Monitoring and IPM of cabbage stem flea beetle (CSFB) in the UK

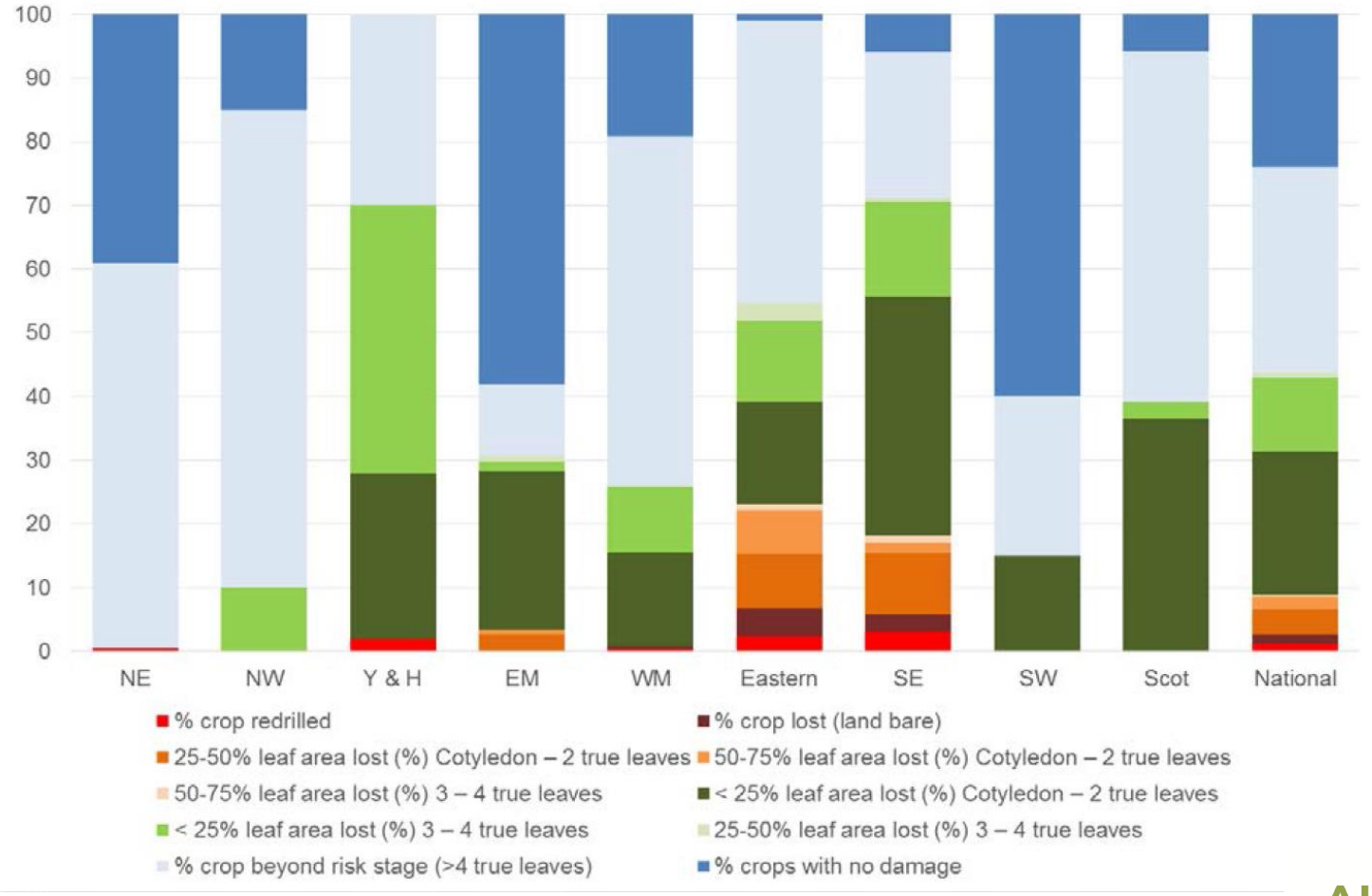
Dr Sacha White, Senior research entomologist, ADAS

UK CSFB damage and incidence surveys

- Neonicotinoid seed treatments unavailable on WOSR.
- Except for 2015 when derogation for 5% of national crop.
- Pyrethroid resistance detected in 2014. Widespread in E and SE. Present in NE, S, W.
- AHDB commissioned a series of national adult and larval surveys starting in 2014.
- Defra-funded larval surveys 1999-2016 (Crop Monitor/Fera).
- Agronomists reported damage due to adult CSFB.
- Crops surveyed equivalent to between 5% and 11% of national crop (depending on year).

