



**Cabbage stem flea beetles and the
neonic ban – UK perspective**

Simon Kightley



Reacting to the developing threat to the oilseed rape crop from the cabbage stem flea beetles, *Psylliodes chrysocephala*, in the UK, in the absence of neonicotinoid seed treatments.

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The banning of the use of neonicotinoid seed treatments for oilseed rape planted in autumn 2014 brought immediate problems for growers in several counties in central and eastern England from cabbage stem flea beetles (CSFB). Levels of damage varied from minor degrees of grazing on the cotyledons and first leaves, to complete crop loss, especially in later sowings. Secondary infestations by beetle larvae, in surviving crops, were a cause for concern for both further crop damage and yield loss and created the potential for very high populations of the pest going forward into the following seasons. The subsequent two sowing seasons have both seen extensive crop damage and losses, with indications that the problem is spreading out, west and north, of the main area of infestation. The relatively warm winter of 2015/16 allowed prolonged egg laying and larval development, resulting in multi-stemmed, stunted crops. Government derogation for growers in the worst affected counties to use neonicotinoid seed treatments was relatively ineffective in protecting the crops and was not repeated for 2016/17.

At NIAB, once the scale of the threat was recognised, we reacted in a number of ways: a Crowd-Sourcing survey for growers, to gain information relating local agronomy practises to CSFB damage; strategies specific to protecting variety trials, including the use of neonicotinoid seed-treated trap crops, insect netting and using insect traps to monitor population levels; investigations into the use of companion cropping to deter, or dilute the effects of, adult gazing activity along with other work to look at the influence of sowing date. It has become clear that conditions promoting rapid early crop growth are a good defence against adult grazing, including good seed bed preparation, starter fertiliser, good soil moisture and warmth but these do not prevent subsequent egg laying and larval infestations. Observational evidence suggests that pre-emergence herbicides delay crop development and increase vulnerability. There is now evidence of growers abandoning oilseed rape as a crop in the more arid areas of Eastern England. The use of trap cropping around, and as strips within, variety trials can improve establishment. For the protection of small scale demonstration plots, we have found fine-mesh insect netting to be highly effective. For farm scale crop protection we have seen some evidence that brassica companion crops, sown in amongst the oilseed rape have potential to improve establishment. White mustard appears to present the greatest promise in this respect.

Psylliodes chrysocephala



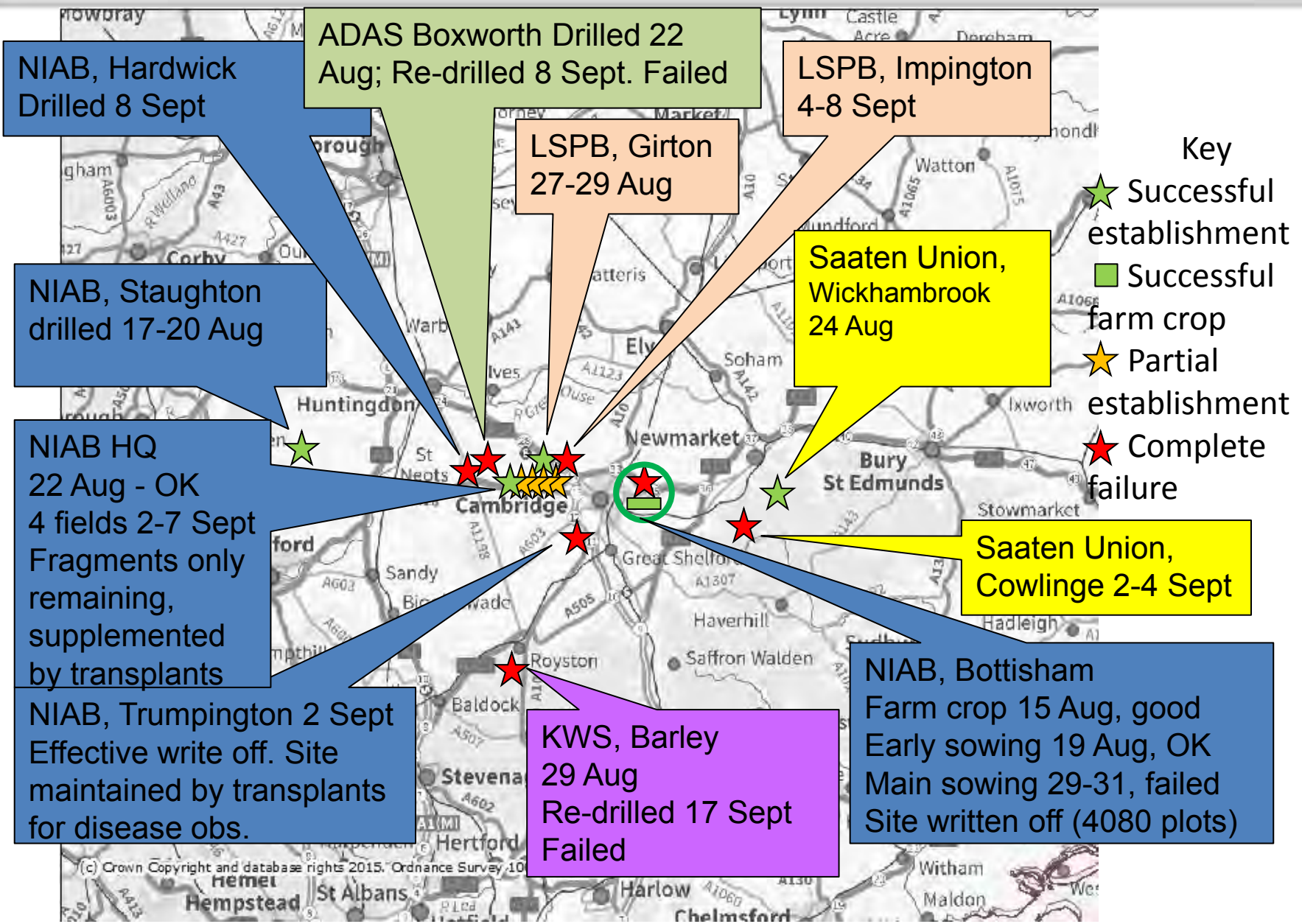
Public
enemy
Number
one!

