



“We’re examining association rather than cause and effect.”

Pulse progress

More from beans

Beans are often treated as the poor relation when it comes to the care lavished upon them. CPM explores how the Bean Yield Enhancement Network (YEN) is providing insights into how a more scientific approach to the crop could reap rewards.

By Marianne Curtis

There’s a buzz of excitement about pulses. Growers who are able to extract their potential make the break crop look an attractive addition to the rotation. And understanding just how to grow them is where the Bean YEN comes into its own.

About to enter its fourth season, the ADAS and PGRO initiative aims to maximise yields on farm through understanding obstacles to achieving the crop’s potential yield.

The 2021 season saw 42 yields submitted, of which 12 were winter beans and 30 spring beans, with one in ten of the crops averaging more than 7t/ha, says ADAS physiologist and Bean YEN manager Dr Thomas Wilkinson. “As the network expands and our knowledge grows, we’ll expect 7t/ha crops to become more common.”

So what factors contribute to yield? The YEN programme has highlighted factors not previously recognised as important for achieving higher yields; including shoot height and size, and seed size. Also important are large, well-podded plants with many seeds per pod.

Yield associations

Achieving such crops depends on maximising light capture and avoiding stress during flowering and seed fill, says Thomas. “This year, because we have accumulated sufficient data since the Bean YEN began, we’ve been able to run a more sophisticated statistical analysis — known as Residual maximum likelihood (REML) — which allows us to look at the effect of individual factors on yield.

“We can look at all data and see how it’s associated with final yield. We’re examining association rather than cause and effect. For example, if we take the average value for Bean YEN crops over the past three years, each pod per shoot above the average is associated with 0.08t/ha of yield.

“Association doesn’t start at zero — it’s based on the average for the data set. Each extra seed per pod above the average is associated with 0.94t/ha of yield, and each gram of thousand seed weight (TSW) above the average is associated with an extra 0.01t/ha.”

Looking at soils and nutrition, bean yields are negatively associated with clay content, with each percentage of clay

above the average associated with 0.03t/ha less yield, says Thomas. “As winters have generally been wet since the Bean YEN competition began, this may suggest potential difficulties of establishment in some heavy soils; so improvements to soil structure could be beneficial to yields.”

Potash (K) inputs are positively associated with yield, as are higher levels of potassium in grain, he says. “This suggests that K is as important for beans, with each kilogram of K₂O fertiliser applied associated with 0.01t/ha of yield above the average.”

Low phosphate (P) index soils are linked with low yields, but there’s a positive association of yield with micro-nutrient ▶



Thomas Wilkinson says as the YEN network expands and knowledge grows, 7t/ha crops will become more common.

Well sown, half grown

A bean grower for 20 years, Mark Gilbert abides by the adage, 'well sown, half grown'. And it seems to work, he achieved one of the highest yields in the 2021 Bean YEN at 7.2t/ha.

It's important to be patient in the spring and feed the crop as it grows, he says. "We have enough machinery to drill when we want to, rather than because we have to. We drilled our YEN crop on 24 March — we were one of the last to drill. We like to put beans into good conditions and watch them grow away — we don't want them to be slow to emerge," says Mark, who farms with his brother Ian.

They grow 90ha of Lynx spring beans on a five-year rotation and plough land before beans, which come after wheat. "We're weaning ourselves off our addiction to the plough — it's more expensive and slower but beans need good rooting depth and a nice loose profile for the roots to work in."

In terms of plant numbers, the Gilberts like to see a thick crop. "We're playing around with seed rates. Agronomist Steve Baldock of Prime Agriculture sets us a minimum average of 43 plants/m² but we actually ended up with 54 plants/m². More plants help with weed control, and we think you need enough plants to get the yield."

The Gilberts apply solid TSP and MOP in the rotation using Soyl maps. They apply a pre-emergence mix of Nirvana (pendimethalin+ imazamox) and Mohawk (clomazone) within 7-10 days of drilling and a foliar feed of Mn and Mg at early establishment. "We suffer from manganese deficiency on the farm," says Ian. "We also make two applications of foliar phosphate to the growing crop."