ADAS

Adult damage - autumn 2014



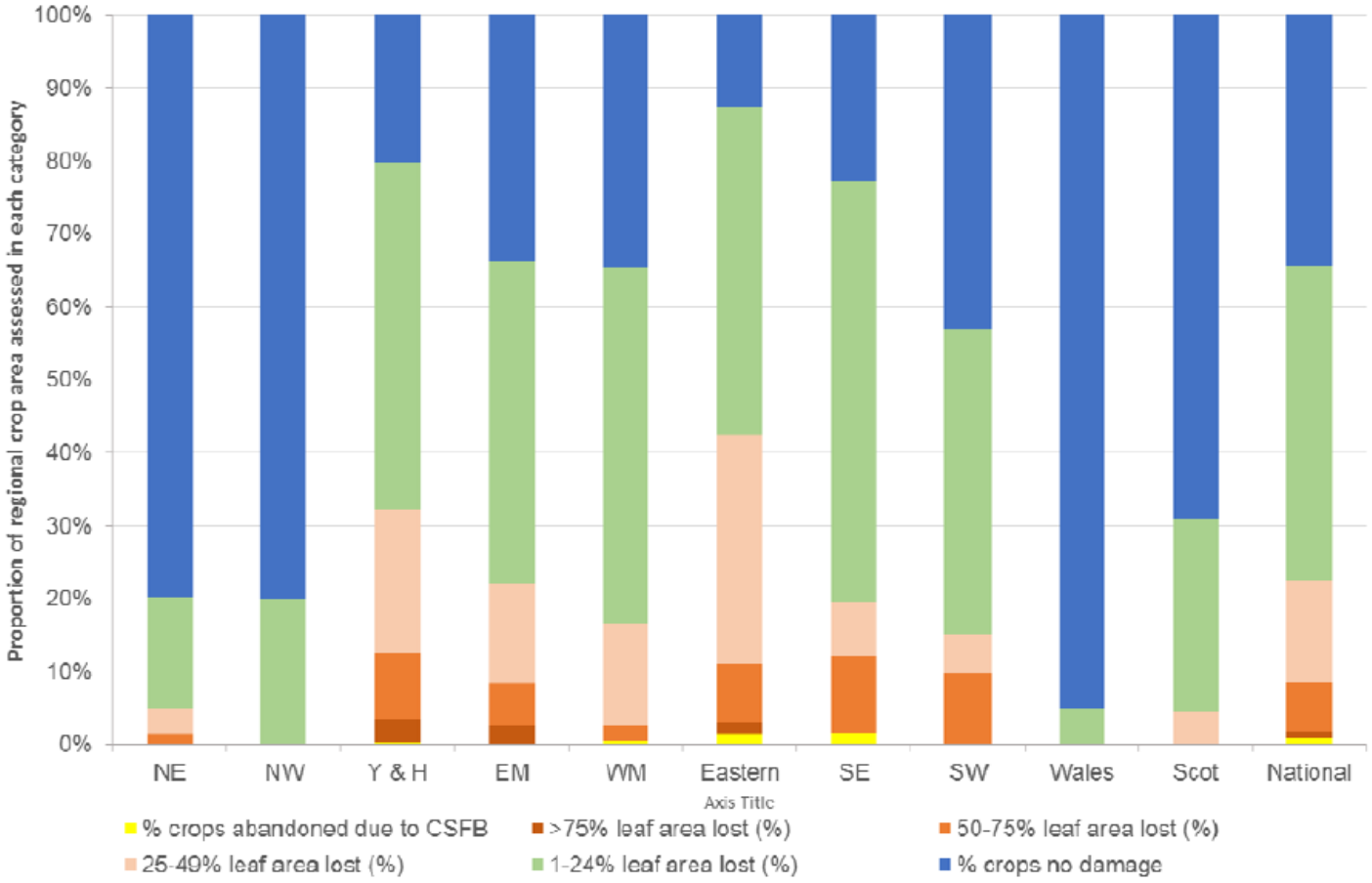
- 41% affected.
- 6% above treatment thresholds.
- 3% lost.
- 5% lost by December.

Wynn *et al.*, 2014

AHDB CEREALS & OILSEEDS

ADAS

Damage - autumn 2015



- 69% affected.
- 22% above cotyledon threshold.
- 4% above 3-4 leaf threshold.
- 1% lost.

