BCPC Pests and Beneficials Expert Working Group Review 2016

Can we continue to grow oilseed rape in the UK?

Jack Watts (Lead Analyst, AHDB Cereals & Oilseeds)

It is a challenging time for oilseed rape (OSR) economics, due to the risks that farmers are faced with. OSR is the UK's most widely grown break crop, offers unique market opportunities and improves the long term sustainability of crop rotations. Areas of OSR production have increased since 1984, but have fallen in recent years due to lower returns and higher risks. These risks include increased levels of crop abandonment, a level of risk not previously encountered in northern European agriculture.

A full net margin analysis of OSR crops in 2017 indicates that assuming a yield of 3.65 t/ha and a price of £250/t, OSR growers are likely to lose £215/ha even without crop losses. Understanding why farmers would seek to grow OSR at all requires an understanding of the costs of not planting an area or the potential returns of growing an alternate break crop. It should be remembered that OSR prices are volatile but demand is robust and growing. Should prices recover from recent lows then the balance between risk and reward will improve.

Oats, beans, spring cereals, linseed, peas and maize etc. offer alternatives to OSR. It is clear though that a small change in the OSR market could have knock-on and overwhelming effects on these alternative markets. The use of fallow or cover cropping can be an investment in future cereal yields. There is also an opportunity to use precision farming to identify specific land areas for fallow as part of a low price strategy.

Charles Godfray (Hope Professor of Zoology at Jesus College and Director of Oxford Martin Programme on the Future of Food, Oxford University)

The Oxford Martin School produces independent summaries of the natural science evidence base and issues external peer-reviewed restatements following stakeholder consultations, and iterative revisions. While it is widely accepted that land use changes are important in explaining declines in insect pollinators, the additional role that pesticides may play remains unclear.

Field surveys of OSR crops have provided information on the concentrations of neonicotinoids present in the pollen and nectar that bees may be exposed to. There is generally good understanding of how exposure to these doses may effect individual bees, but much less understanding of how this translates into population processes. This is complicated by interactions between insecticide exposure and diseases as well as other stressors, and a limited ability to conduct field based studies to measure these effects effectively. This is due to the difficulties of extrapolating from laboratory or semi-field trials to true field conditions, and interpretation of sub-lethal effects to impact at the population level.

Research faces challenges to improve the evidence base. Potential conflicts of interest must be overcome in addition to bias and incentives that drive research pursuits. The pervasiveness of subconscious bias is greatly underestimated. The reality is that decisions have to be made with imperfect knowledge, but some of these challenges can be overcome through pre-experiment peer review, greater transparency and "adversarial collaboration" between those with opposing viewpoints.

Panel discussion led by Charles Godfray

Norman Carreck (Science Director, International Bee Research Association and Researcher in the Laboratory of Apiculture & Social Insects, University of Sussex) – to prevent honey bee COlony LOSSes (COLOSS), a group of 710 scientists from 89 countries, is working to try and understand the reasons for loss of honey bees and other insect pollinators. Land-use change is the major cause; poor beekeeping techniques, pests and diseases are also key factors; the *Varroa* mite remains the greatest threat to honey bee colonies worldwide.

The world is safer now for bees than it was 35 years ago, when colony losses due to pesticide exposure were more common. In the OP era there were 50 recorded incidents of pesticide-induced losses per year; in the neonicotinoid era there were 5. Beekeepers cite OSR as an important nectar source; colonies build up on winter rape and make honey from spring rape. Bee farmers move their bee colonies to allow them access this resource. It remains uncertain what a reduction in OSR planted area, or the use of alternative insecticide compounds, will have on honey bees and other insect pollinators.

Peter Campbell (Senior Environmental Risk Assessment Specialist, Syngenta) - provided some background on assessment of pesticide safety and the impact of new European Food Safety Authority (EFSA) guidance on approval of new herbicides. The EFSA scientific opinion on terrestrial arthropods is that biodiversity would have to be protected from both direct and indirect effects of multiple pesticide applications ***within*** the crop – the implications for herbicide use are obvious!

