> *"You can't underestimate how rewarding it is carrying out a trial and having a scientist on your farm."*

When farming meets science

Technical
OSR agronomy

Farmer-led groups, co-ordinated by scientists, are exploring innovative ways to boost OSR productivity and combat cabbage stem flea beetle. *CPM* reviews some results.

By Tom Allen-Stevens

It may seem a little like cutting off your nose to spite your face, but early trials work conducted by a group of farmers suggests cutting or grazing oilseed rape can significantly reduce damage from cabbage stem flea beetle (CSFB) larvae. The snag is that the first year of trials have also resulted in an average yield penalty of 14% from the winter defoliation.

A second year of trials is now underway aiming to explore this practice further and shed more light on how timing in particular could have an influence. It's carried out through Innovative Farmers, a network that supports farmers who want to carry out on-farm trials. Launched in 2015, this brings groups of farmers together who work directly with a researcher to design field labs — on-farm trials that can be set up quickly and are designed to be practical. The group decides on the topic and the researcher helps design a trial.

The CSFB control field lab has brought eight farmers together under the stewardship of Dr Sacha White of ADAS.

"Damage from CSFB larvae has increased rapidly in recent years. It's brought significant crop losses to growers, particularly those in the Eastern Counties," he says. Monitoring shows average populations from 2003-2012 were just 0.09 larvae per plant, but by 2017 this had shot up to 8.2 per plant, with some plants assessed in March bowing under a burden of more than 80 larvae.

Limited options

"Growers now have limited control options with no neonicotinoid seed dressings and resistance to pyrethroids becoming a growing problem," he says. The larvae overwinter in OSR leaf petioles before moving into the stems as they mature in early spring, he explains. That's where the damage occurs, and the more larvae per plant, the more it suffers.

So the theory behind the trials is that if you can remove the leaves before the larvae move into the stem, you'll save the plant which can grow up again in spring. Previous trials, stretching right back to 1992, have proven OSR's remarkable ability to bounce back from winter defoliation, and can even result in a canopy benefit and higher yield.

"AHDB-funded trials were carried out in 2016/17 to assess the effect winter defoliation would have on larval burden," continues Sacha. In a randomised, replicated plot trial, a lawn mower was used to defoliate a WOSR crop in either December, January or March.

"We found that the later you leave the defoliation, the lower the number of larvae found. Importantly, there were no significant differences in yield between the treatments," he reports (see chart on p32).

So that was the basis of the field lab (see panel on p32). The first-year results show that, on average, defoliation reduced the number of larvae by 39%, with grazing and topping leading to a 51% and 25% drop respectively. But the results from the group showed that defoliation resulted in yield losses, with an average reduction of 14.2%.

"The yield results from year one of the research were disappointing," notes Sacha. "But we believe this is down to timing as the crops didn't have time to recover, rather than being down to the method itself. It could also be in part due to the weather as the mild winter conditions last year may not have killed off larvae and poor spring conditions may have limited crop recovery.

"This year, many early sown crops have survived adult flea beetle feeding but are likely to have high larval loads and so defoliation may be ideal for these crops. ▸

The yield results were disappointing, but Sacha White believes this is down to timing and weather.

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We create chemistry

Chris Eglington aims for big, strong plants with thick stems to limit the damage from CSFB larvae.

▸ With farmers dealing with devastation caused by this pest and no effective control available, it's crucial that we explore the factors that can impact on potential solutions and that the research takes place on real farms with real farmers."

So the second year of field-lab trials are now underway, with funding from AHDB and BASF. The aim is to test the timing theory in real farm settings, as well as assessing any variation in results down to weather. For the first time, this field lab will also investigate the size of the larvae, thought to have an important impact on yield loss.

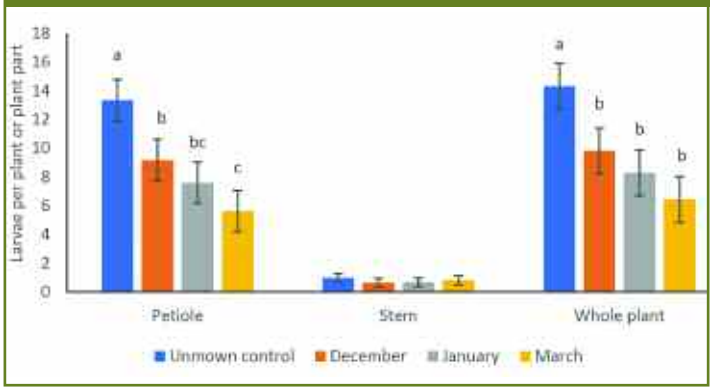
One farmer who's followed it from the start and is now taking part in the second year of field labs is mid-Norfolk grower Chris Eglington. "My interest started about five years ago when I had some trials with Syngenta on Toprex (difenaconazole+ paclobutrazol)," he recalls.