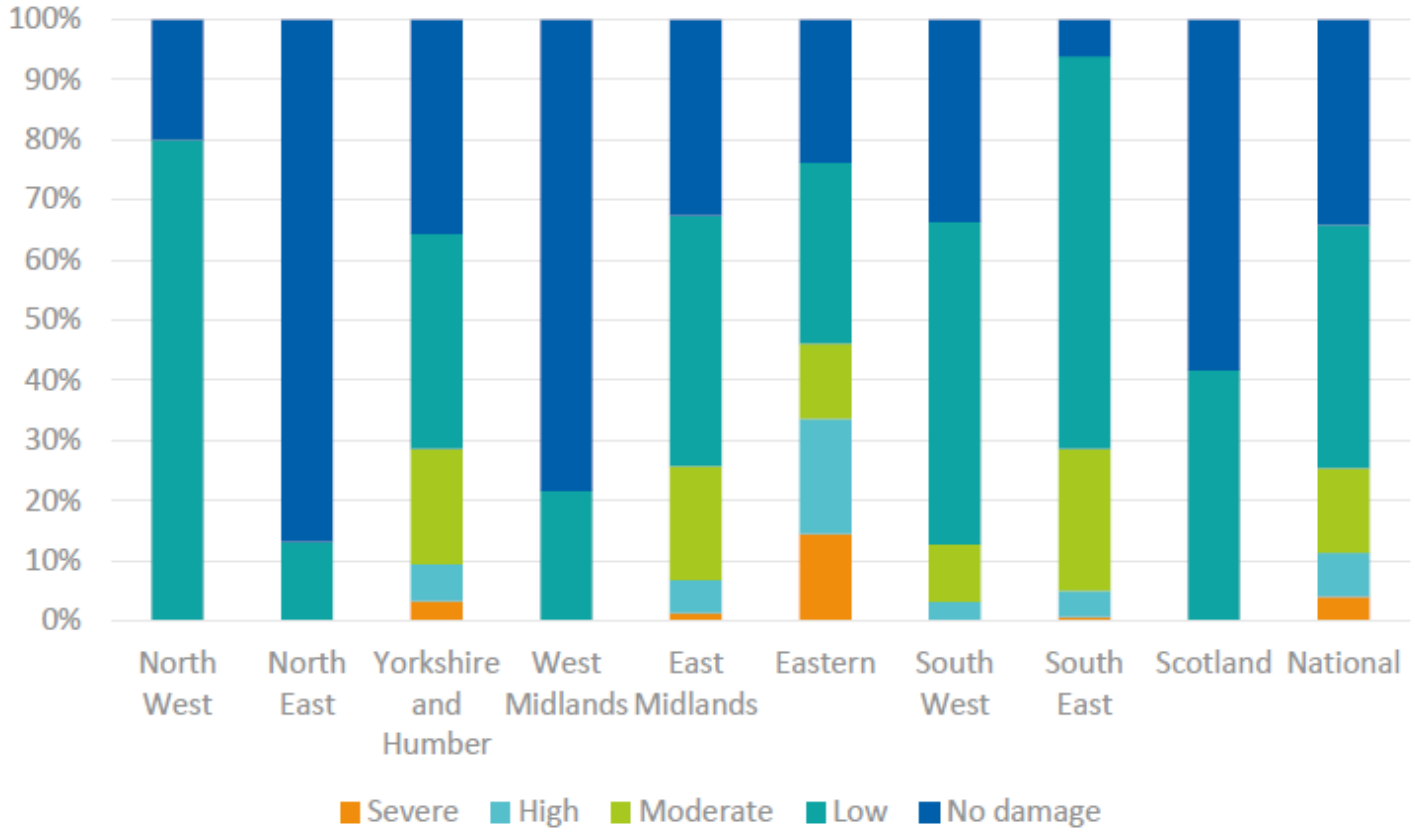
Alves *et al.*, 2016

AHDB CEREALS & OILSEEDS

AICC ASSOCIATION OF INDEPENDENT CROP CONSULTANTS

ADAS

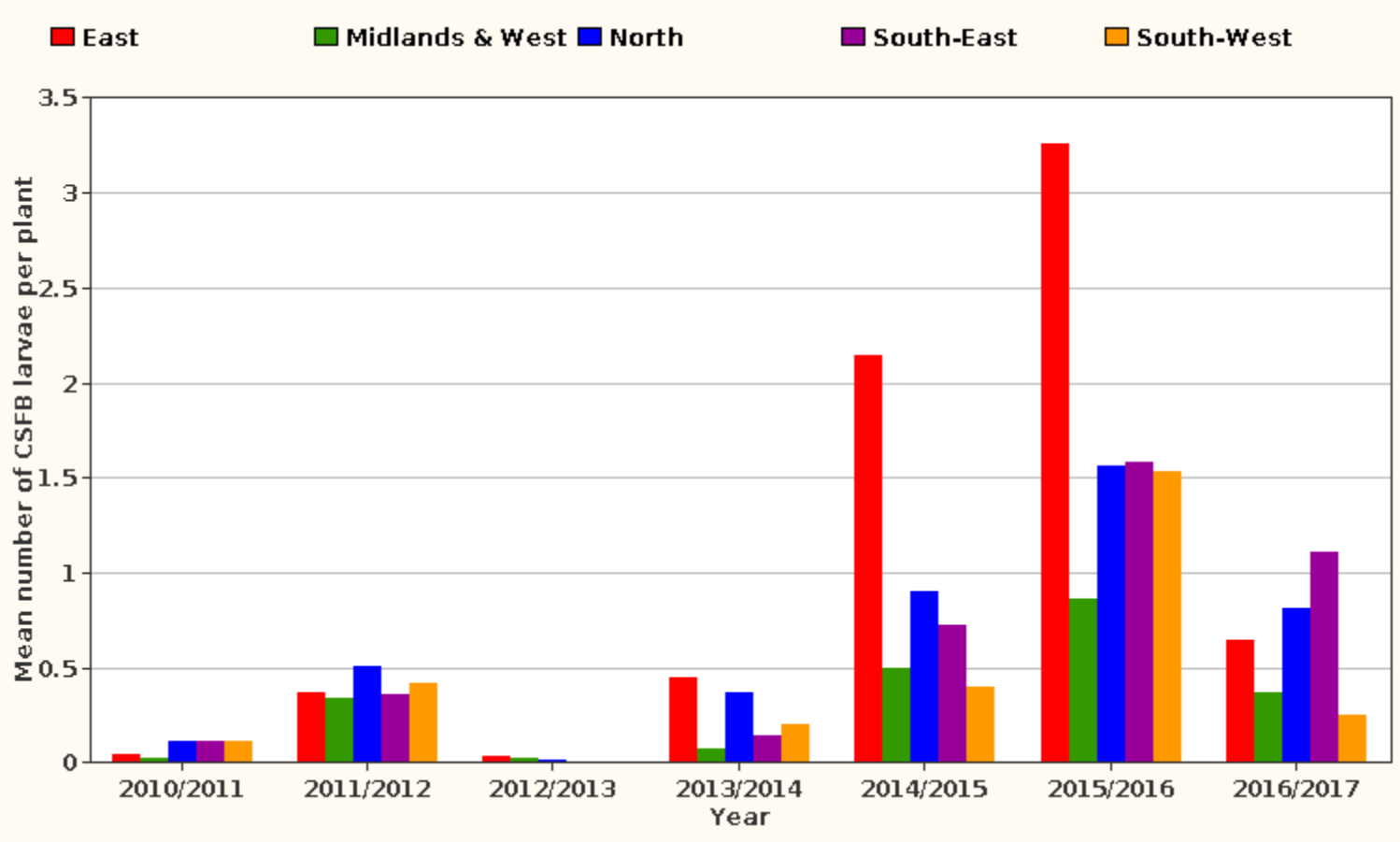