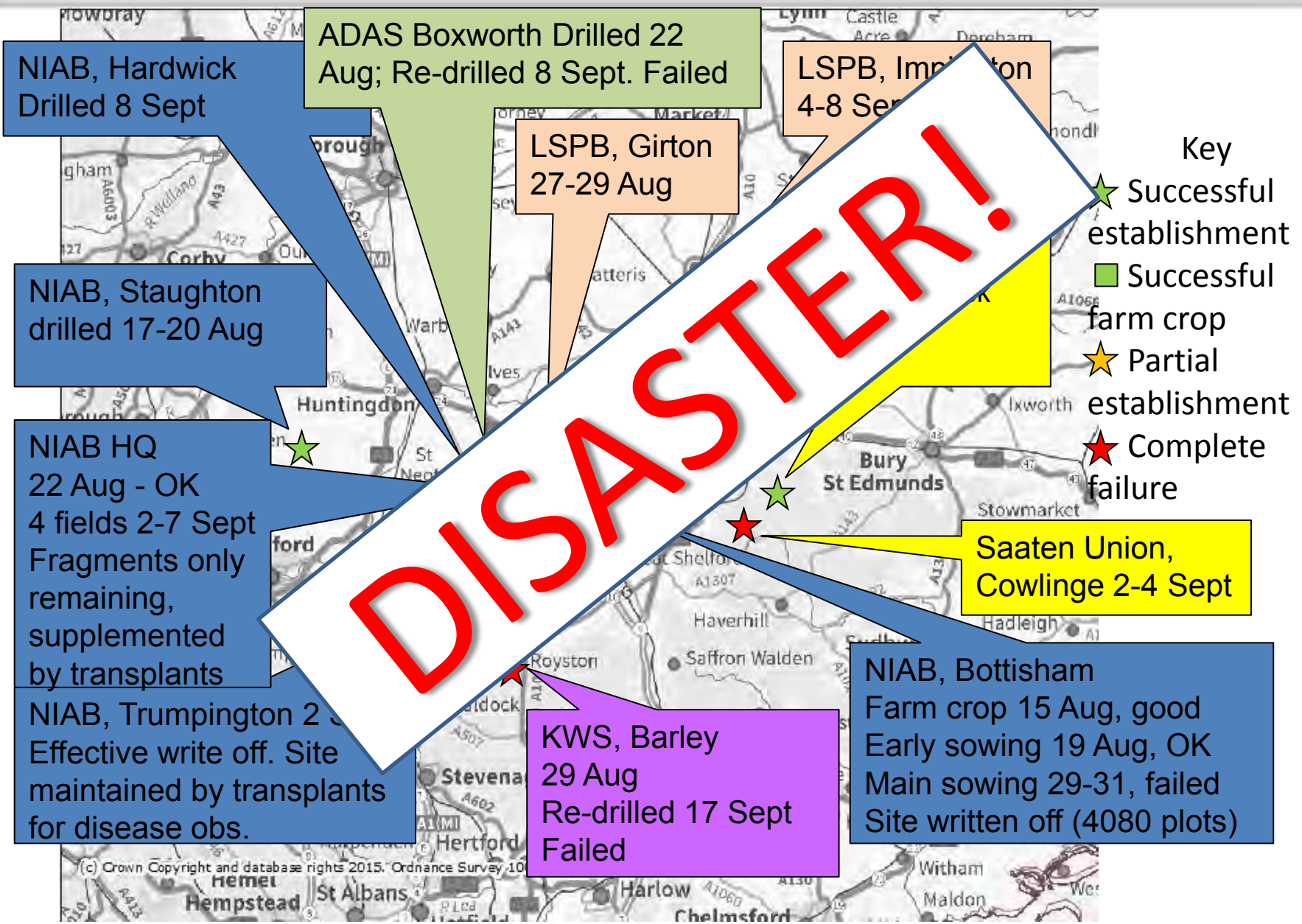
Neonicotinoid seed treatment ban – Autumn 2014 – a perfect storm

- Warm winters in preceding years
- Very high background population of beetles
- Poor growing conditions – cool and dry
- Pyrethroid resistance

