HFFA RESEARCH STUDY ON
ECONOMIC AND ENVIRONMENTAL IMPACTS OF BANNING NEONICOTINOIDS IN THE EU

QUESTIONS AND ANSWERS

A RECENT STUDY COMPILED BY HFFA RESEARCH GMBH HIGHLIGHTS ECONOMIC AND ENVIRONMENTAL IMPACTS OF BANNING NEONICOTINOIDS IN THE EUROPEAN UNION WITH A PARTICULAR FOCUS ON OILSEED RAPE FARMERS.

WHO IS THE AUTHOR OF THE STUDY?

The study was undertaken by HFFA Research GmbH under the lead of its managing director, Dr. Steffen Noleppa. HFFA Research GmbH is a Berlin-based research consultancy with a focus on scientific research in the field of agricultural and life sciences and has worked with many German, European and international organisations in the agri-food sector. HFFA Research GmbH is a 100 percent subsidiary of the Humboldt Forum for Food and Agriculture e.V.

WHAT IS THE BACKGROUND OF THE STUDY?

On request of the European Commission, the European Food Safety Authority (EFSA) carried out a review of studies regarding the impact of neonicotinoids on bees in 2012. Following the publication of EFSA's conclusions in early 2013, the European Commission restricted the application of the three neonicotinoids clothianidin, imidacloprid and thiamethoxam for seed treatment, soil application and foliar treatment in crops attractive to bees by Implementing Regulation (EU) No 485/2013. As of 1 December 2013, placing seeds treated with plant protection products containing one of the three substances on the market was prohibited in the European Union (EU).

While the ban does not include a time limit, the Regulation does foresee a review of new scientific information within two years of its implementation. EFSA's conclusions on the new data are expected to be published in early 2017. Based on their conclusions, the European Commission is expected to take a decision whether to lift, maintain or amend the ban.

One of the major open questions frequently brought up in the debate on the ban was the magnitude of its actual impact on European farming. Diverging predictions were made when the ban came into place and opinions on this question continue to differ greatly. In order to provide more insight on this topic, a study to calculate the economic and environmental impacts of the ban was undertaken, focusing in particular on the impact on oilseed rape cultivation.

WHY FOCUS ON OILSEED RAPE?

Oilseed rape is a distinctive arable crop characterizing European agricultural landscapes. It is grown for the production of edible vegetable oils, animal feed and biodiesel. The EU is a leading producer next to Canada, China, India, Australia, and the Ukraine. Key producing countries in Europe include France, Germany, Poland, UK and Romania[1]. Oilseed rape is a very profitable crop for famers.

The loss of neonicotinoids for seed treatment is particularly significant for oilseed rape. Oilseed rape is prone to a number of pests such as the cabbage stem flea beetle, for which only few management options exist. Neonicotinoids have consequently been widely used as a seed-treatment with oilseed rape.

WHAT WAS THE RESEARCH METHODOLOGY USED?

A dual approach was pursued. As a first step, a meta-analysis of available research and data on economic impacts in EU oilseed rape production, i.e. scientific studies and academic papers was carried out. The findings of 13 clusters of relevant scientific studies and academic papers[2] on the mainly economic impacts of the ban were synthesized and stress-tested. Based on this data, as a second step a quantification of the EU-wide economic and environmental effects was undertaken, which combined the findings of the individual studies with additional expert opinions and inputs. The extrapolated EU wide impacts were used to lay down some key definitions on the basis of which various economic and environmental impacts were calculated.

WHAT ARE THE MAIN FINDINGS OF THE STUDY?

The aim of the study was to identify the major economic and non-pollinator-related environmental consequences of banning the three neonicotinoids in the EU using the case study of oilseed rape production. The three main drivers impacting the economic performance of European oilseed rape producers following the neonicotinoid ban were found to be:

1. Yield depression: a negative yield impact of 4 percent (weighted average) in oilseed rape production in the EU;
2. Quality losses: on average 6.3 percent of the realised harvest saw quality losses at a cost of € 36.50 per ton affected;
3. More foliar applications: additional 0.73 applications per hectare (weighted average), mainly pyrethroids.

These three impacts can be translated into economic and environmental costs:

The costs for the European oilseed rape industry related to the neonicotinoid ban amount to almost € 900 million:

- Almost € 350 million market revenue losses
- More than € 50 million revenue losses due to lower quality
- Close to € 120 million additional production costs
- Well above € 360 million in upstream and downstream industries.