Adult damage - autumn 2016



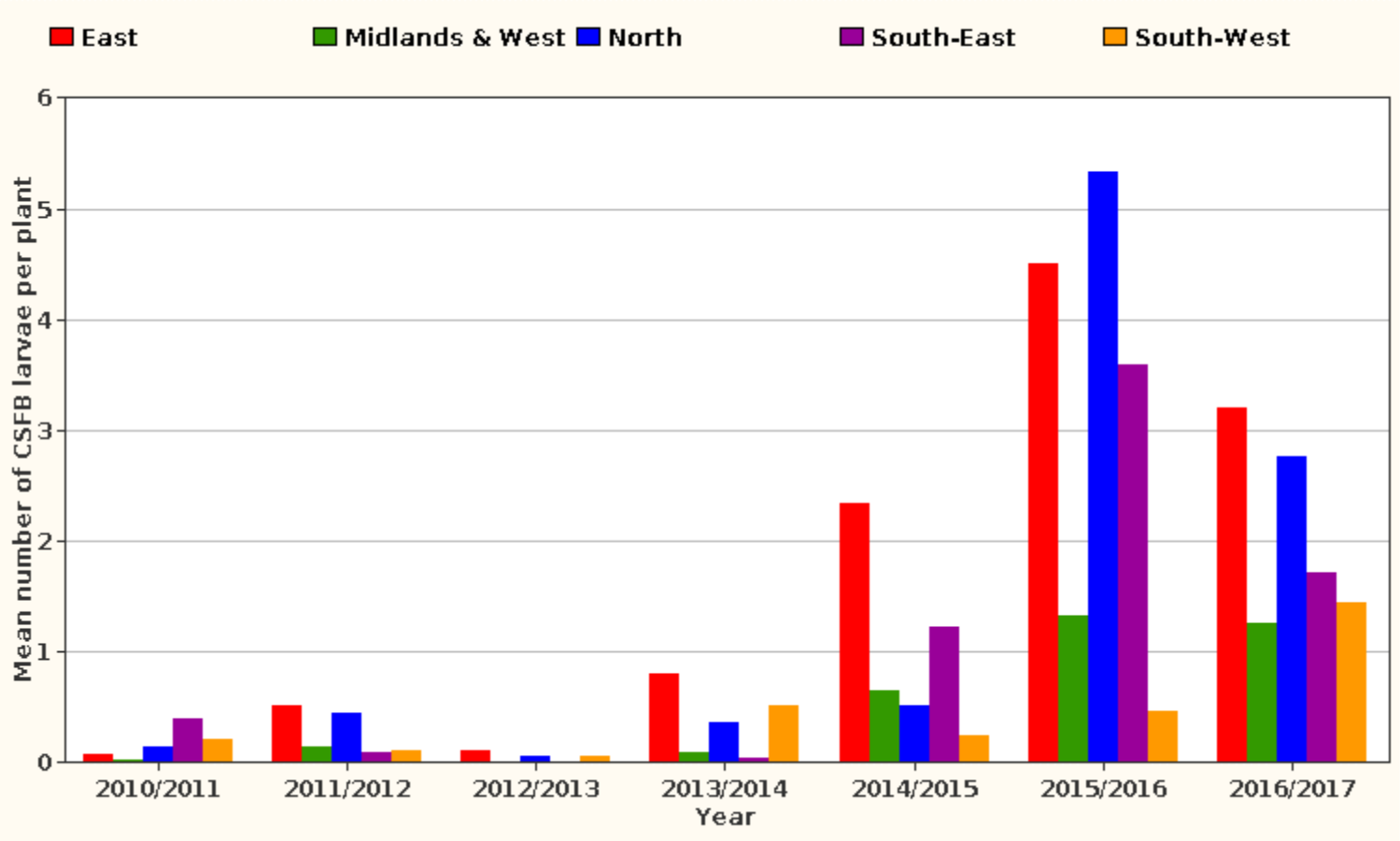
- 74% affected.
- 29% above cotyledon threshold.
- 6% above 3-4 leaf threshold.
- 7% lost. Dry autumn!