"As part of the trials, they took some CSFB larval counts. I didn't think there'd be any, but was staggered when they found up to ten in one leaf."

With 400ha at Letton, soil type for SS Eglington and Son ranges from sandy loam to heavy clay loam. An all combinable crops rotation has pushed OSR out to just once every eight years, interspersed with winter wheat and barley and peas as the other break crop.

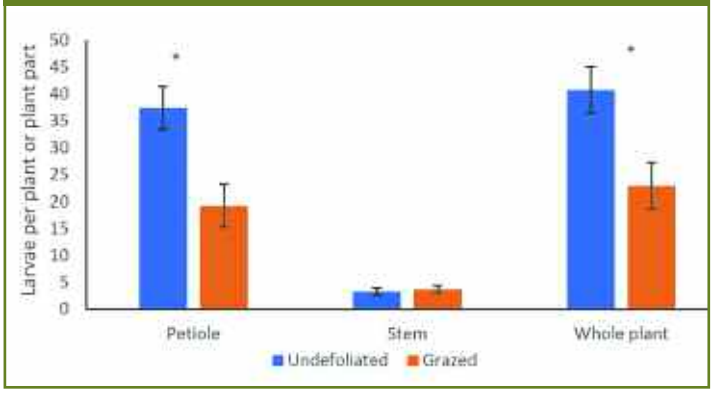
"We've been growing Barbados for the past six years, but have moved to Dariot this year," says Chris. The crop's established with a 7-row Kverneland Monopill precision drill in a one-pass combo trailed behind a subsoiler. "We plant just

Effect of defoliation on larval burden found in winter OSR



Source: ADAS, 2019; Months shown are when defoliation occurred. Assessments made in late March. Letters indicate where significant differences between treatments were observed.

Effect of defoliation at SS Eglington, 2019



Source: ADAS, 2019; asterisks indicate where significant differences between treatments were observed.

Lessons learned from farmer-led field lab

The first year field lab, funded by AHDB and Syngenta, brought in data from eleven other sites across Herts and Sussex, along with the Norfolk trial. Grazing appeared slightly more effective at reducing larval numbers than topping (51% compared with 25% — see chart right).

This was probably due to the greater severity of defoliation that occurred from grazing, notes Sacha. "Also larvae may be ingested by sheep rather than surviving in topped debris, from which they could re-invade the plants." The level of larval Infestation in the stems, although low overall, was actually almost double in the defoliated areas compared with untouched crop.

Yield reductions were reported from all sites, ranging from 11% to 50%. Only three sites had data suitable for robust yield comparisons (see chart right), which showed an average reduction of 14%. "Defoliation is likely to reduce the number of adult CSFB emerging from the crop, however, and may, in turn, reduce CSFB pressure in following OSR crops," he suggests.

There were also practical difficulties — preventing overgrazing by sheep was found to be hard while multiple wheelings occurred when topping, which didn't do the crop any good, given ground conditions in winter months.

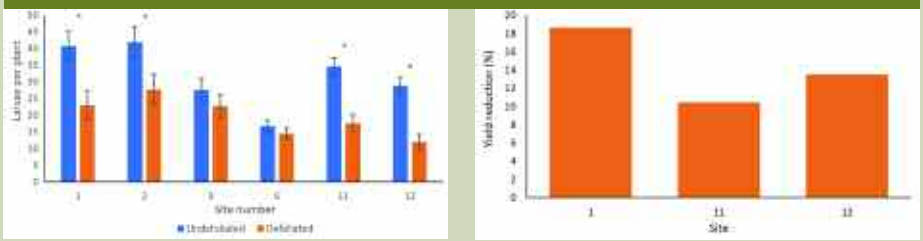
The yield results came as a disappointment to the growers involved, too, who gathered in October to discuss results. "We have a lot to learn about the severity of grazing, finding the ideal stocking rate and timing," noted one. Topping was felt to leave stems exposed to recolonization.

The weather during spring last year, with dry conditions followed by a relatively cool May, was also considered unsuitable for good regrowth. "We just couldn't regenerate the biomass, but then the plant's ability to do so may have been compromised by the larval burden anyway."

For those interested in defoliating crops to reduce CSFB, Sacha has the following advice:

- Target crops that have experienced significant adult CSFB pressure
- Target early drilled, non-backward crops in good soil as these tend to have higher larval populations and are likely to be more robust
- Defoliate early, ideally before Jan, to ensure the crop recovers
- Manage pigeon pressure, choosing a crop away from woodland.

Effect of defoliation at selected UK sites, 2019



Source: ADAS, 2019; asterisks indicate where significant differences between treatments were observed; results shown only for sites where treatments were in the same field – site 1 was grazed, while 2,3,6,11 and 12 were topped.

24 seeds/m² and typically achieve a plant count of 14/m². More important than anything is that we double roll to get good seed-to-soil contact, and that helps establishment."

