

The BCPC Congress 8-9 November 2022

Progress(?) in invertebrate pest control – highlights from BCPC reviews

Dr Jon Knight

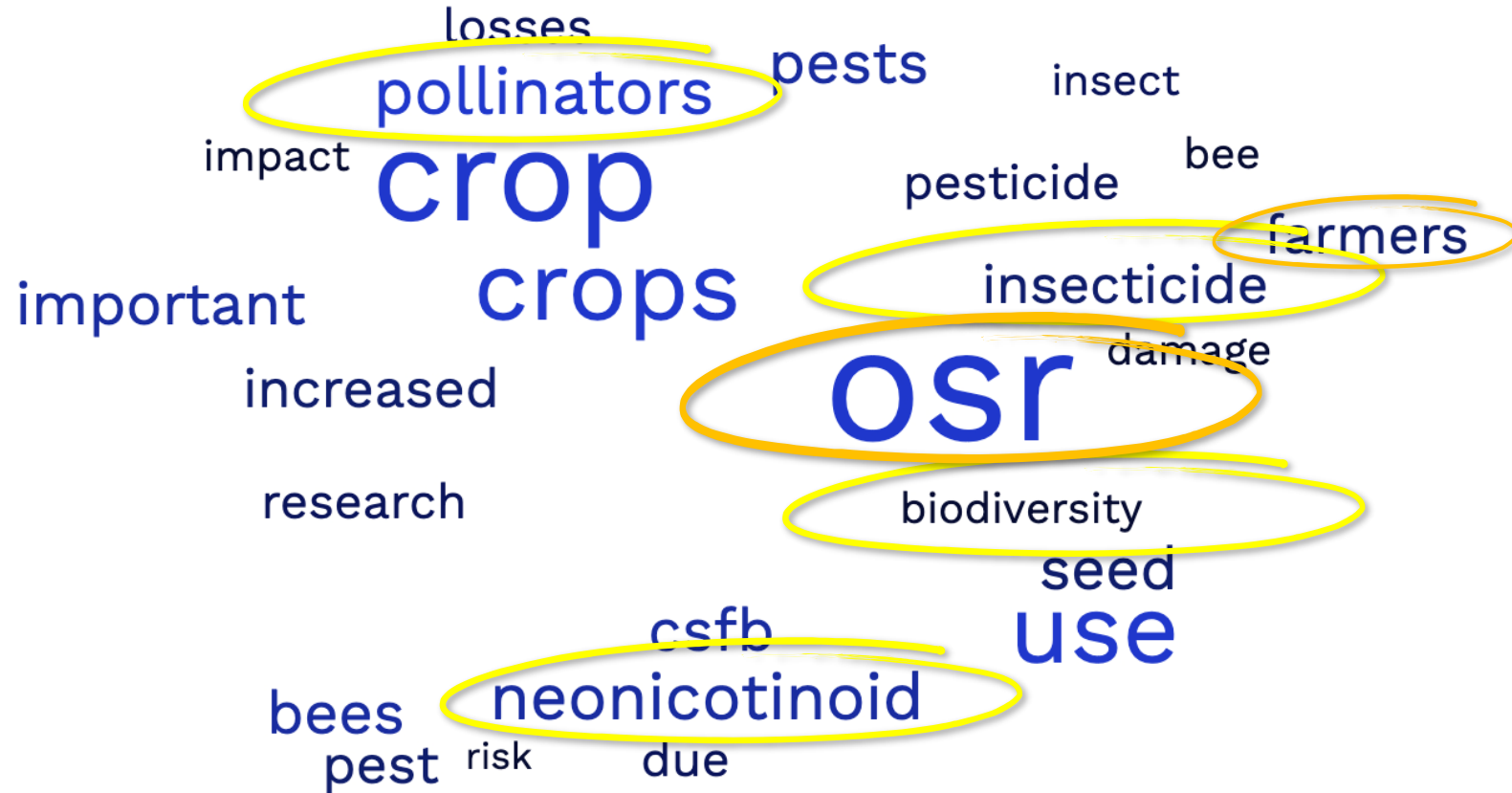


Highlights of Pests and Beneficials Reviews



- ▶ 7 years of Pest & Beneficials Review meetings
- ▶ Recurring themes
- ▶ Crop examples
- ▶ Grower perspectives
- ▶ Conclusions - Progress....