Wynn *et al.*, 2017

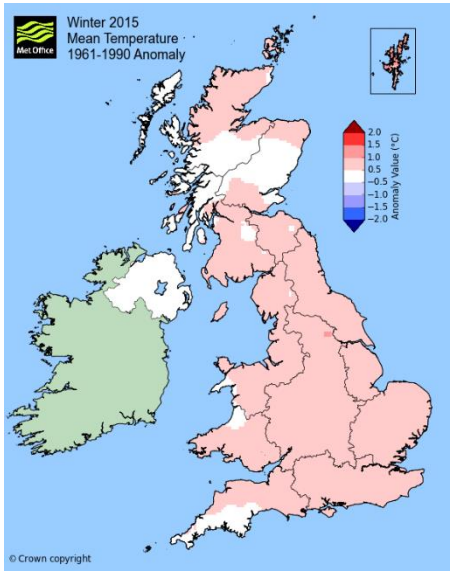
Larval surveys - autumn assessment

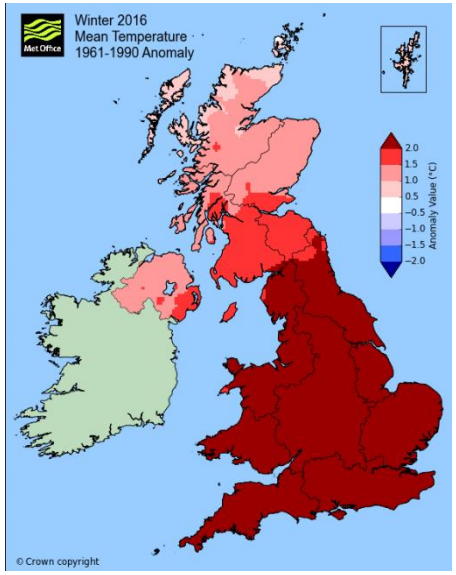


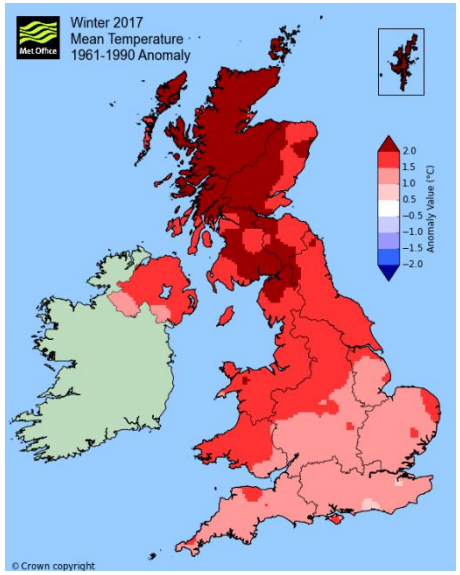
Larval surveys - spring assessment

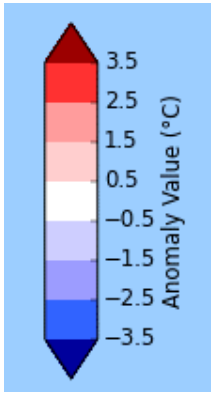


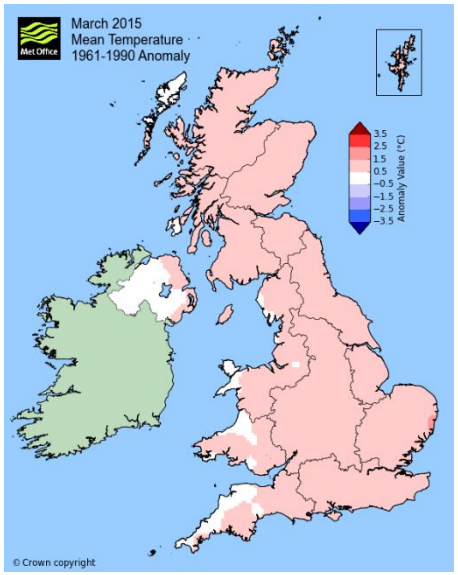
Winter temperatures

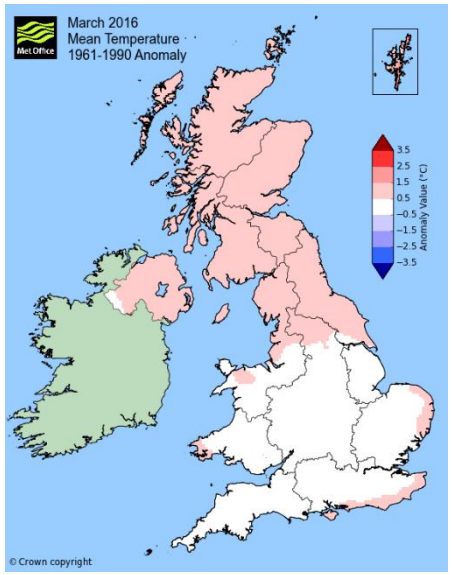


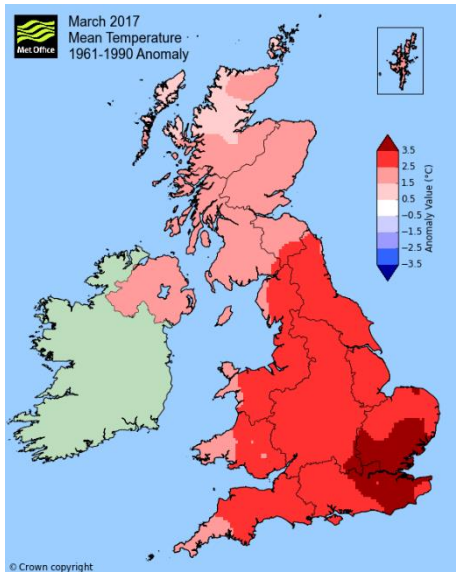












Met Office

ADAS

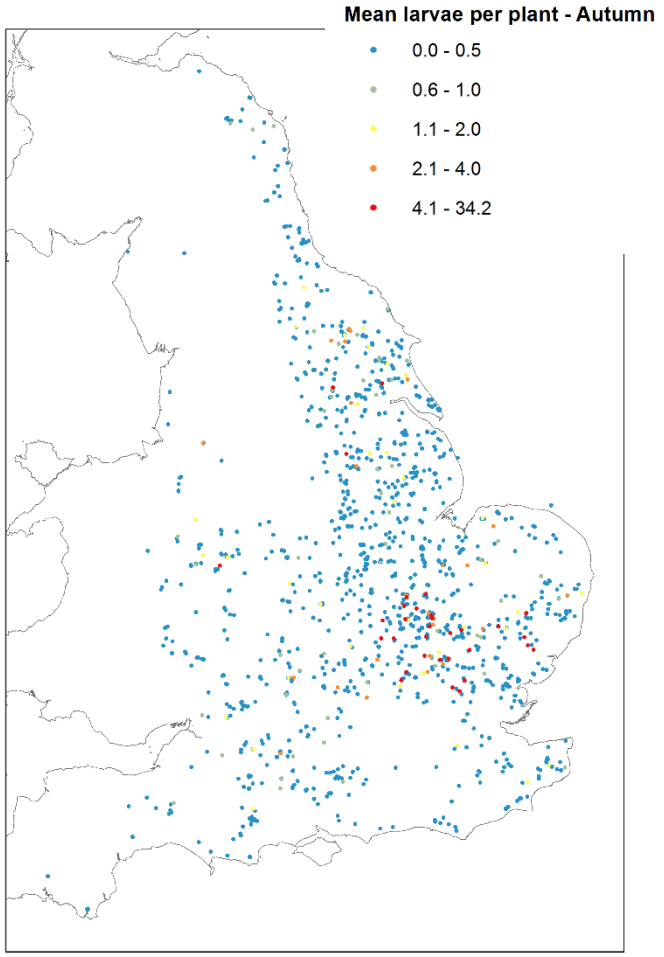
Integrated pest management of CSFB

- Increasing CSFB populations since 2014.
- Exacerbated by lack of effective control options.
- Warm winter weather resulting in higher larval populations.
- September 2016 AHDB-funded project commenced.
- Aim: Develop an integrated pest management strategy for CSFB control.
- Collaborators: Syngenta UK, Bayer CropScience, Fera and Cotton Farm Consultancy

ADAS

1. Identifying agronomic risk factors

- Data set of CSFB incidence and damage from >1400 sites.
- England and Scotland.
- 14 years.
- Includes data on location, weather and soil conditions and agronomic factors including OSR rotation, drilling method, stubble mgmt., location of previous OSR, etc.
- Survey 75 farms in autumn 2017
- Meta-analysis to identify:
    1. factors that categorise CSFB risk, e.g., location, prev. cropping, proximity to prev. OSR.
    2. crop management factors that reduce risk, e.g. direct drilling, stubble management, fertiliser applications.
    3. factors that determine changes in larval population overwinter.