The ban also has significant environmental impacts, both within the EU and on a global scale:

- Globally, shifting oilseed rape production outside the EU causes 80.2 million tons of CO_2 emissions, 1,300 million m^3 additional water consumption, and biodiversity losses equaling the slashing and burning of 333,000 hectares of Indonesian rainforest.
- In the EU, additional foliar insecticide applications add Greenhouse Gas (GHG) emissions of estimated 0.03 million tons CO_2 equivalents and 1.4 million m^3 of additional water use annually.

HOW DID THE STUDY CALCULATE THE ECONOMIC COSTS?

A yield gap of 4 percent equals a missing annual harvest of 912,000 tons which is just below what has been produced in Romania[3] in a year. Based on an average price of € 378 per ton, which was generated by weighting weekly prices paid for volumes of oilseed rape traded at Matif in Paris[4] this equals missing annual market revenue of almost € 350 million. Adding additional market losses due to lower quality of more than € 50 million, this amounts to a total of around € 400 million revenue losses.

The costs accruing due to the additional 0.73 foliar applications per hectare are estimated at almost €120 million based on an approximate value of € 25 per application (covering the costs of the active ingredients as well as costs of applying them on the field).

The aggregated economic losses on-farm therefore account for almost € 520 million. In addition to that, missing additional income in upstream and downstream sectors (transport, crushing, processing, packaging, and tracing) is worth more than € 360 million. In total, the annual economic costs of the neonicotinoid ban for European oilseed rape farming can therefore be determined to be almost € 900 million per year.

HOW DID THE STUDY CALCULATE THE ENVIRONMENTAL IMPACTS?

Assuming that global demand holds constant, the missing harvest of 912,000 tons in the EU needs to be produced elsewhere. Since global land productivity will not rise as a direct consequence of the ban, this production increase requires additional land resources which can be calculated using international trade and yield data. The size of the additional oilseed rape area needed is at least as large as the entire de facto territory of Cyprus. Additional land resources are to a large part located in Oceania and the Commonwealth of Independent States, i.e. Australia and the Ukraine in particular, who continue to be key trading partners with the EU. This land conversion in countries outside the EU will have several significant environmental impacts:

- **Greenhouse Gas emissions:**

The extra arable land needed is not readily available; instead, land needs to be converted from grassland or natural habitats. Such conversion will come with the release of CO_2 into the atmosphere. Globally, such additional emissions can be estimated at 80.2 million tons. This is about the equivalent of what Austria as a country currently emits in total per year[5]. Annualised, this would correspond to 4 million tons of of CO_2 emissions per year.

In addition to that, within the EU an increase of annual GHG emissions of 0.03 million tons of CO_2 occurs due to agricultural machinery and diesel on-farm required by additional insecticide foliar applications.

- **Additional water consumption:**

Banning neonicotinoids in the EU has direct and indirect effects on water use: The direct impact is linked to the additional foliar applications in the EU which are estimated to require a total of 1.4 million m^3 of additional water annually. This is based on 300 litres of water[6] needed per hectare plus tank filling and cleaning. When production shifts from the EU to other world regions, this may mean a shift to regions with lower water productivity, such as Australia or Ukraine, two major trading partners to the EU. In these regions, more water is needed for cultivation than in the EU. An estimated additional 1,300 million m^3 of water will be used on a global scale, already taking into account agricultural water “saved” in the EU. Compared to this, the direct impact linked to additional foliar applications in the EU is small.

- **Biodiversity losses:**

Following from the above, around 500,000 hectares of grassland and natural habitats rich in species need to be converted into arable land. This is to be compared to more or less intensely used arable land in the EU. The biodiversity losses that come with such a land conversion can be calculated in different ways. Using the National Biodiversity Index[7], the loss in global diversity would equal the slashing and burning of 333,000 hectares of Indonesian rainforest.

DID THE STUDY ALSO LOOK AT HOW FARMERS CHANGED THEIR PEST-MANAGEMENT APPROACHES?

Yes. Faced with a ban of one of the most effective tools in the insecticide-toolbox, farmers were forced to switch to other, more costly management solutions. A common approach was to resort to spraying pyrethroids. On average, farmers applied 0.73 additional foliar applications per hectare of cultivated oilseed rape. As highlighted above, additional foliar insecticide applications will cause associated GHG emissions and require significant amounts of additional water. The total increase of production costs at farm level is therefore estimated at € 120 million.