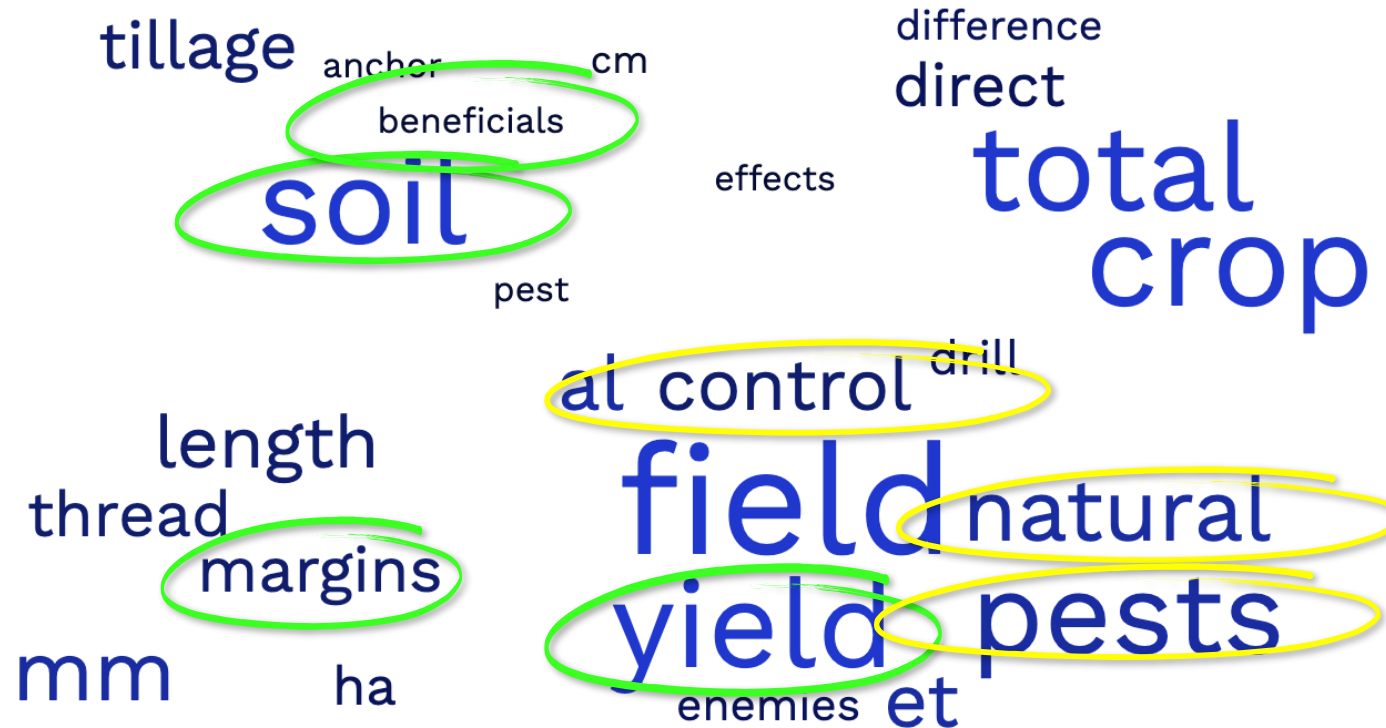
2016 - Can we continue to grow oilseed rape in the UK?



2017 - Achieving sustainable pest control – hard lessons from the pyrethroid story and implications for an IPM future