Levels of natural variability means that the quantification of these protection goals is extremely problematic. The field study specification is impossible to meet. The consequence of this is that, after nearly a 2-year delay, the EFSA guidance for bees has still not been adopted by EU member states due to the implications on herbicide, fungicide and insecticide use. Authorities in the US, Canada and Australia have drawn different conclusions from the EU on the effect of neonicotinoids, and thus have not followed the EFSA approach to restrict use.

Chris Hartfield (Chief Advisor for Horticulture and Potatoes, NFU) - urged delegates to recognise a common interest in insect pollinators. The decline in biodiversity of bees in Britain was most dramatic between 1950s-1980s. Since then the losses have slowed and biodiversity including butterflies and solitary bees has increased (due to conservation and /agri-environment schemes). This is not the impression held by politicians and the public; there are positive messages to be given out.

Scientists are beginning to understand on-farm biodiversity, but more work is required to understand functional pollinator abundance. The national pollinator strategy has highlighted that “without a systematic and standardised monitoring strategy, we will fail to see current status of pollinators and success of any actions”. However, there is no plan to determine which pollinators are, and are not, important, and to determine a baseline from which future trends can be observed.

Farmers are delivering actions on the ground, by providing pollinators with the food and habitats they require and by using Integrated Pest Management (IPM). In 2013, through the Campaign for the Farmed Environment (CFE), farmers were implementing measures to benefit pollinators across 677,000 hectares.

Lin Field (Head of Department for Biological Chemistry & Crop Protection, Rothamsted Research) – OSR crops are attacked by a range of pests, including peach-potato aphid, pollen beetle and cabbage stem flea beetle (CSFB). All three pests have developed insecticide resistance to pyrethroid insecticides and in the case of peach-potato aphid to carbamate insecticides as well. We are already seeing increasing pest pressures as peach-potato aphids and CSFB are less effectively controlled in the absence of neonicotinoid seed treatments.

A body known as the European Academies Science Advisory Council (EASAC) recently commented that the 'widespread use of neonicotinoids (as well as other pesticides) constrains the potential for restoring biodiversity in farmland under the EU's Agri-environment Regulation'. This far-reaching conclusion is likely to lead to calls to extend the neonicotinoid restrictions and expand them to other crops and other insecticides.

Sacha White (Research Entomologist, ADAS) - presented initial data from the CSFB monitoring programme, completed as part of the neonicotinoid derogation. In total, 48 sites have been monitored, collecting data on crop establishment, crop damage, assessments of adult and larval numbers and finally crop yields at harvest.

Assessment of plant damage at the cotyledon stage, based on percentage leaf area lost, showed that 18.4% leaf area was lost in untreated crops, and 8.9% in neonicotinoid treated crops. Ten sites were above the treatment threshold, with one site of total crop loss in an untreated crop (at the same site in treated crops there was just 7% damage). At the 3-4 true leaf stage there was little difference in percentage leaf area lost between untreated and treated plots. CSFB numbers and the impact on plant populations and damage to yield remain to be quantified. In addition, analysis of other factors that potentially explain levels of CSFB damage are still to be completed.

James Peck (Managing Director, PX Farms Ltd)

A case study of a farm on predominantly heavy and fenland that historically grew continuous barley and wheat was given. As the farm moved away from continuous crops, OSR become an important part of the rotation. However, OSR yields have stagnated, and in 2014 and 2015, the farm experienced complete loss of some OSR crop. In response, the farm has moved from a simple rotation to a more complicated one that includes feed wheat, OSR, milling wheat, spring barley, sugar beet, winter beans, peas, mustard, and linseed. It is important to consider the wider rotation and the knock-on effects of poor OSR crops, for example on black-grass populations in the following wheat crop.

Andrew Blazey (Agronomist, Prime Agriculture)

From a regional perspective, it is clear that loss of neonicotinoid seed treatment is only part of the problem. With no effective foliar insecticide available, even where crops establish they may fail in the spring. The impact has been increased insecticide costs, a 10% crop loss in autumn, and additional crop losses in spring. Patchy crops result in weed infestations, uneven ripening, which impacts on harvesting and cultivations, mediocre yields and increased CSFB numbers.