ADAS

2. Investigate varietal tolerance to CSFB

Years 1 & 2

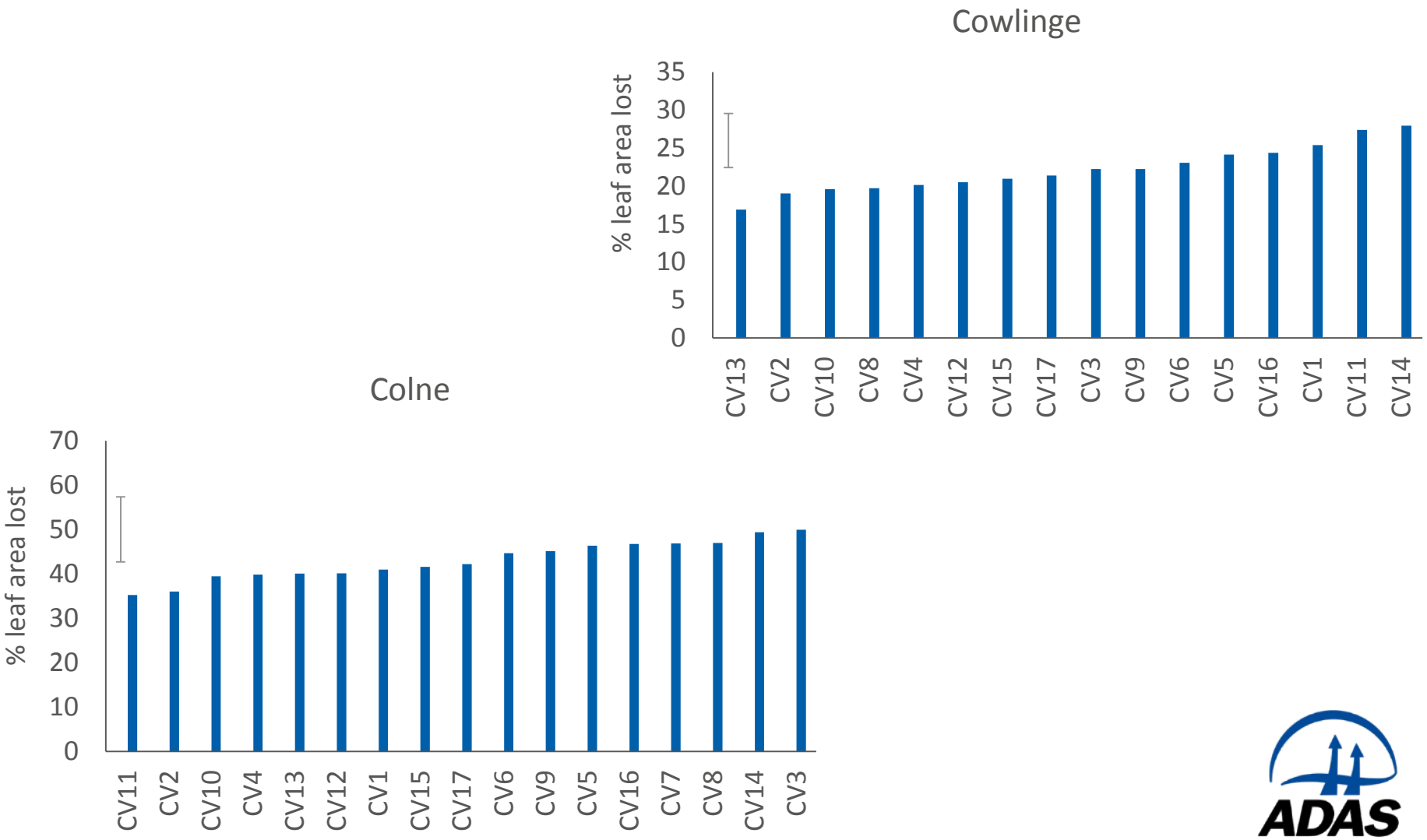
- Monitor 3 RL trials
- CSFB adult & larval damage and yield
- Range of varietal characteristics (e.g. autumn vigour, glucosinolate content)

Years 2 & 3

- 2 x variety/seed rate trials
  - 10 varieties with 1 variety at 5 seed rates
- Interaction of varietal tolerance and seed rate
- Adult damage, larval populations & yield

ADAS

2. RL trials: adult feeding damage



3. Improve understanding of crop tolerance

- Origin of adult damage thresholds unknown[1].
- Research suggests could be higher[2].
- Larval treatment threshold based on 1980s trial data[3]. Relevant for modern varieties and practice?
- Work involves bespoke trials to manipulate larval populations and other trial data to better understand impact of adult and larval damage on yield.
- Determine new thresholds and whether these vary with seed rate and variety.
- Trials ongoing…