2018 - Building confidence in beneficials

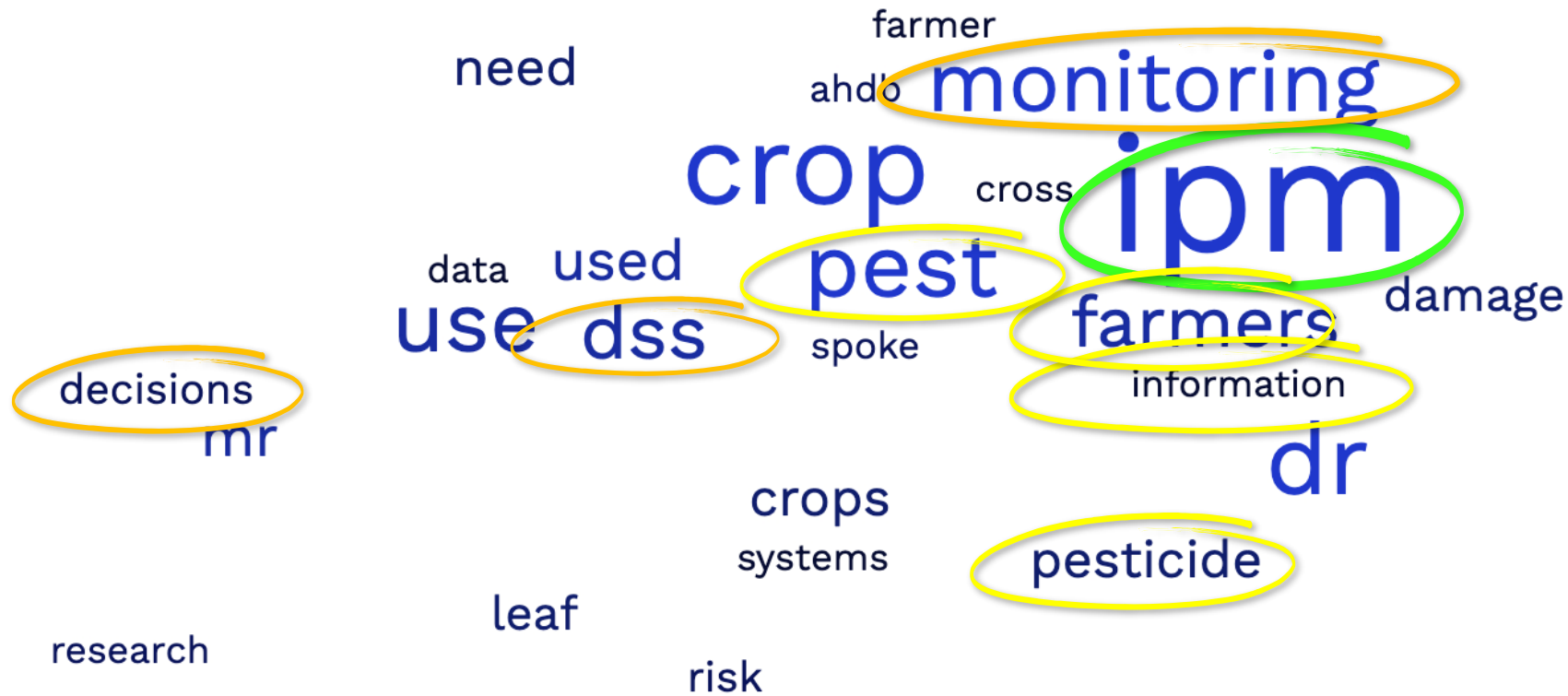


2019 - Breeding to Boost IPM - Can We Rise to the Pest Control Challenge?



2020 - 'Making Metrics Pay'

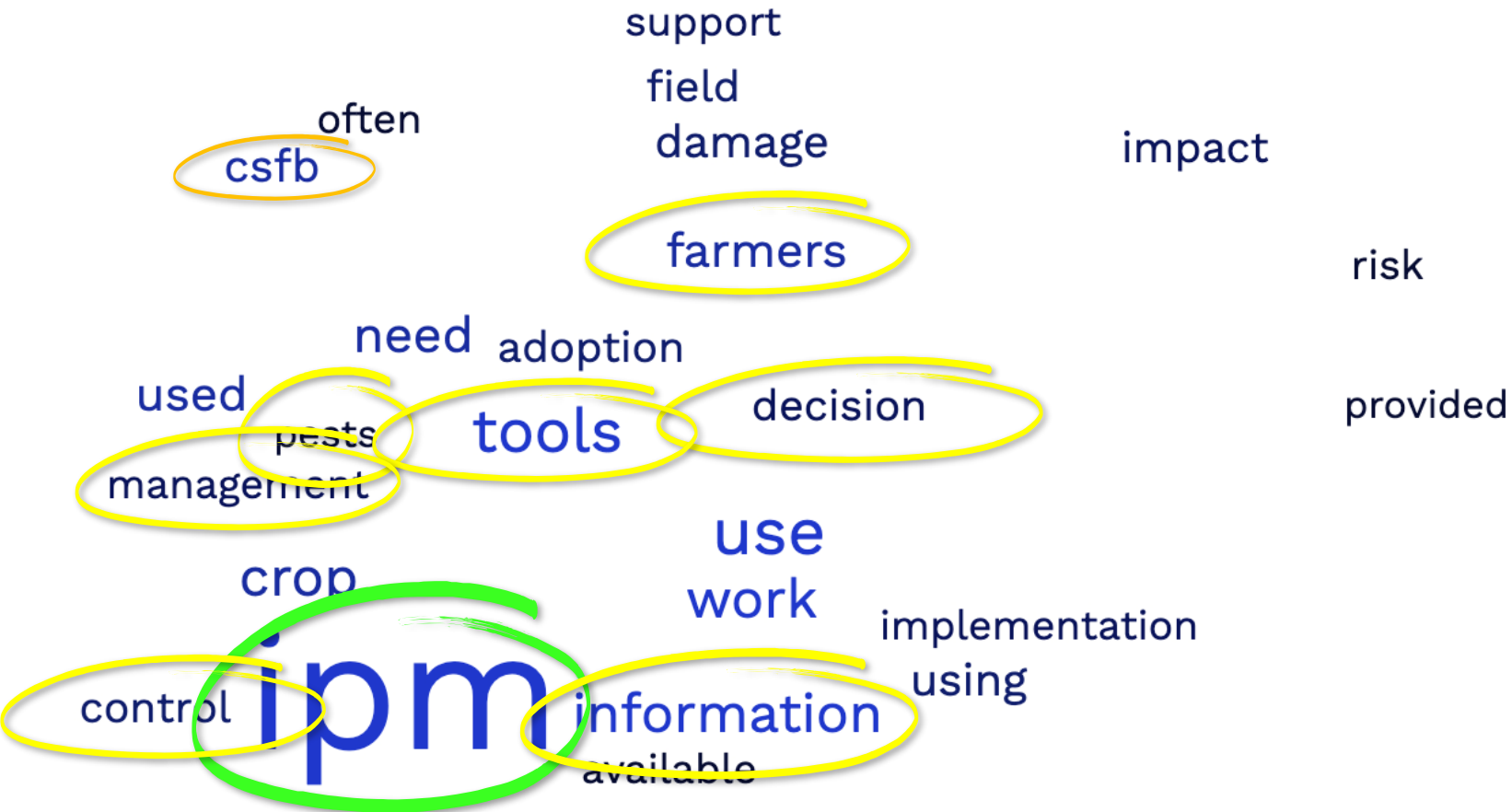
Can data-driven decision making deliver profitable IPM?