Two fungicides are applied, with tebuconazole being the mainstay, he says. "We also apply Aphox (pirimicarb) in late June to control aphids, if required."

Bruchid beetle, however, is a problem the Gilberts have stopped trying to solve using non-selective insecticides. "We didn't apply



Mark Gilbert likes to put beans into good conditions and watch them grow away — we don't want them to be slow to emerge.

insecticides this year and it was no worse than when we did apply them — we're hoping the predator numbers keep up," says Mark.

Bruchid beetle damage can be 10-15%, which means the brothers usually target the animal feed market. "If it makes the human consumption market, it's a lovely bonus — currently the premium is around £30/t," says Mark.

The YEN crop was harvested on 20 September 2021. "We're nearer the late end as we have a thick, green crop to ripen. On the combine we have a header table that can extend forwards, which creates a bigger surface area for beans to fall on, reducing harvest losses."

The Gilberts are looking forward to joining Bean YEN again for the 2022 season. "Our beans are still only achieving 65% of their potential. They have done well, but there's still more that we could do. YEN has encouraged us to pay more attention. We've always measured yield but never counted plant numbers, let alone shoots or pods," says Mark.

Farm Facts

*Mark and Ian Gilbert,
J Gilbert & Son, Littleport,
Ely, Cambridgeshire*

- Arable area: 1200ha
- Cropping: winter wheat, sugar beet, onion, potato, spring beans, linseed
- Soil type: mature Fen, predominantly Grade 1
- Tillage: Mixture of plough and non-inversion depending on the season and crop

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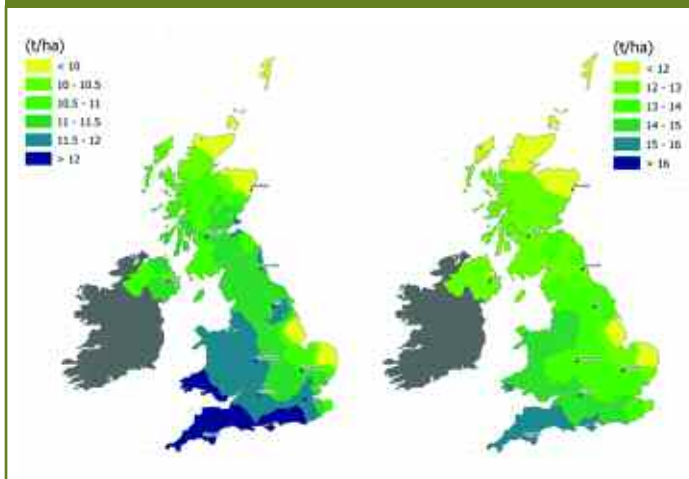


Farmers who are managing disease are achieving higher yields.

► applications, says Thomas. “Micro-nutrients seem to be associated with higher yields, but we don’t know which ones in particular — yet. In the future we hope to be able to automatically integrate with farm management software and then we’ll be able to identify

which ones have a positive association.” Higher yields are also associated with good pest and disease control, early sowing, longer season length, and late harvesting, says Thomas. “Farmers who are managing disease are achieving higher

YEN Bean yield potential maps



Calculated biophysical potential yields of spring (left) and winter (right) beans in 2021. Assumed available water holding capacity of silty loam soils. Source: ADAS, YEN Bean 2021

yields. Each fungicide application above the crop average is associated with 0.6t/ha of yield and 0.016t per

£1 spent.” Bruchid beetle damage showed a strong link with yield, with each percentage of damage due to ►

Beans trump peas

When Batchelors stopped direct contracts to grow marrowfat peas, it prompted Andrew Gentle, who supplied the firm, to think again about break crops.

“The pea crop struggled with pigeon damage and was becoming too much of a risk. Seed is expensive and eight years ago we were due to have peas in fields which can have bad pigeon damage, but our independent CCC agronomist suggested having beans on those fields instead,” he says.

“They yielded very well in the first year and we thought ‘this is easier than peas and the margin isn’t that different’. For 4-5 years we haven’t grown any peas, we’ve fully replaced them with beans.”

While Andrew is moving towards non-inversion tillage, he still ploughs for beans. “If we winter plough, the soil dries out a lot quicker than with over-wintered stubble or cover crops. We can get on earlier; our soil has a high clay content and frost gets in, making a lovely seedbed and last year we sowed the YEN crop on 6 March.