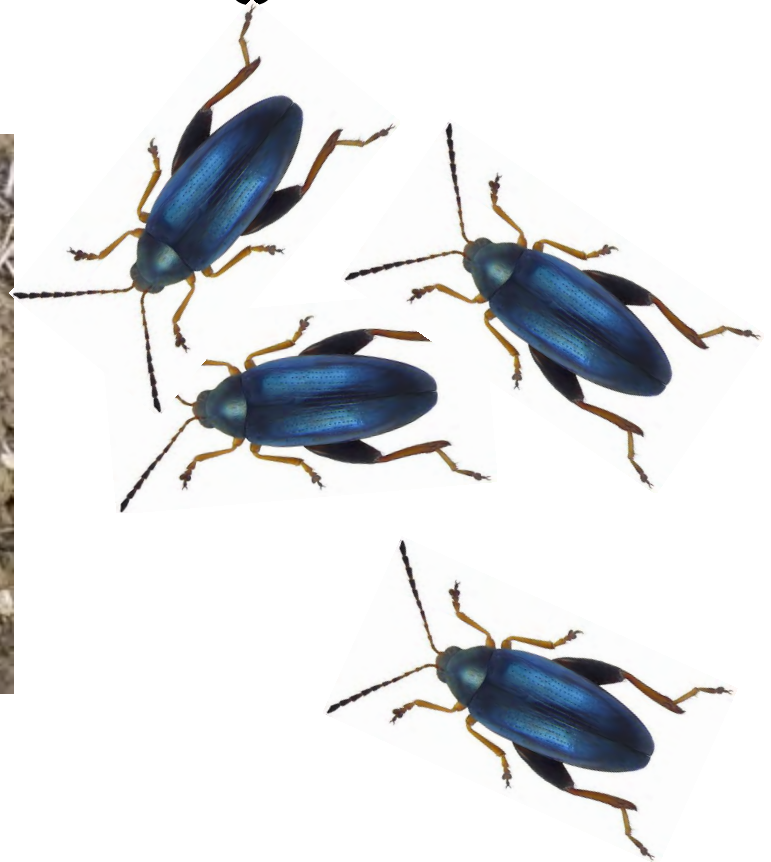


How bad would it be?





Adult damage to crop establishment - before, during and after emergence



- Better conditions for establishment – good rainfall for early sowings, warmer
- High adult beetle numbers
- Increased losses of commercial crops
- Warm winter prolonged egg laying and larval development
- Many larval infested crops were branched and stunted
- Large population of adults seen in the grain sheds at harvest

- Better control of rainfall for
- High adult
- Increased
- Warm winter development
- Many larvae stunted
- Large population



Beetles leaving the grain heap

ment – good
mer

al crops

aying and larval

ere branched and

en at harvest

Larval feeding damage



Help from the UK Government!

Acknowledgement of the serious threat to the oilseed rape crop:

- A derogation for limited use of neonic seed treatment in worst affected counties
- A derogation for use of neonic insecticide crop sprays

Pre-emergence herbicide effect

- Observations that our Clearfield variety trial at Hinxtton, grown without pre-ems, got away better than the rest of our trials
- We used:
 - BANASTAR (dimethenamid-p, metazachlor, quinmerac)
 - CIRRUS (clomazone)

- Dry September
- High adult beetle numbers
- Widespread losses of commercial crops

BUT:

- Cool October/November reduced egg laying/larval development
- Few larvae reported in petioles
- Surviving crops developed well in normal April flowering period
- Reduced CSFB pressure for Autumn 2017?

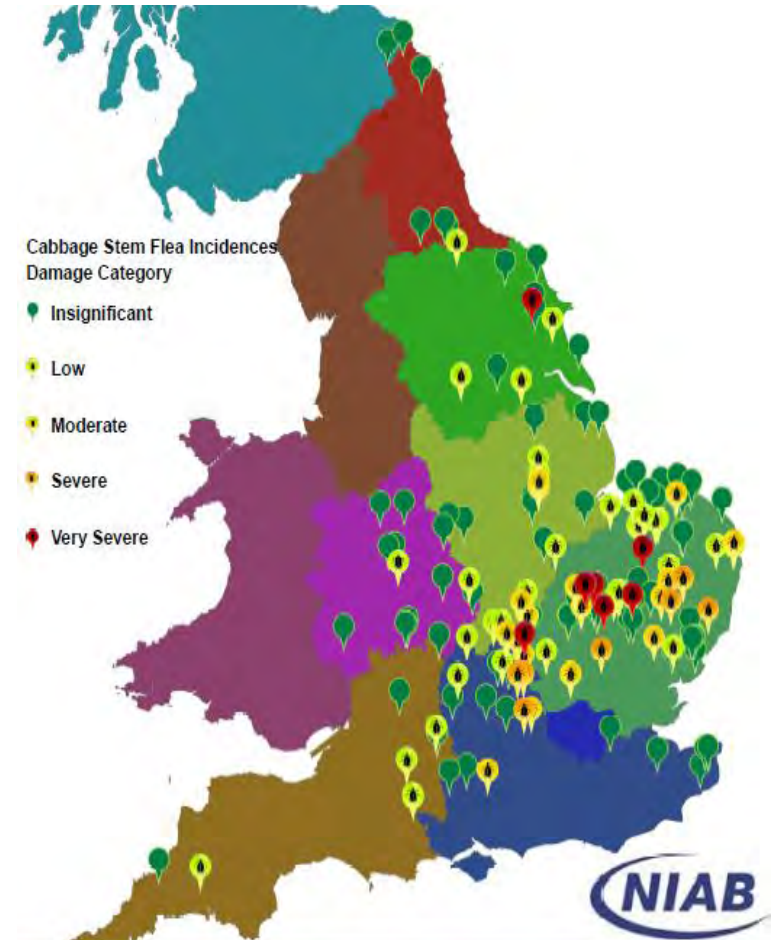
Two new initiatives introduced for Autumn 2015