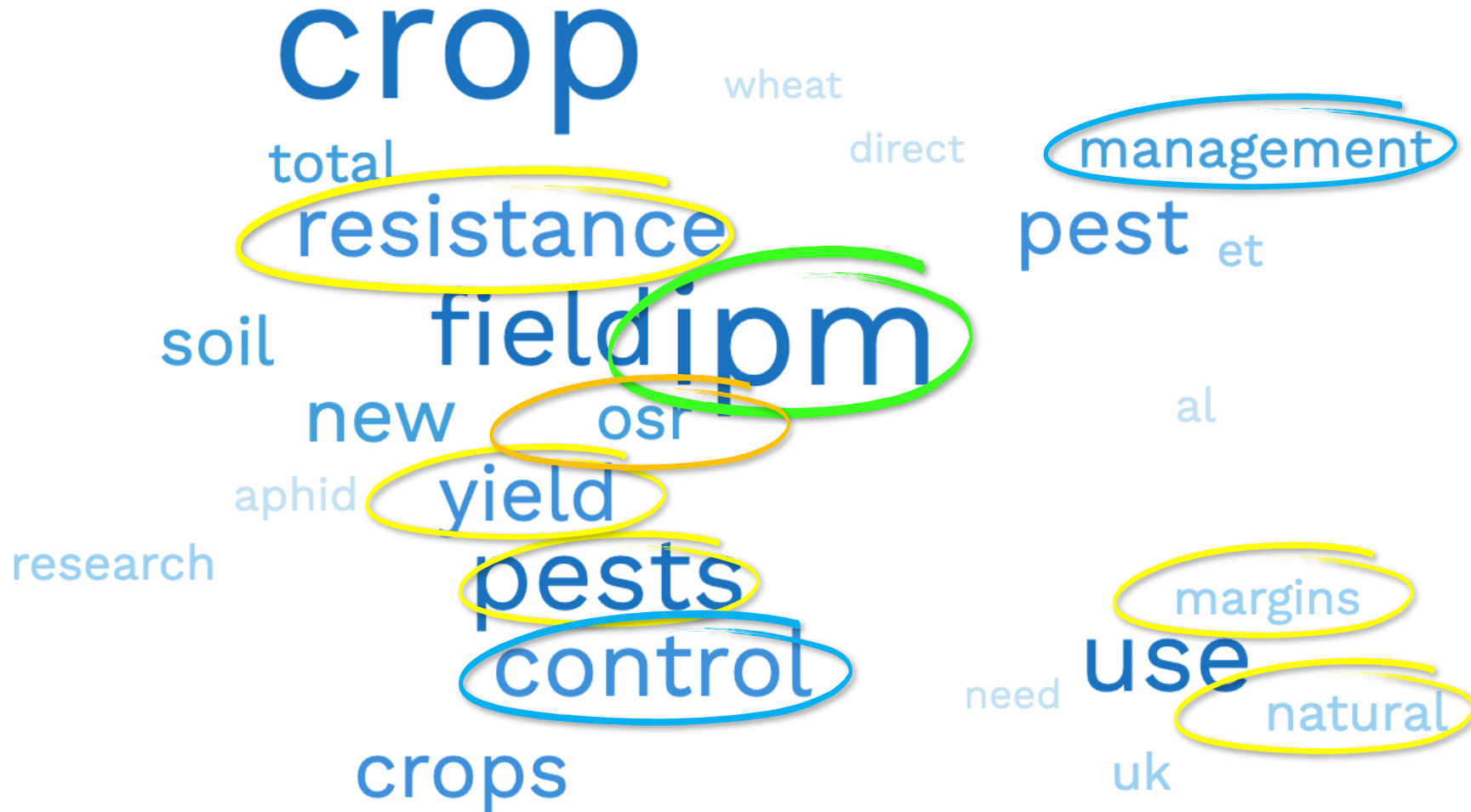
2021 - Delivering IPM - Overcoming the Regulatory and Economic Barriers to Progress