[1]Ellis *et al.*, 2009; [2]Ellis, 2015; [3]Purvis, 1986

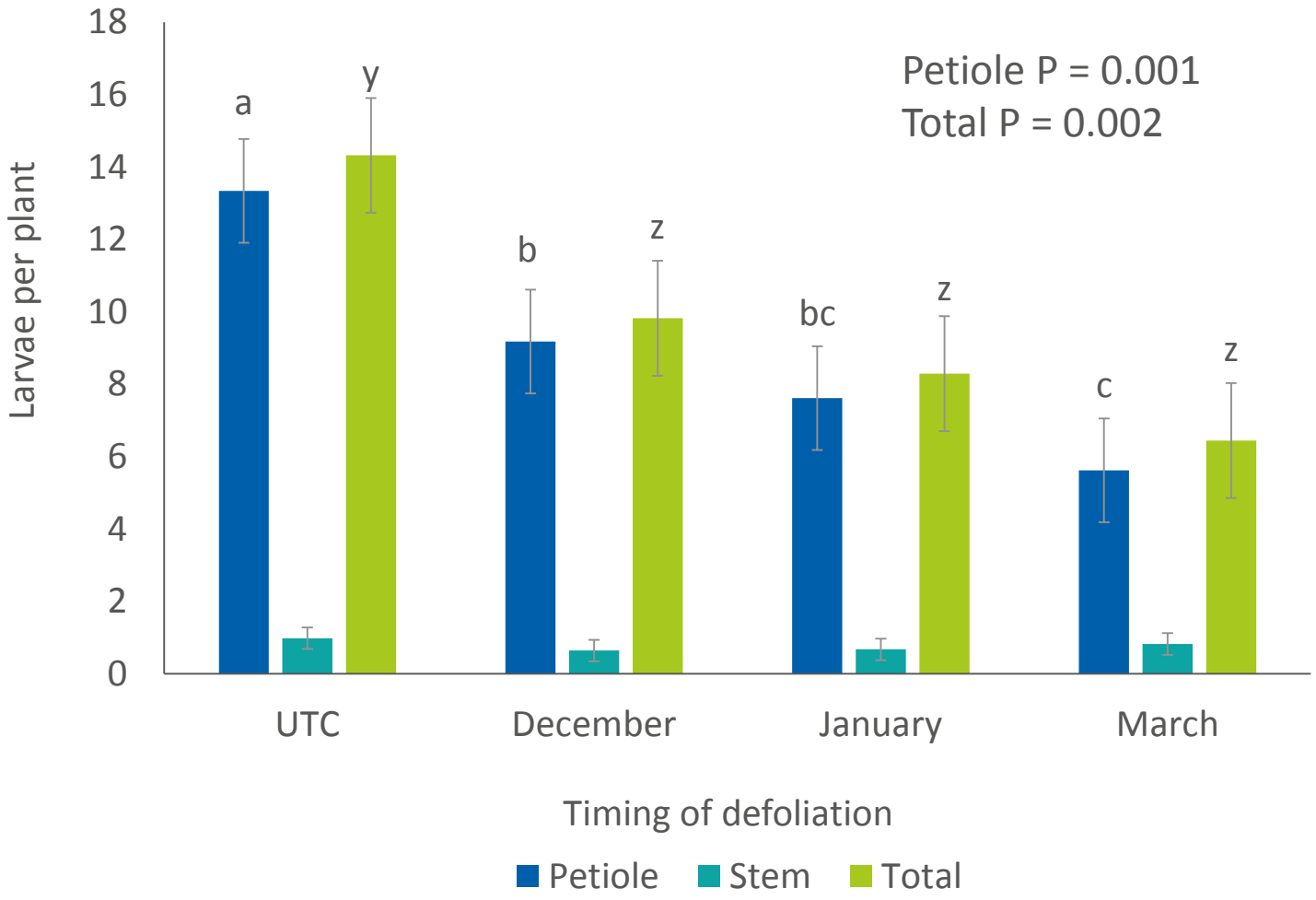
ADAS

4. Cultural control (a): Defoliation to control larvae

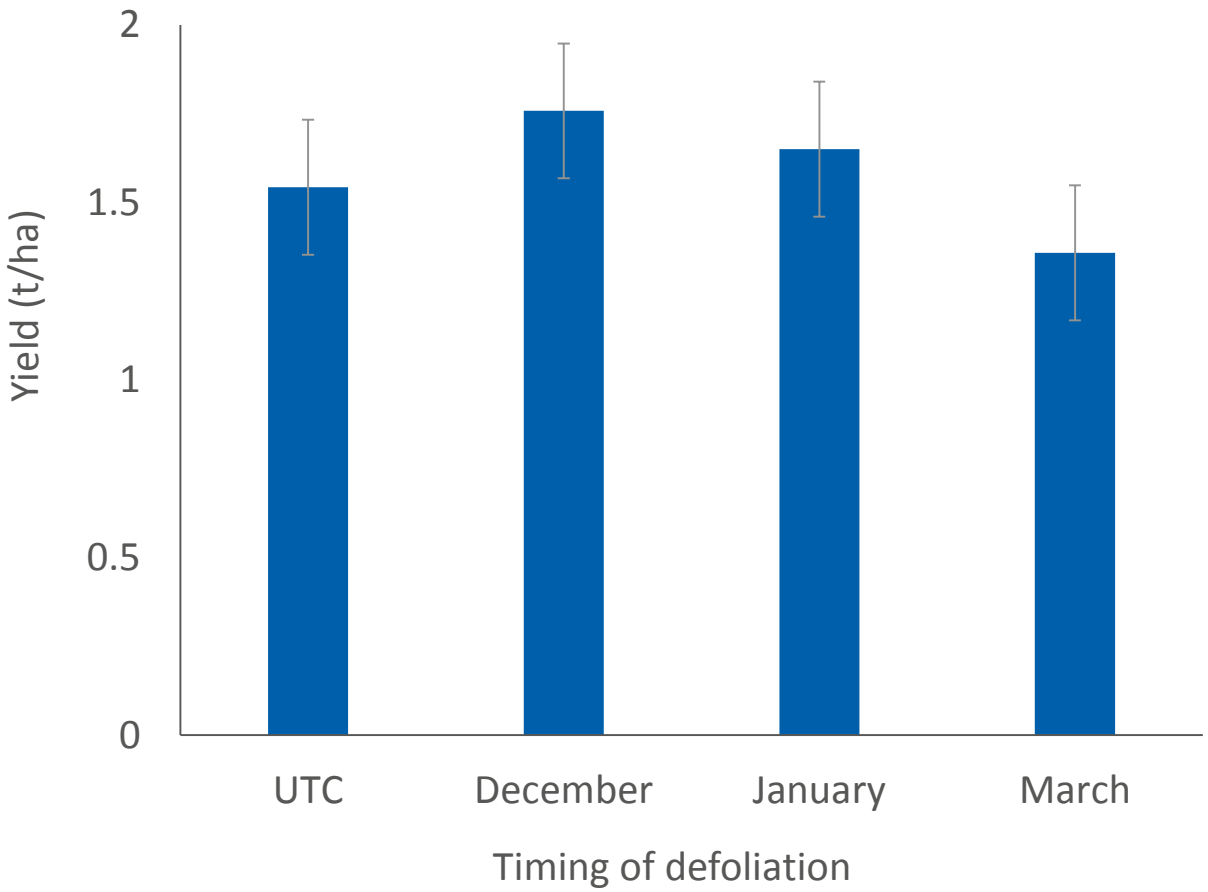
- OSR used for grazing in some systems.
- Defoliation occurs before stem elongation.
- Previous work (UK, Australia and Canada) suggests negligible yield impact.
- 1 x trial in Years 1 & 2
- 4 defoliation (mowing) treatments
  - UTC, December, January and March (post stem elongation)
- Assess larval numbers before and after.
- Yield at harvest.
- Potential cultural control in crops with high over-winter larval populations.