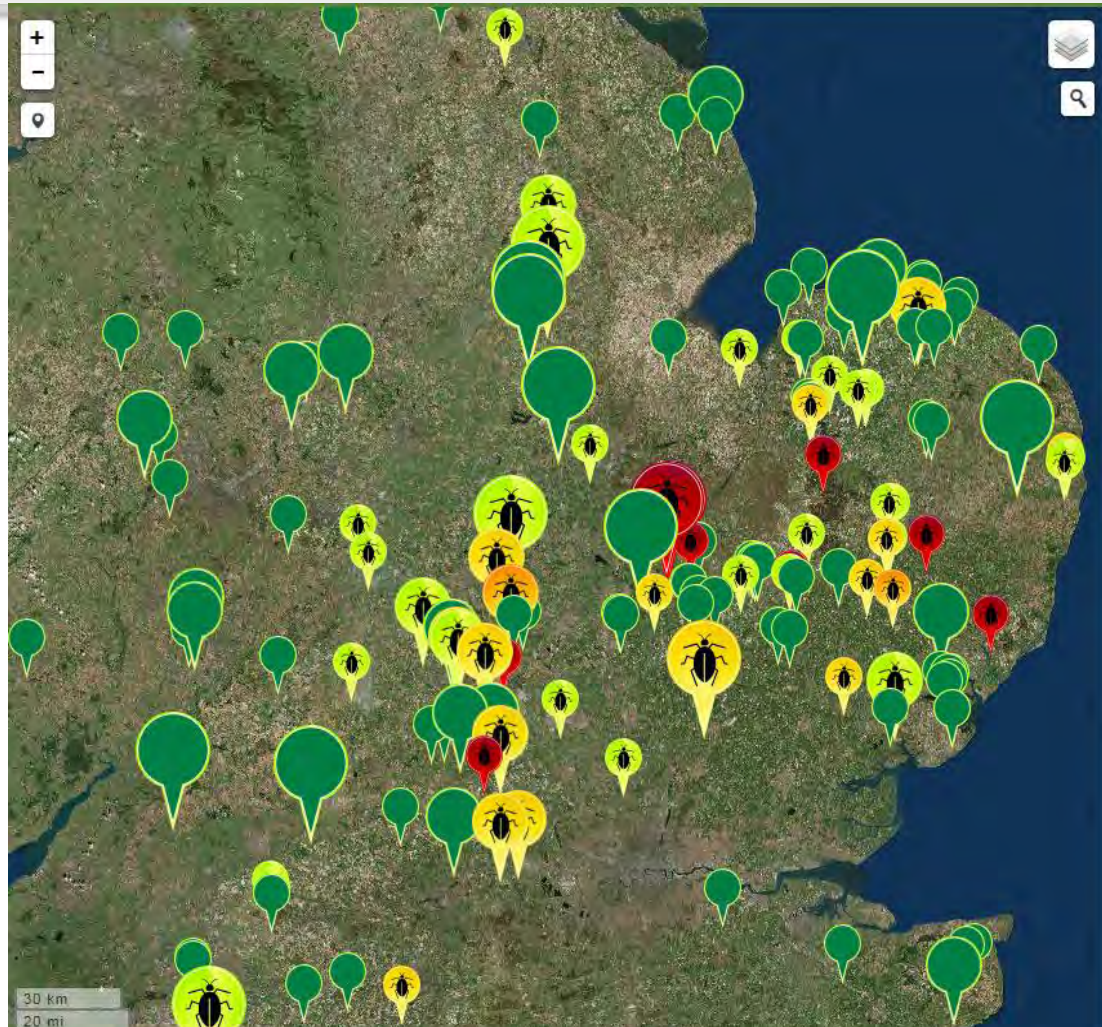
- Crowd Sourcing farmer survey
- Experiments with companion crops

Crowd Sourcing survey - Autumn 2015

Questionnaire

- Sowing date
- Crop area
- Cultivation/Establishment
- Insecticide seed treatment and sprays
- Variety type
- Classify crop into 5 damage categories (1 = good; 5 = bad)





Zooming in reveals more hidden pins and clicking on the pins reveals the survey answers.

Provisional findings

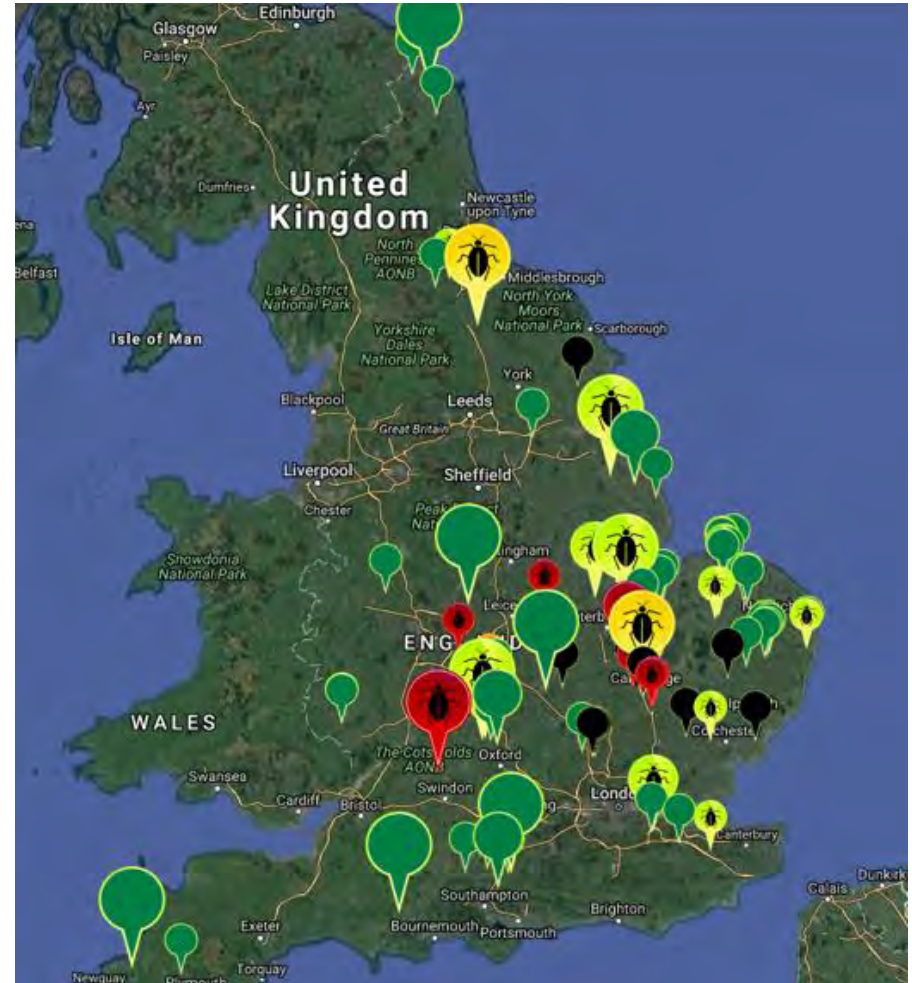
	Combined damage score	No. of obs.
Variety type		
Mixed	25.3	30
Conventional	25.4	78
Hybrid	27.7	73
Establishment method		
Autocast	15.4	7
Plough	21.4	33
Non-inversion	24.1	63
Subcast	27.7	32
Direct drill	33.5	46
Seed treatment		
Other	22.3	65
None	26.3	95
Neonicotinoid	36.2	21