2022 - Trials, Tribulations and Successes of IPM



All years

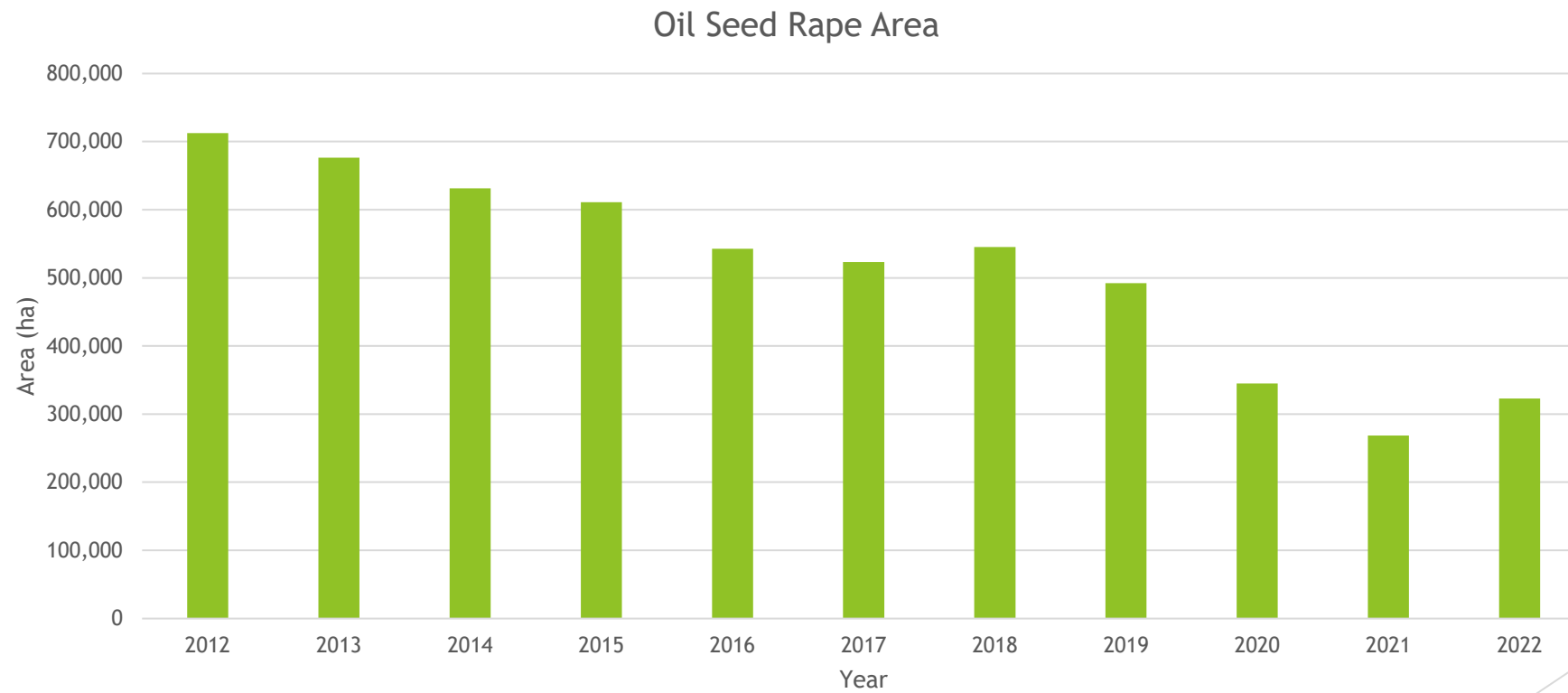


Any change?