“It’s our fourth year growing Lynx and it does well, so we’ll drill it again this spring. We aim for a plant population of 55 plants/m² and last year we got 53 plants/m².”

He uses variable rate P and K application over the whole farm. “Interestingly, when we did the soil test for YEN it showed P and K to be a little low. However, leaf tissue analysis showed that both elements had been taken up and levels in the plant were alright.”

To control weeds, Andrew applies pre-em herbicide Nirvana (pendimethalin+ imazamox) using

bentazone at five leaves where required and a graminicide 10-14 days later. “This is to take out low-level grassweeds. Here, ryegrass is more of a problem than blackgrass and we want to keep on top of it,” he says.

He aims for the human consumption market and was the YEN entrant with the lowest bruchid damage. “We use Hallmark (lambda-cyhalothrin) if conditions are favourable for the beetle and we believe it’s still working. Last year wasn’t a bad bruchid year - rain in the spring and early summer meant they didn’t thrive. We also may use pirimicarb at late flowering to control black bean aphid.”

A wet June meant disease was an issue for the crop. “It came wet just when the beans were starting to flower. We saw chocolate spot and bean rust and applied Signum (boscalid+ pyraclostrobin) on 15 June at the beginning of flowering to try to keep on top of it. We followed up two weeks later with tebuconazole.”

Lack of sunlight meant the crop only flowered for three weeks, stopping in late June; normally it flowers for six weeks to mid-July, he says. “It was concerning but the crop compensated in other ways. There were fewer pods but the yield of beans per pod was similar to the previous year and beans were larger and heavier due to more available water.”

Yield for the YEN crop was a healthy 7.1t/ha, says Andrew. So what does he put his success down to? “We establish the crop in good time,



Andrew Gentle aims to establish the crop in good time, sowing into good conditions, and then a lot is dependent on the weather.

sowing into good conditions. Then a lot comes from the weather. It’s very sunny on the Chichester Plain which helps hugely.”

Farm Facts

Andrew Gentle, G Gentle & Son, Hale Farm, West Wittering, Chichester, West Sussex.

- Arable area: 700ha (around 50% farmed in own right, and 50% contract farmed)
- Cropping: Six-year rotation – Group 1 and Group 3 wheats, oilseed rape, spring beans, forage maize, spring barley and lupins
- Soil type: Heavy clay with silty loam over the top – Grade 2
- Tillage: Ploughing and non-inversion. Ploughing for beans

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YEN data shows bean yields are negatively associated with clay content in the soil, probably because of increasing establishment difficulties as soils get heavier.

► the pest above the crop average associated with a reduced yield of 0.03t/ha. It's also highly associated with temperature in May — with hotter temperatures favouring bruchid beetle; but there's no association between bruchid damage and insecticide application, he explains.

Another factor which has a strong association with yield is harvest losses, says Daniel Kindred, head of agronomics at ADAS, who is keen to tease this out. "Crops with higher harvest losses tend to have lower yields.

"Is this connected with harvest date or

setting up the combine header with a longer table to pick up some of the beans that are shattering?"

Harvest losses

It's something Thomas aims to find out. "We're keen to understand this more in the 2022 Bean YEN. Managing harvest losses during combining is not always easy to do but it's important for yield.

"This year we'll measure the height of the lowest pods on the plant to see whether there's an association between pod setting and yield. If pods are low, they

Plant Characteristics

Taller plants
Greater plant biomass
Greater shoot biomass
Higher harvest index
More pods/shoot
More seeds/pod
More seeds set/m ²
Heavier seed weight

Physiological components of Bean YEN crops positively associated with yield.

Source: ADAS Bean YEN, 2021

may go under the cutting knife and may not make it into the combine."

Looking ahead to the 2022 season, Bean YEN will continue to collect more data which should enable more robust messages, he says.

"Rather than add more measurements, we want to refine the information we ask for so that the Bean YEN is as interactive as possible and easier for pulse growers to be involved in." ■

• For more information about the Bean YEN, please visit www.yen.adas.co.uk/join-bean-yen

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