Crowd sourcing - Autumn 2016

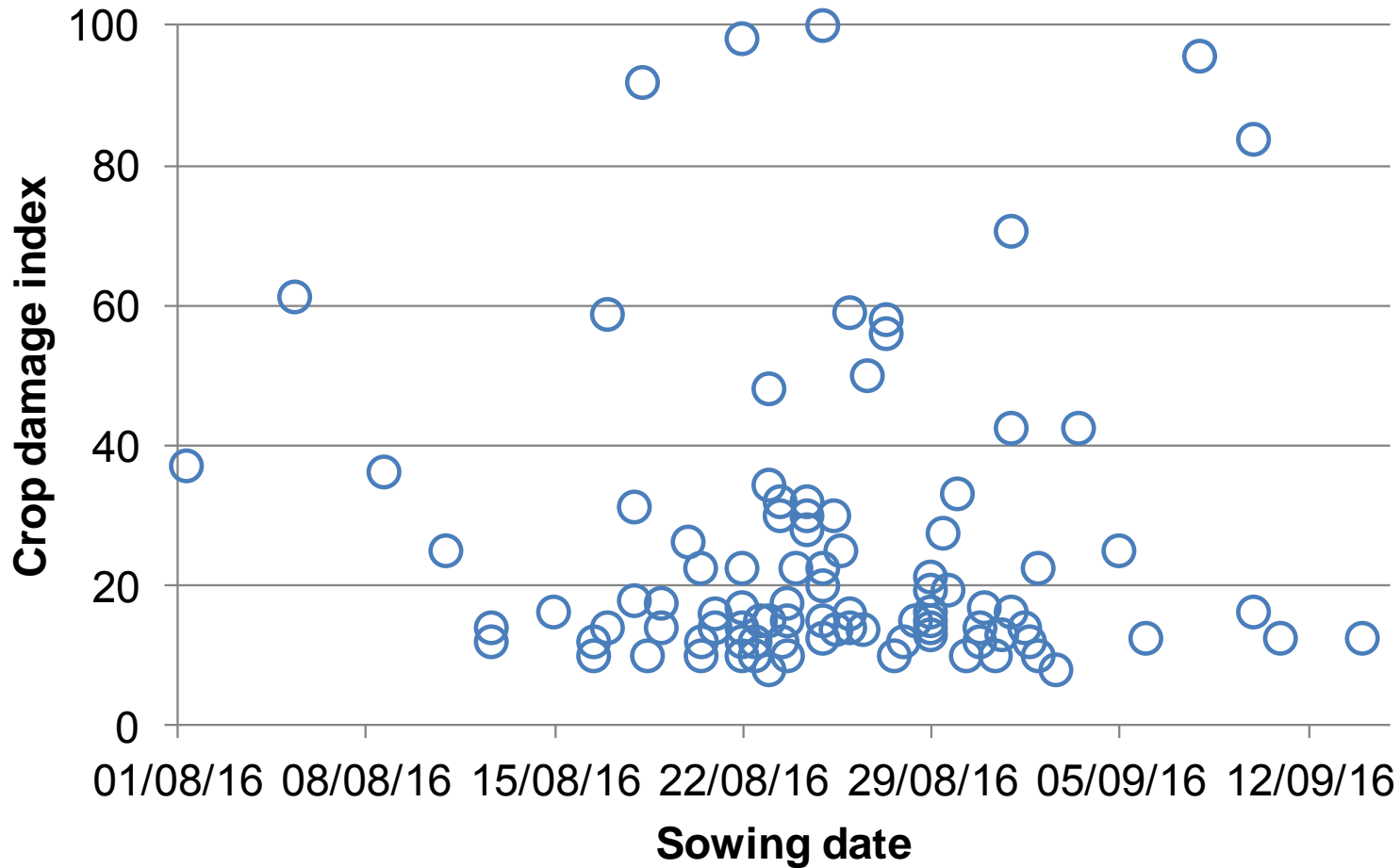
We asked for responses from farmers who had stopped growing oilseed rape – Black pins

Fewer responses:

Survey had become over complicated

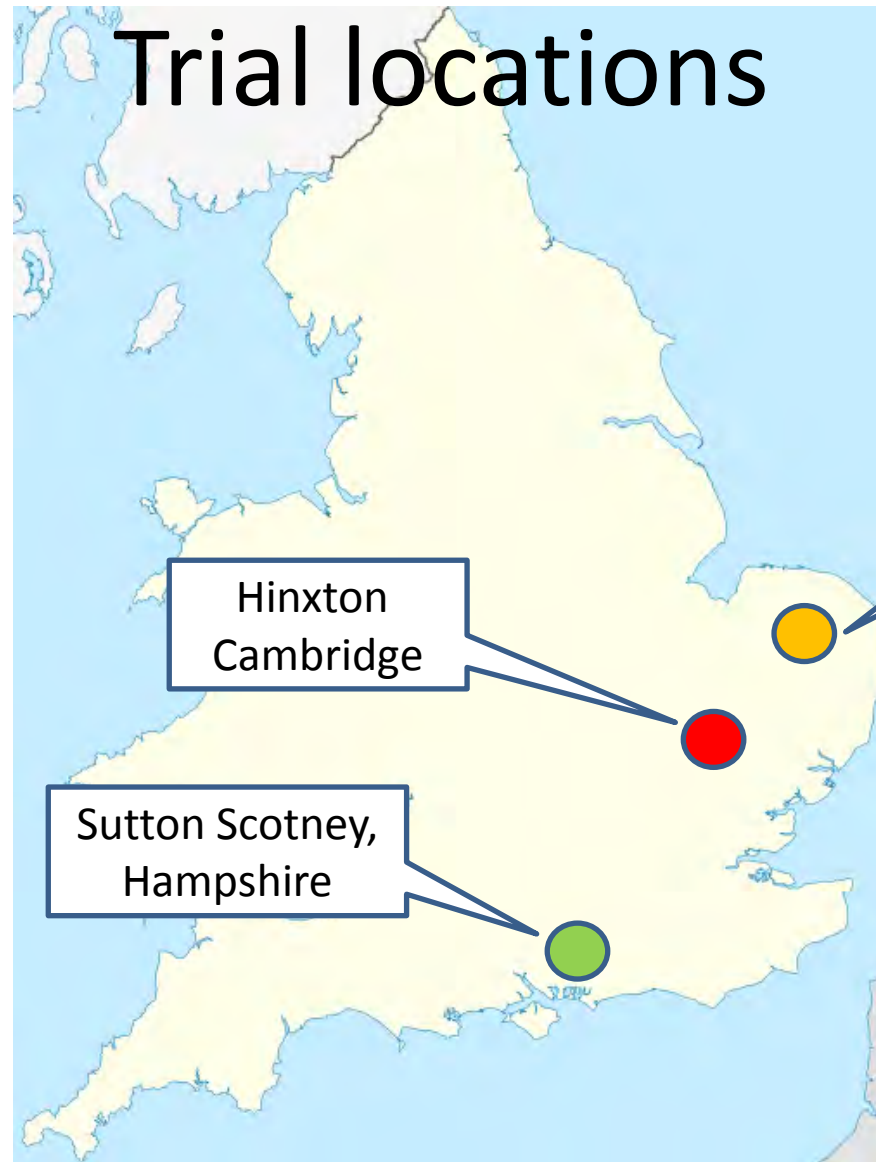


Sowing data x beetle damage



Also new for Autumn 2015

Experiments with
companion crops



Seed rate x companion crop experiment

Companion crop	OSR seed rate/m ²			
	60	80	100	120
No companion crop	N60	N80	N100	N120
Mixture A	A60	A80	A100	A120
Mixture B	B60	B80	B100	B120
Mixture C	C60	C80	C100	C120

OSR variety:

CHARGER

A = Insect deterrent?:

Fenugreek

B = Insect attractant:

Pak choi/Chinese cabbage/salad rocket/linseed

C = Insect neutral:

Berseem clover/crimson clover/Persian clover/common vetch

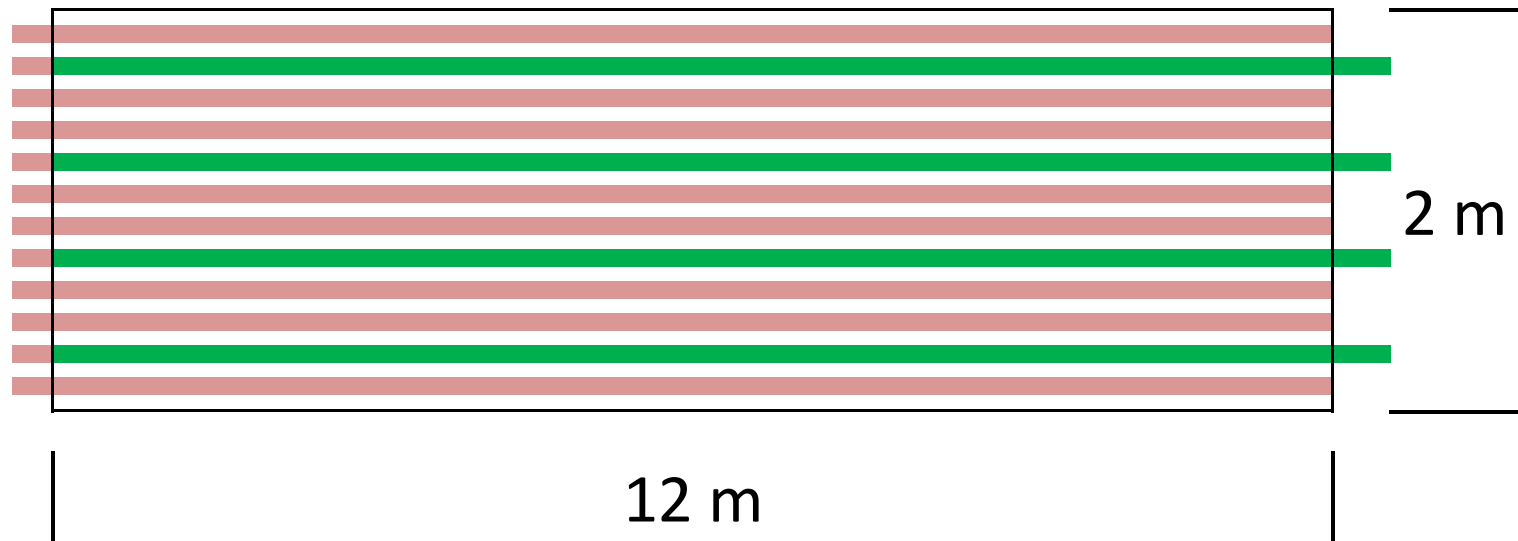
Replicates:

4

Sites:

3 – Cambridge (Hinxton), Morley, Sutton Scotney

The aim was to achieve well defined rows of oilseed rape in a carpet of non-hardy, companion species plants.