Oilseed Rape



Why the interest?



First meeting of group in 2016 on *The future of growing oilseed rape*

- ▶ Economic appraisal
- ▶ OSR and neonicotinoid loss. Discussion of evidence and best practice to determine impacts
- ▶ Farmer and Agronomist perspective
- ▶ Danish experience
- ▶ Cabbage Stem Flea Beetle management

“IPM is a need not an option”

2016 Review take-home messages

- ▶ A drive for increased in-crop biodiversity (as opposed to pollinator margins etc.) could have a significant negative impact on crop production.
- ▶ There is a need for transparent farm relevant, experimental data to provide robust decision making e.g. thresholds
- ▶ Current concerns over the use of neonicotinoid insecticide seed treatments must be put into context with other factors impacting bee health
- ▶ “Limited chemistries will mean unlimited resistance”.
- ▶ The economic and environmental impact of OSR must be understood
- ▶ There is an urgent need to establish a systematic and standardised monitoring programme for insect pollinators

2018 Review (Beneficials)

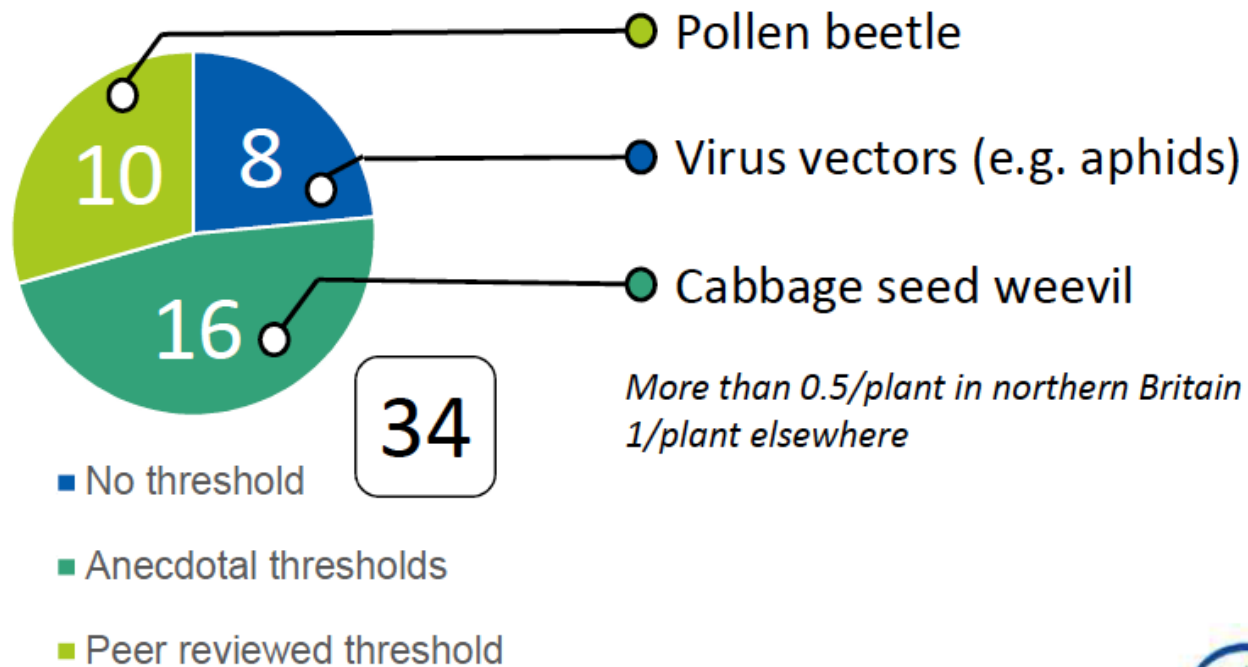
- ▶ Cost Benefits of thresholds - including for pests of OSR e.g. Pollen Beetle
- ▶ Report on work on conservation biocontrol of OSR pests by beneficials

2022 Review (Trials, tribulations...)

- ▶ IPM strategies for cabbage stem flea beetle

2018 - Cost Benefits of thresholds

Economic thresholds



Ramsden et al. (2017) *Crop Protection* 96, 30-43



2018 - Cost Benefits of thresholds

Summary example – Pollen beetle

If there are less than 30 plants/m ²	the threshold is 25 pollen beetles per plant
If there are 30–50 plants/m ²	the threshold is 18 pollen beetles per plant
If there are 50–70 plants/m ²	the threshold is 11 pollen beetles per plant
If there are more than 70 plants/m ²	the threshold is 7 pollen beetles per plant

