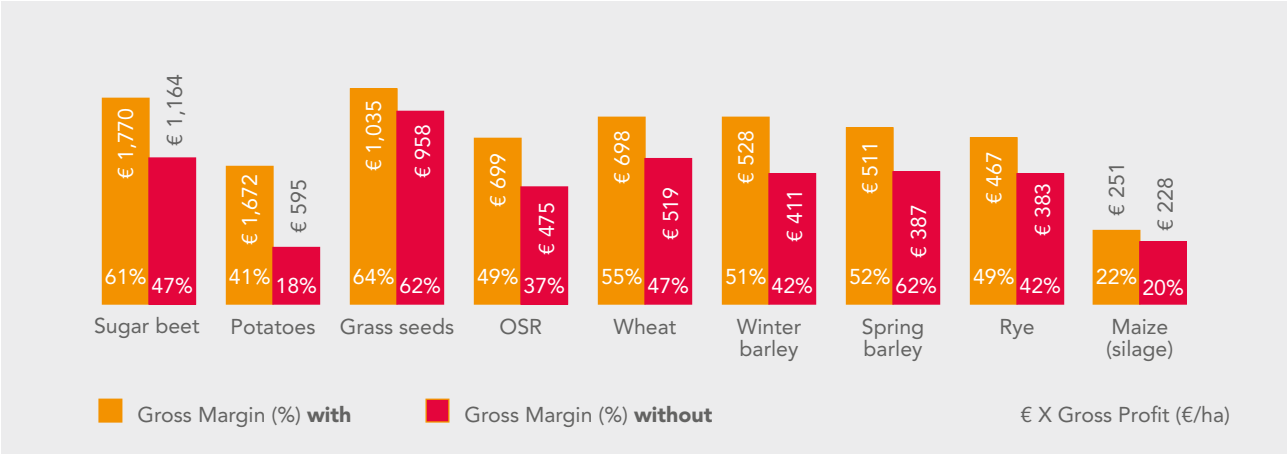

***Exhibit 21**: Income effects at farm level (in €/ha)*

39 *Gross margin is calculated on the basis of the figures provided in the table above: ((revenue)−(costs)) / (revenue) = ((ex-farm price * yield)−(costs)) / (ex-farm price * yield).*

DANISH COUNTRY-LEVEL EFFECTS

The yield losses and cost increases at the Danish farm level will translate into effects at the national level. Assuming a stable annual production area, Denmark stands to lose approximately 1.6 million tonnes of crop production with a restricted toolbox.[40]

Danish cereal producers stand to lose 912 million tonnes of their crop production with the restricted toolbox. This constitutes approximately 10% of total cereal production in Denmark (an average 9.3 million tonnes per year). More than half of the lost cereal production is driven by a 14% yield decrease in the production of Denmark's largest cereal crop, wheat.

The loss of 1.6 million tonnes of crop production annually is equal to a loss of €221 million in production value (Exhibit 22). The total loss of production value for cereal crops is approximately €151 million or 69% of total value loss. This is concomitant with the high loss in tonnes produced, with the highest loss in value (approximately half) resulting from the loss in wheat production.

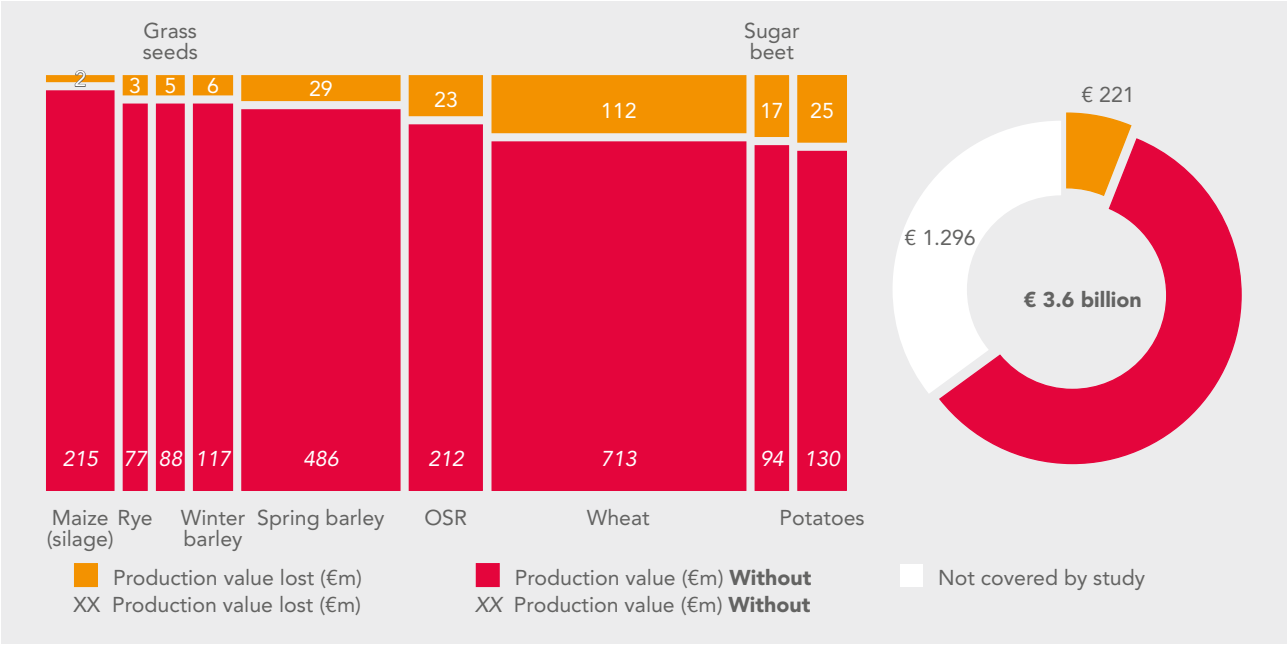

***Exhibit 22**: Total production value in scope (in € million), left; total production value (in € million), right*[39]

40 *For detailed crop production statistics, please refer to Annex 3.*

41 *Differences in totals are due to rounding.*

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