ADAS

4. Results of 2017 defoliation trial



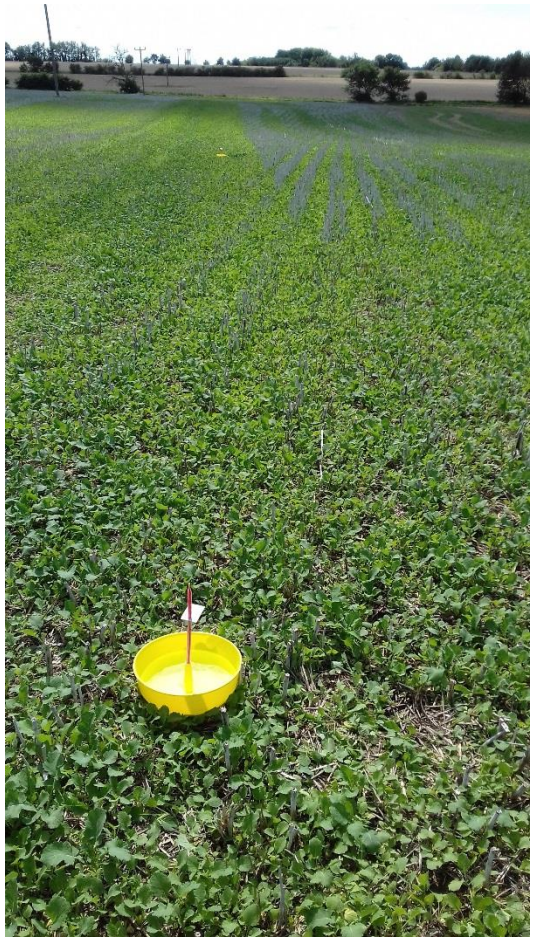
4. Results of 2017 defoliation trial



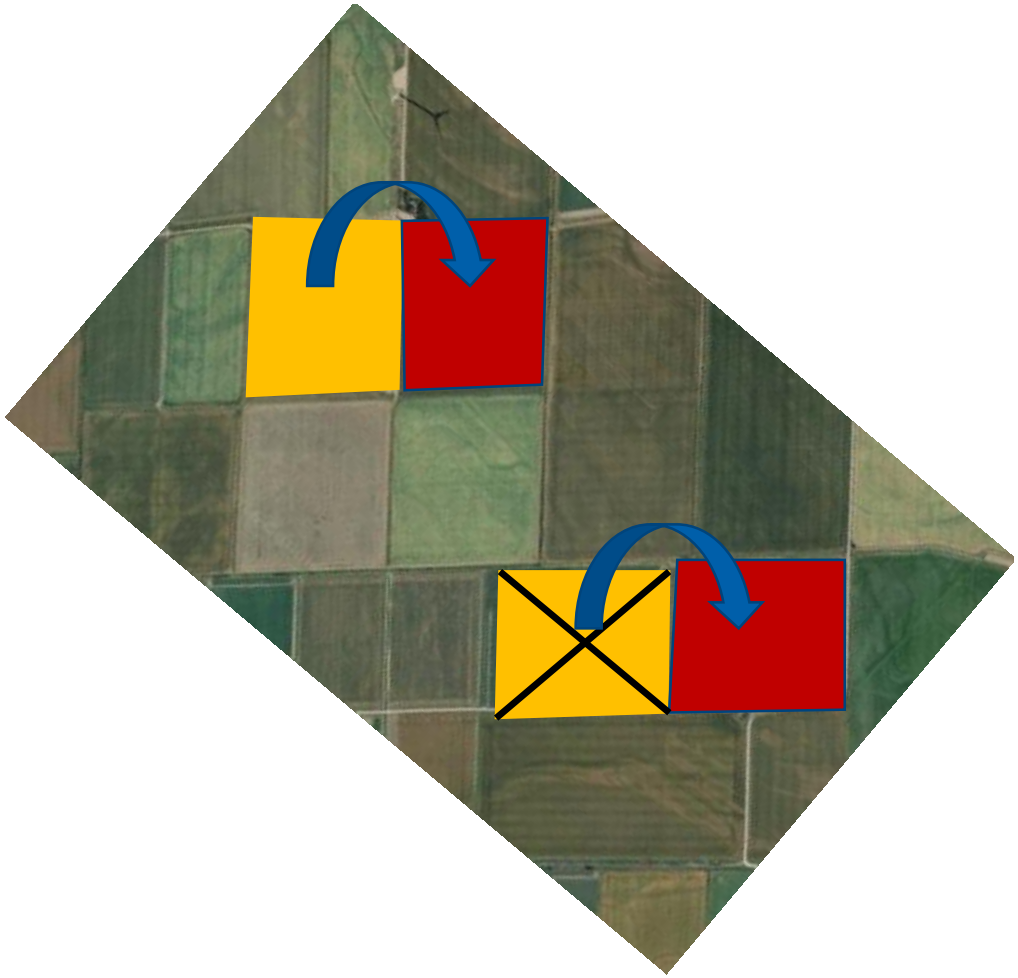
- Mowing significantly reduced larval number.
- No significant effect on yield.
- Field unevenly affected by pigeon damage and weed pressure.
- Trial repeated this year.

4. Cultural control (b): Volunteer OSR as a trap crop

- Trap crops (e.g. turnip rape, mustard) shown to reduce CSFB damage.
- Trap crops can be expensive to sow and manage.
- Use volunteer OSR as a less costly alternative?
- Exploits biological quirk of CSFB.
- Wing muscles degenerate following arrival on a host (volunteer OSR).
- Limit subsequent ability to move on to newly emerged OSR crop.



4. Cultural control (b): Volunteer OSR as a trap crop



- 4 trials (2 in 2017, 2 in 2018)
  - 2 fields coming out of OSR adjacent to fields going into OSR.
- Volunteers controlled early in one field and late in other. (after new OSR crop has emerged).
- Monitor adults, crop stand and feeding damage.
- Check adults for muscle degeneration.
- Potential cultural control in areas at high risk from adult damage.

ADAS

Conclusions

- CSFB currently the most important WOSR pest in UK.
- High adult and larval populations are increasingly difficult to control.
- New IPM project is identifying :
  - agronomic practices that reduce risk.
  - inherent and varietal tolerance.
  - cultural control methods that provide alternatives to the lack of chemical control options.

ADAS

Thank you for listening.

Thanks to:

Cotton Farm Consultancy

ADAS technical staff

Host farmers