Excess pods can be lost with no impact on yield



2018 - Cost Benefits of thresholds

Obstacles to implementing thresholds

- ▶ Calendar/insurance based insecticide application
 - ▶ Obvious results
 - ▶ Forgiving application
 - ▶ Established methods
 - ▶ Cheap
 - ▶ Quick
- ▶ Threshold based applications
 - ▶ Relative results
 - ▶ Difficult to get right
 - ▶ Complex systems
 - ▶ Investment needed
 - ▶ Often slow

- ▶ All insects gone
- ▶ Sub-optimal application still works
- ▶ Fits with existing system
- ▶ Relatively low short-term costs
- ▶ Can have immediate effect

Farmer Focused Research

- ▶ Pest remains in crop
- ▶ IPM solutions do not always work
- ▶ Numerous spatially variable techniques
- ▶ Establishing field margins
- ▶ Benefits accumulate over years

Conservation via habitat management : field margins



- Uncultivated field margins can act as refuges for tillage-susceptible parasitoid populations to thrive
- Flowering field margins can improve pollen beetle parasitism on neighbouring crops (by provision of pollen and nectar resources) (Thies & Tscharrntke (1999); Buchi (2002))
- Brassicas needed to build-up populations of brassica-specialist parasitoids (!)

- Insect samples & plant composition was monitored from 16 margins sown to 4 different types of semi-natural habitat: (1) wild bird cover (2) florally-enriched grassland (3) insect rich cover (4) natural regeneration

- 50 parasitoids of OSR pests were identified; only 3 were in margins containing no brassicas



OSR

► 2016

Four steps to developing and delivering fully integrated pest management strategies.

1. Action thresholds - defined in the UK but essential they are understood and trusted.
2. Monitoring and risk assessment aids decision making. Tools now available.
3. Prevention. Pest resistant cultivars (Amalie resistance to TuYV)
4. Control can be managed using mechanical, insecticidal and biological controls.

► 2022

IPM is the solution to CSFB problem using 4 key steps.

1. Action thresholds –rethink threshold in terms of physiological damage to the plants.
2. Early sowing strategies to avoid adult damage require caution - monitoring
3. Prevention of damage by planting resistant cultivars is not currently available. Trap crops showing some promise, cultivations and rotations.
4. Controls using new insecticides with RNAi technology, biopesticides, entomopathogenic fungi and nematodes have been shown to work in the lab. Conservation biological control shows some promise in field experiments.

2018 Review - Application of biocontrols in outdoor crops - Horticulture

- ▶ Conservation Biocontrol
 - ▶ Pear sucker
 - ▶ Conservation biocontrol
 - ▶ Pesticide impact on biocontrols
 - ▶ Thresholds
 - ▶ Habitat required



2018 Review - Application of biocontrols in outdoor crops - Horticulture

- ▶ Augmentation biocontrol
 - ▶ Western Flower thrips in strawberry
 - ▶ Neoseiulus cucumeris predatory mite
- ▶ New Pests
 - ▶ Spotted Wing Drosophila
 - ▶ First discovered in the UK 2012
 - ▶ Development of trapping
 - ▶ i.d. of parasitoids in UK



([https://commons.wikimedia.org/wiki/File:Spotted-wing_Drosophila_\(Drosophila_suzukii\)_male_\(15359228246\).jpg](https://commons.wikimedia.org/wiki/File:Spotted-wing_Drosophila_(Drosophila_suzukii)_male_(15359228246).jpg)), „Spotted-wing Drosophila (Drosophila suzukii) male (15359228246)“, <https://creativecommons.org/licenses/by/2.0/legalcode>

A Plan... Andy Barr - Kent Farmer 2018

▶ OSR

- ▶ Architect
- ▶ Companion crop - beans/clover/cereal volunteers
- ▶ Trap crop - turnip rape/kale
- ▶ Home Saved Seed and prepare to be flexible
- ▶ Don not spray for pollen beetle or seed weevil

▶ Wheat

- ▶ Skyfall/Zyatt?/Deter?
- ▶ Clover understory/keep OSR volunteers
- ▶ Not too early apply compost
- ▶ No T0 fungicide
- ▶ No autumn aphicide