Separate sowings of: 12 rows companions,
4 rows oilseed rape

Companion cropping (Sutton Scotney)



Fenugreek



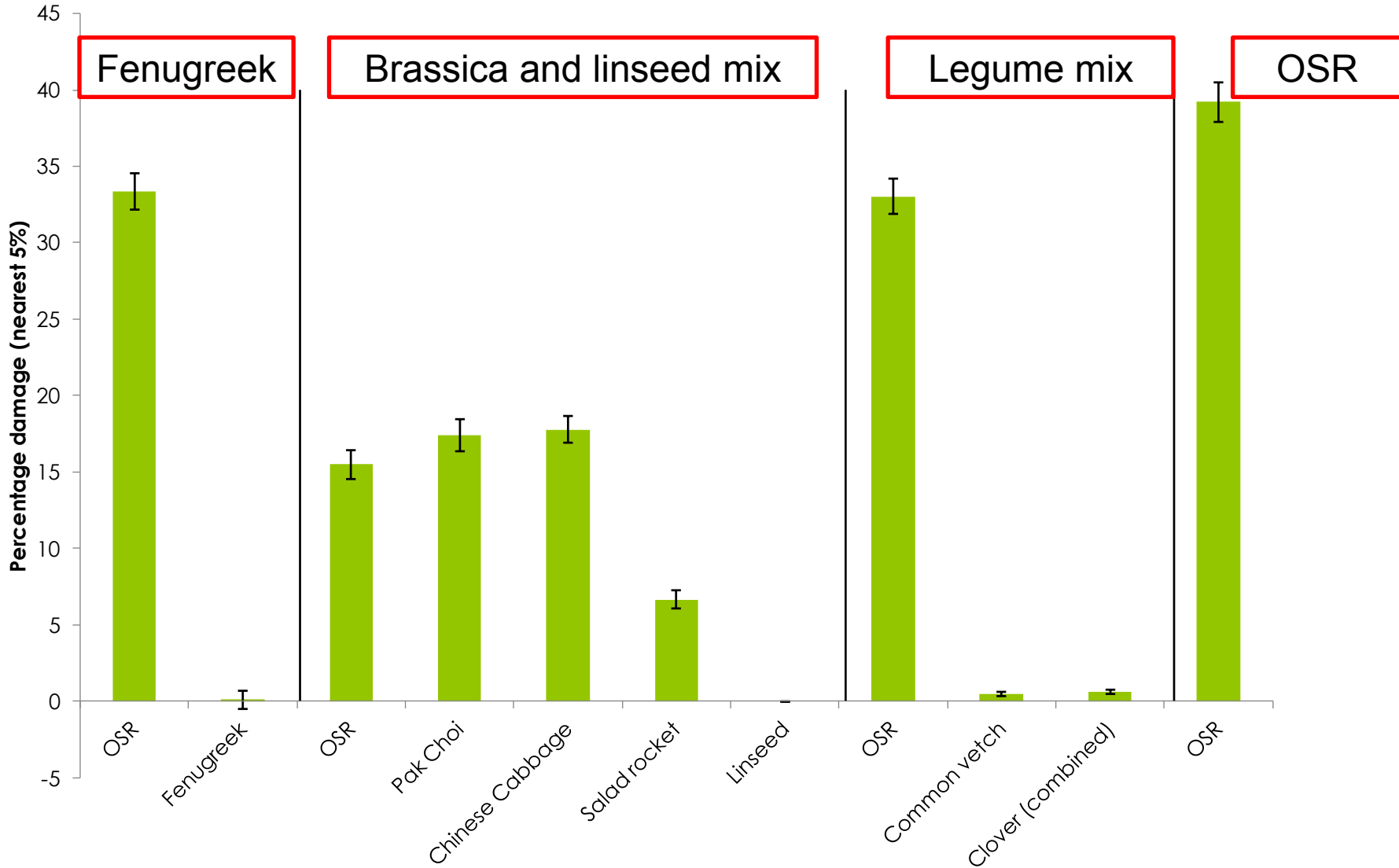
Rocket,
Pak Choi,
Chinese cabbage,
Linseed



Common vetch
Crimson clover
Berseem clover
Persian clover

Working with Reading University and Rothamsted Research
(Duncan Coston)