Changes in the management of drilled crops has also changed. There is a consensus to drill early, but drilling before clean-up after harvesting of the previous crop may create green bridges for pests and diseases. Improved establishment methods using disc coulters following a tine to create an even and consistent seed placement is increasingly required to improve establishment.

Establishment doesn't get much easier than autumn 2015, but harvest 2016 yield outcomes will decide for many farmers whether they continue to grow OSR.

Jens Erik Jenson (Senior Advisor, SEGES Knowledge Centre for Agriculture, Denmark)

The Danish motto for crop protection is "as little as possible, as much as necessary". Many farmers consider bees to be their most important employees. OSR is an important break crop and the winter OSR has doubled in the last 15 years. Denmark does not have the same CSFB pressures as the UK , but applied for a derogation on the use of neonicotinoid seed treatments in March 2015; justifications included delaying pyrethroid resistance, and economic losses for farmers in the case of unsatisfactory control. The derogation has resulted in 95% of OSR seed being neonicotinoid treated in 2015.

The pesticide registration regime is strict and coupled with high pesticide costs due to the Pesticide Tax, has resulted in increased monitoring of fields, which reduces dependence on pesticides in Denmark. Trusting available thresholds is also important in limiting numbers of insecticide applications. Education, raising awareness and increased understanding of pest biology are key.

Despite the strict pesticide registration regime, neonicotinoid seed treatments are not considered to present an unacceptable risk to the bee populations in Denmark.

Sam Cook (Senior Research Scientist, Rothamsted Research)

Use of IPM in OSR crops is a need not an option. Pest resistance to insecticides is one of the biggest challenges. OSR crops face different pest pressures throughout the season but crops once established compensate for much of this damage, while natural enemies play an important role. Farming practices that seek to kill pests often also kill beneficials. The use of pyrethroid sprays for example has negative impacts on carabid beetles, which are natural enemies of CSFB.

There are four steps to developing and delivering fully integrated pest management strategies. Firstly, action thresholds have been defined in the UK, and it is essential to understand these thresholds so they are trusted. Secondly, monitoring and risk assessment aids decision making. ProPlant is an online decision support tool which uses local weather conditions to predict, up to three days in advance, the start, peak and end of pollen beetle migration periods. Researchers are now evaluating the use of ProPlant to monitor CSFB. The third step in developing IPM strategies is prevention. Pest resistant cultivars are available, and a genetic breakthrough has occurred in the development of Amalie which is resistance to TuYV. Finally, the control of these pests can be managed using mechanical methods, insecticidal practices and biological control.

Conservation biocontrol is the use of agronomy and habitat to conserve natural enemies of crop pests in the agro-environment. For OSR the most efficient are *Brassica* specialist parasitoids, however, these species are sensitive to tillage. There is a challenge in the future to optimise seed mixtures for buffer strips to support naturally occurring beneficials.

Integrated pest management includes the use of insecticides but only when necessary, prolonging their active life, safeguarding the environment, maximising profit and contributing towards the sustainable intensification of OSR crops. It is clear that there is no quick fix. The answer is not in a bag of seed dressing, the challenges are broader and reflect all crop pests.

Key messages from the papers and discussion

- Current prices mean that at present risks of growing OSR are higher than rewards
- It has not been established that modern pesticides play a dominant role in the observed declines of insect pollinators.
- Any drive for increased in-crop biodiversity (as opposed to pollinator margins etc.) will have huge negative impact on crop production.
- There is a requirement for greater transparency and cooperation in the design and interpretation of experiments and availability of data to reduce decisions based on imperfect science
- Current concerns over the use of neonicotinoid insecticide seed treatments must be put into context with major drivers such as land use change and pests such as *Varroa* mite.
- “Limited chemistries will mean unlimited resistance”.
- The economic and environmental impact of reduced OSR production must be understood
- There is an urgent need to establish a systematic and standardised monitoring programme for insect pollinators