▶ Beans

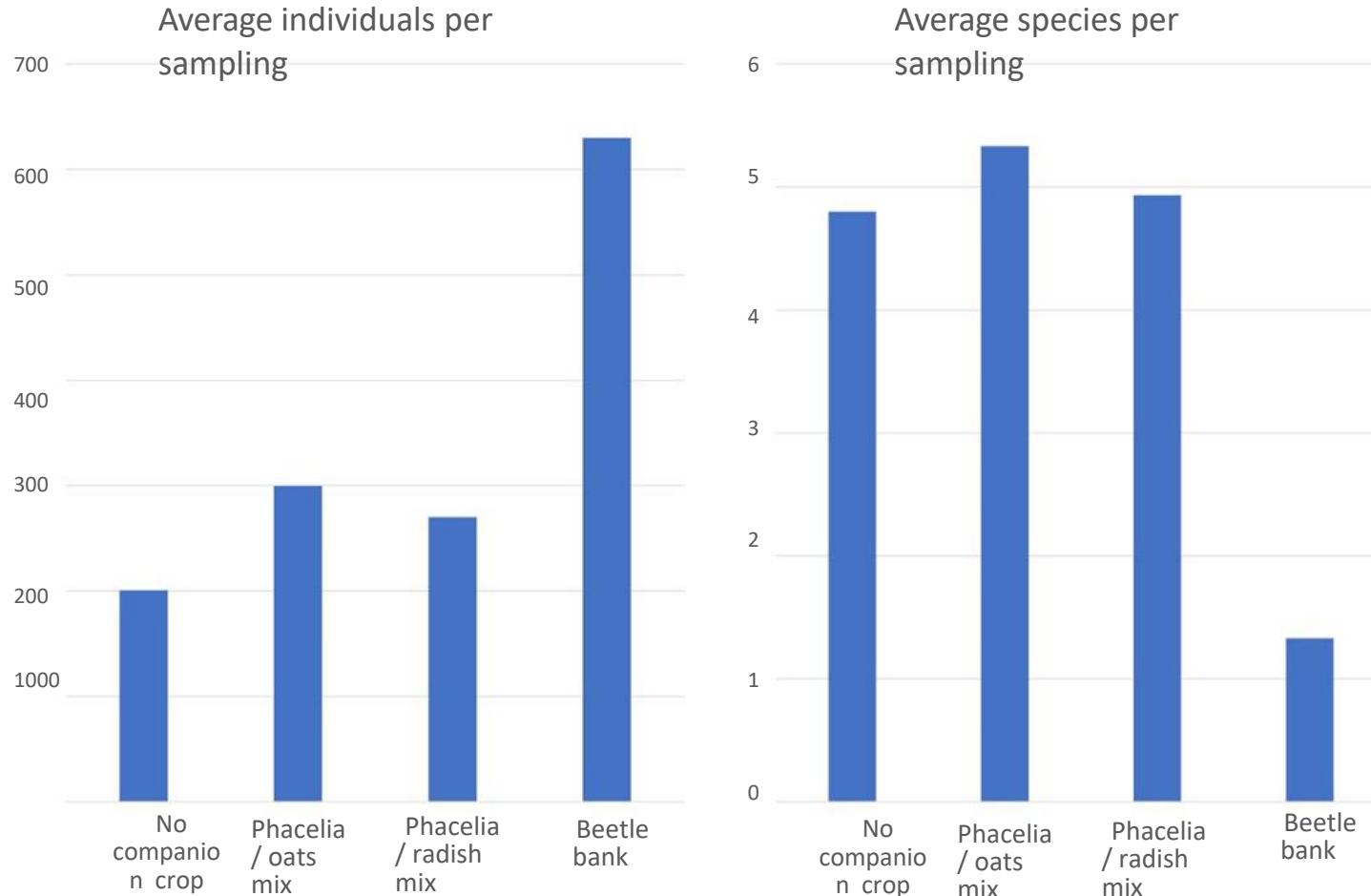
- ▶ Spraying pointless or use entomopathogen
- ▶ Plant into rye/oats cover crop mulch

▶ Backed up by

- ▶ No till
- ▶ Compost/manure
- ▶ Urea/UAN/foliar nutrients
- ▶ Countryside stewardship
- ▶ LEAF Marque
- ▶ Field specific monitoring alerts
- ▶ Patience & flexibility

Knowing more on farm Andy Barr 2022

Insect biodiversity Lenham



Progress.....

- ▶ Enabling policy is emerging ?
- ▶ We know more about more ✓
- ▶ We can change how we manage pests ✓ ✗
- ▶ More options are available ✓ ✗
- ▶ We better Understand Risks ?
- ▶ More work to be done ✓ ✓ ✓

Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to ecosystems and encourages natural pest control mechanisms

Thank You

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