Percentage CSFB damage

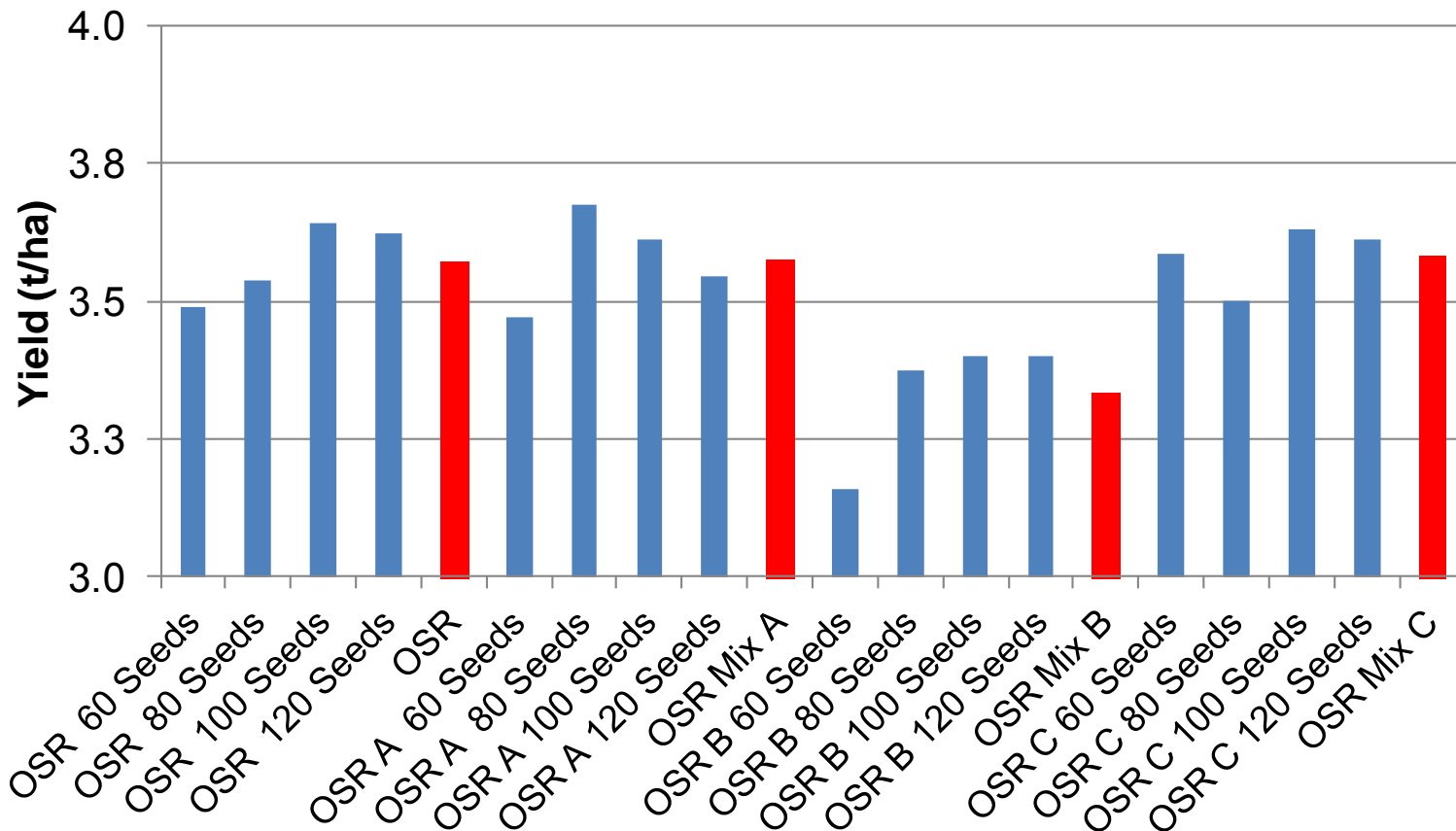


Control of companion species

- No killing frosts in 2015/16 winter
- Several herbicide applications were tried but were rather ineffective post-Christmas and limited by label regulations
- Brassica/linseed mix was particularly resilient – crowded-out the OSR

Yield - No CSFB pressure

Yield (t/ha) Sutton Scotney - 2016



Companions for 2016/17

Crop	Mix code	1000 seed weight	seeds /m ²	seed wt/m ²	Plot size	Packet size
OSR		4.5	60	0.27	20	5.4
OSR		4.5	90	0.41	20	8.1
OSR		4.5	120	0.54	20	10.8
Companions						
Fenugreek	A	12.0	250	3.00	20	60.0
Pak choi	B	1.9	80	0.15	20	3.0
Chinese kale	B	4.0	80	0.32	20	6.4
Choi sum	B	2.4	80	0.19	20	3.8
Rocket	C	1.4	125	0.18	20	3.5
White mustard	C	7.4	125	0.93	20	18.5
Buck wheat	D	33.4	250	8.35	20	167.0

14/12 2016 Cambridge - Fenugreek



14/12 2016 Cambridge – Brassica mix



Buck wheat, with OSR plots in foreground



White mustard, and 34 ha of weeds and desolation



But what have we here?!



4 rows of healthy oilseed rape plants surviving under the mustard canopy

Autumn 2016 – Morley - damage

Trt. No.	WOR sdr	Companion mix	09/09	14/09	19/09	26/09	07/10	12/10
1	60	-	1.0	2.7	2.7	3.3	2.0	1.0
2	90	-	1.0	3.0	2.7	3.7	2.3	1.3
3	120	-	1.0	3.0	3.0	3.3	2.3	1.0
4	60	Fenugreek	1.0	2.7	2.7	2.7	2.0	1.0
5	90	Fenugreek	1.0	2.7	2.3	2.7	2.0	1.0
6	120	Fenugreek	1.0	2.0	2.3	3.0	2.0	1.0
7	60	Chinese brassicas	1.0	2.7	3.0	3.3	2.7	2.3
8	90	Chinese brassicas	1.0	2.3	3.0	3.3	2.7	2.0
9	120	Chinese brassicas	1.0	2.7	3.0	3.7	3.0	1.7
10	60	Mustard & Rocket	1.0	1.7	1.7	2.0	2.3	1.0
11	90	Mustard & Rocket	1.0	1.7	2.0	2.0	2.3	1.3
12	120	Mustard & Rocket	1.0	2.0	2.0	2.0	2.0	1.3
13	60	Buck wheat	1.0	1.7	2.0	3.0	3.0	1.0
14	90	Buck wheat	1.0	2.7	3.0	3.0	2.7	1.0
15	120	Buck wheat	1.0	2.7	2.7	3.0	3.0	1.0
Averaged over treatments			1.0	2.4	2.5	2.9	2.4	1.3

Observations on the 2017 companions

- All except Rocket (*Eruca sativa*) proved susceptible to the frost
- White mustard appears to have potential for protecting the crop
- But:
- If controlled after the winter, the mixture stunted the OSR and reduced yield potential
- Much work still to do

Good companion-bad companion



Salad rocket

White mustard

OSR stunted in mustard mix



Overall conclusions

- Cabbage stem flea beetles remain a huge threat to the oilseed rape crop
- Threat is greater for later sowings
- Attention to improved conditions for rapid germination is important
- Successive cold winters may help
- Companion crops have potential and white mustard seems to be the best candidate
 - **More work needed**