Economic note on the costs and benefits of banning NNi pesticides

This note presents a preliminary assessment of costs and benefits for banning neonicotinoids (NNis). The analysis has been conducted in house and comprises three possible scenarios. The analysis has significant limitations and much more scientific and economic evidence is required in order to eliminate the uncertainties.

Estimating the costs and benefits of restricting NNis

The costs of restricting use of NNis are estimated here by calculating the reduction in the value of crops produced. For example, evidence suggests that if oilseed rape (OSR) is not treated with NNis it is susceptible to particular viruses which would result in a certain reduction in yield. In this case a measure of the cost of banning NNis is obtained by multiplying the difference in the revenue per hectare of OSR by the number of hectares planted with OSR.

The benefit of NNi restrictions is estimated using a dose-response function approach.

The dose-response function approach requires estimating a relationship between the quantity of NNis and the number of pollinators. The second step then involves multiplying the number of pollinators by a value per pollinator.

The major difficulty associated with this methodology is that estimating the dose response function requires currently unavailable field trials (although some are underway). It is also unclear what the value of pollinator services is and how the value of such services changes with the quantity of pollinators.

In fact the in house analysis uses estimates for the impact on pollination services based on the National Ecosystems Assessment (Scenario 2) and estimates for the benefits of pollinator services to OSR provided by the University of Reading[1] (Scenario 3).

In house cost benefit analysis

Using these methodologies in house research has developed three scenarios relying on available evidence of agricultural losses, the demand of pesticides and values for pollination services. These scenarios are all compared with a business as usual scenario. Further details about assumptions and analysis are contained in Appendix 1.

<u>Scenario 1: Loss of productivity and no benefits from increased pollination services</u>

This scenario assumes that average yields of OSR are gradually reduced by up to 26% over a period of 10 years, based on research by the Broom's Barn Research Centre. It is furthermore assumed that that 7.3% of maize production grown from seeds treated with NNi would be lost. We assume that the production of linseeds would cease.

[1] Tom D. Breeze, Stuart P.M. Roberts and Simon G. Potts 4/29/2012 'The Decline of England's Bees' University of Reading

Regarding the benefits it is assumed that NNis do not affect pollination by bees.

The NPV of this scenario is -£1,267M measured over a period of 10 years.

This scenario assumes no effect on bee populations, given that Defra's recent study of the impact of NNis found no adverse effects on bee populations. This scenario might change following field trials results.

Moreover, the scenario does not consider substitution effects which might change completely the results. In fact producers and consumers effects have not been investigated for the purpose of the present work. Consideration is being given to developing this aspect of the assessment.

Scenario 2: Loss of productivity but benefits from increased pollination services of £55m per year

The assumptions underlying the costs of scenario 2 are the same as for scenario 1, except that restricting NNis is assumed to increase pollination services by £55m per year, increasing by 2.5% per annum. This assumption is based on figures presented in Defra's National Ecosystem Services report which states that the total value of UK pollination services was £430M in 2009. Given that oilseed rape and seed-treated maize account for only 12% of the UK croppable land, we estimate a loss of £55M per annum (£430M*12%) from banning NNis.

The NPV of this scenario is -£741M measured over a period of 10 years.

This scenario is relying on the only available study showing that the total economic value of pollinators in UK is £430M. There are limitations associated with such a study and further evidence development is being discussed within the pollinator strategy in order to verify what figures can be used for this purpose .

Scenario 3: Loss of productivity but benefits from increased pollination services of £117m per year

The assumptions underlying the costs of scenario 3 are the same as for scenario 1.
Estimates of the change in the value of the pollination services are based on those provided by the University of Reading as reported above. More specifically, it is assumed that the value of additional pollinator services increases from £117M per year at a rate of 2.5% per annum.

The NPV of this scenario is -£147M measured over a period of 10 years.

This represents an extreme scenario as it assumes that all bees coming into contact with NNis are killed. This scenario is unlikely to be used for the purpose of the IA of restricting neonics to be carried out by DEFRA

Limitations and the need for further analysis

The key uncertainties associated with these estimates are as follows:

- The impact of NNis on crop yields;
- The extent to which farmers would substitute away from oilseed rape, maize and linseed if NNis were restricted (analysis is being carried out at the moment by DEFRA analysts);
- The impact of restricting NNis on bees' pollination services.

To estimate the costs and benefits of banning NNis more robustly, more scientific research is required into these issues.

DEFRA is preparing an IA of banning NNis after 2 years of moratorium where the above uncertainties will be investigated in more details.

Conclusions

This analysis suggests that banning NNis would result in a net cost to the UK economy. Nevertheless, the size of the cost depends on a number of uncertain assumptions including the extent to which NNis affect pollination services provided by bees. Assuming that NNis have no impact on pollination services, possible NPV costs would be in the order of £1.2bn over 10 years. Nevertheless, further scientific evidence will be required to obtain more robust estimates for the costs and benefits of the restrictions. On the available evidence, it is unclear precisely to what extent restricting NNis would reduce overall agricultural yields (or even the yields of particular crops). It is also unclear to what extent, if any, there are benefits arising from prohibiting the use of NNis. A high value should therefore be attached to the provision of information which would dispel these uncertainties. Such information might prevent the imposition of a costly ban on NNis not having any impact on the number of pollinators. Equally, such information might also prevent inaction causing a further decline in the number of pollinators (where this might have been avoided with only modest costs to agriculture).

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[redacted] **and** [redacted]
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