Drilling usually takes place around 20 Aug, but this autumn his 25ha field was drilled on 11 Aug. "We wanted to get the crop up and going before the adult beetles came in. We're aiming for big, strong plants with thick stems and I believe that helps limit the damage from the larvae."

Last year, as part of the field lab, Chris decided to try grazing, and duly fenced off a 1ha plot of his field between two tramlines. "We have sheep on the farm under an arrangement with a local shepherd, that puts a flock of 400-1800 ewes in our fields throughout the year. They mainly graze our 100ha of pasture that's in Higher Level Stewardship.

"We put 110 ewes on the OSR from 1-9 Jan. The aim was that they'd take out the leaves, but they took the middle of the plant too, and in retrospect I think they grazed it too hard."

The crop began to regrow in Feb and a larval count revealed the petioles from the grazed area contained about half the burden of the ungrazed (see chart on p32). Flowering was delayed by around ten days, lasting three days less, and a pollen beetle assessment on 20 April found pest pressure to be higher in the grazed area, however. The grazed plants responded by producing multiple stems and the seed yield at harvest was significantly lower — 3.25t/ha compared with 4.15t/ha.

Overgrazing (left) may have contributed to the significantly lower yield, illustrated through the yield map analysed by ADAS Agronomics (right).

Whole crop 'grab' samples Chris submitted before harvest to ADAS were sampled and while seeds/m² was reduced by about 25%, thousand seed weight (TSW) was higher by 7%, notes Sacha. "OSR is sink-limited, so reductions in biomass and harvest index probably compromised yield potential of the grazed area, although the crop was able to compensate against the lower number of seeds by increasing TSW."

Charlock control

Despite the disappointing yield, Chris was willing to try again, this time grazing significantly earlier. The sheep went into the 1.4ha area of Dariot on 9 Nov, and this included crop that was infested with charlock. "The sheep took the charlock out, but again I think they grazed the crop too hard, and with the wetter weather, the field looked like the Somme by the time we took them out," says Chris.

Although he's yet to see how the crop will recover, Chris' gut feeling is that yield potential has yet again been compromised. "The trial's been a lot of work for no financial gain. But there is scope to reduce inputs through grazing."

The grazed area didn't need an autumn spray for turnip yellows virus (TuYV), nor did it need post-emergence treatment for the charlock, he notes. "In both years we've had to step up the first nitrogen dressing by about 30kgN/ha, but I feel the lower insecticide use helps with beneficial insects and the results with charlock control look promising.

"As for CSFB, however, I feel our best defence is to establish a crop early with a low plant population and big strong stems," he concludes. ■

Erratum

In the Feb issue on p38, we referred to a new urease inhibitor containing both NBPT and NPPT. The correct brand name for this is Limus, not 2-NPT as stated. *CPM* would like to apologise for any confusion caused.

Cross-drilling trial brings valuable knowledge exchange

Finding the optimal plant population may be key to maximising OSR yields, according to results from a grower-led trial conducted by three farmers who cross-drilled an area of their crops.

The trials were carried out as part of a programme co-ordinated by ADAS and funded by EIP-Agri, the EC's innovation partnership. The cross-drilling group was one of five farmer innovation groups (FIGs) who carried out a total of 48 trials in 2018 and 2019 to test their own questions, which were often prompted by results they had achieved from YEN (Yield Enhancement Network).

Two of the three trials provided a positive yield response where the growers with 50cm row widths had cross-drilled a plot within their crop. At the third site in Cheshire, a yield reduction was probably down to the relatively narrow (12.5cm) row width and high seed rate, concludes Dr Sarah Kendall of ADAS, who co-ordinated the trial.

	Conv. Yield Yield (t/ha)	X-drilled Yield adv (t/ha)	Yield diff for 95% confidence	Seed rate (/m²)	Row width (cm)	X-drilled Plant pop (/m²)
N Yorks	4.63	1.1 ±0.12	0.24	30	50	16
Lincs	3.40	0.22 ±0.12	0.23	45	50	34
Cheshire	4.61	-0.98 ±0.37	0.72	83	12.5	41

"This trial wasn't about the commercial viability of cross-drilling, but more to explore how spatial set-up affects yield," she notes.

N Yorks grower Richard Wainwright was one of the growers who took part in the trial. "Visually the difference was dramatic, but if you give the plant the space it needs, you still have to feed it right so it reaches its potential," he maintains.

But what he learnt most from the trial was the benefits of working with scientists. "You can't underestimate how rewarding it is carrying out a trial and having a scientist on your farm."

Following the project, there are plans to use the farmer-led trial model to help stimulate agri-innovation as part of a number of measures due to be introduced through the Agriculture Bill aimed at driving up productivity.

"The most exciting thing about these trials is the potential to use the results to inform the science," says Prof Roger Sylvester-Bradley of ADAS. "Great ideas are just as likely to come from farmers as from a scientist, and learning together is so much more effective than learning in isolation."