IS THE SWITCH FARMERS HAVE MADE FROM NEONICOTINOIDS TO OTHER MANAGEMENT PRACTICES, SUCH AS FOLIAR APPLICATIONS, BENEFICIAL TO REGIONAL BIODIVERSITY?

Not necessarily. While foliar applications and pyrethroids in particular provide certain benefits, there are at the same time several limitations to their application, as well as serious concerns with regard to resistance development For example, while pyrethroids are ineffective against the cabbage root fly, a key pest targeting oilseed rape, they do have an effect on important non-target insects such as spiders. Further to that, resistance of the cabbage stem flea beetle (another common pest) against pyrethroids is rising, and cross-resistance has also been found in at least 20 other pest insects.

These limitations highlight how important it is for farmers to have more than one solution to fight certain pests and avoid a vicious cycle of increased resistance and higher application doses. The Sustainable Use of Pesticides Directive (2009/128/EC) recognizes the relevance of using products with different modes of action for anti-resistance strategies in Integrated Pest Management.

ARE THE FINDINGS IN LINE WITH OTHER STUDIES?

Yes, they are. A recent study undertaken by ADAS[8] also investigated the impact of the neonicotinoid withdrawal on the EU oilseed rape (and maize) industries. In contrast to the 2016 HFFA-Study, it only focused on the impact in seven European countries (Austria, Germany, Finland, France, Portugal, Romania, Sweden and the UK), and focused specifically on winter oilseed rape crops. Further to that, there are some differences in the study approach, but nevertheless, the study demonstrated very similarly significant impacts at farm level:

- Across these seven countries, oilseed rape crop areas declined by approximately 4 percent in 2016;
- The combined economic impact across the countries of the loss of production (€ 96 million) and increased cost of production (€ 86 million) is estimated to have reduced the industry farm gate gross margin of oilseed rape production by € 182 million, which represents an average reduction of 9 percent in 2015; this includes cases, in which growing winter oilseed rape may no longer be profitable.
- A high risk of resistance development due to an estimated 5-fold increase in pyrethroid usage increase.

Another recent study carried out by the consultancy Steward Redqueen[9] looked at a broader, cumulative impact of losing an even higher number of substances currently used in crop protection products in Europe. Similarly, the study demonstrated that without these crop protection products, EU farmers might be at risk of suffering from significant yield losses and that greenhouse gas emissions related to cultivation would significantly rise.

The results of these studies demonstrate that it is worth putting costs and benefits of banning neonicotinoids into perspective.

Source: HFFA Research Paper 01/2017 “Banning Neonicotinoids in the European Union: An ex-post Assessment of Economic and Environmental Costs”.
The European Crop Protection Association (ECPA), the European Seed Association (ESA), and the European Farmers and European Agri-Cooperatives (Copa and Cogeca) support this new scientific evidence, which is consistent with findings and conclusions of other studies. This research paper was financed by Bayer Division Crop Science and Syngenta.

[1] FAOSTAT (2016): Production quantity of rapeseed in 2014.
[2] Alves et al. (2016), ESA (2015), ESA (2016), Hughes et at. (2016), Kim et al. (2016), Market Probe (2015a; b), Market Probe (2015c; d), Market Probe (2015 e; f), Meszka et al. (2016), Nicholls (2016; 2015), Scott and Bilsborrow (2015), Vasilescu et al. (2015) and White (2016).
[3] COCERAL (2016): EU-28 Oilseed crop forecast June 2016. Brussels: COCERAL.
[4] ZMP (Zentrale Markt- und Preisinformationen GmbH) (2016): Matif-rapeseed price quotations. Bonn: ZMP.
[5] EEA (European Environment Agency) (2016): EAA greenhouse gas – data viewer. Copenhagen: EAA.
[6] KTBL (Kuratorium für Technik und Bauwesen in der Landwirtschaft) (2014): Betriebsplanung Landwirtschaft 2014/15. Darmstadt: KTBL.
[7] CBD (Convention on Biological Diversity), (2014): Global Biodiversity Outlook 4. Montreal: CBD.
[8] ADAS (2016): “The impact of the neonicotinoid withdrawal on the EU oilseed rape and maize industries”: GOL(16)798:2. Unpublished Briefing Paper.
[9] Steward Redqueen (2016): “Cumulative impact of hazard based legislation on crop protection products in Europe”. Brussels: ECPA.