Case Study

Optimum tillage recipe unearthed

Controlled traffic farming (CTF) plus direct drilling (DD) is working wonders for one Cotswold farmer. Andrew Blake takes a closer look

Direct drilling with a controlled traffic farming system is reaping rewards on Nick August's Cotswold farm

Until 2008 all Nick August's crops at Signet Hill, Burford had been established by minimal tillage. Now, after six seasons – admittedly including a "torrid" 2012 – he is convinced that his trials-based CTF/DD approach is the most appropriate for his land.

"It's typical Cotswold brash often only 20cm deep, although there are some clay caps down to 1m.

"I know it's a cliché but the soil is our most important asset, so we need to look after it. Ours is shallow, drought-prone and full of stones."

Until two years ago milling wheat accounted for half the rotation, the other main crops on his 400ha being oilseed rape and peas. But poor establishment using home-saved seed in the sodden autumn of 2012 and a heavy slug toll led him to re-drill with feed wheat. Now a proportion of his wheat is in feed varieties grown for seed.

"I wanted to show and justify to myself that wide row spacing direct drilling was not detrimental to my bottom line."

"I had to buy in seed that year which made me evaluate feed wheat seed contracts. Peas have been grown for seed for some time."

Feed wheat varieties have averaged 10t/ha – some fields giving up to 13t/ha. "That's 2t/ha more than we usually got from milling wheat and means that the margin from growing feed wheat for seed is slightly better."

Despite the stony land peas are important at Signet. "It's becoming even more relevant to have a spring-sown crop, to help with blackgrass control, and we've always had a legume to help build fertility. The stones are quite soft, though they do play havoc with the straw chopper."

Heavy tined cultivator

Until 2007 all his crops were sown after passes with a heavy tined cultivator followed as necessary by a spring-tine machine; but with a view to future direct drilling he was, by then, using a 6m Vaderstad Seed Hawk drill.

A year later he began trialling a CTF system, and the benefits that its combination with direct drilling brought have persuaded him that he is on the right route – both in terms of protecting his soils and maintaining profitability.

A replicated field-scale trial last season proved the point. "I wanted to show and justify to myself that wide row spacing direct drilling was not detrimental to my bottom line," says Mr August.

The yields from winter wheat sown with an 8m Seed Hawk, bought to fit into the CTF system better, were compared with those from a Sumo direct drill, and with a Horsch Pronto following minimal tillage.

"The crop sown with the Horsch

looked better all year and yielded 300kg/ha more than the others; but this year that didn't pay for the extra cost of the min-till, which showed that the lower yield from direct drilling wasn't financially detrimental."

Out Track approach

CTF is now employed over all his land. Initially he was unconvinced that the technique would suit, and buying all new equipment wasn't economically viable. However, he has found the so-called 'Out Track' approach (see box), adopted with advice from CTF Europe's Tim Chamen, has brought several benefits.

The most noticeable is that the land has become more easily worked, the coulter pressure required to keep the Seed Hawk's tines penetrating to the correct sowing depth having reduced considerably over the seasons.

Worm casts aplenty at Signet Hill show the organic matter benefits of the system.

Until this year that easier working was also reflected in lower fuel consumption.

"When we started out we were using 3.8litres/ha for drilling – last year it was down to 3.3litres/ha; and until this year I thought it was all going in my favour. It was back up to 4litres/ha." However there was a good reason.

"All our wheat follows a break crop and it was all harvested before August. We had 4in of rain in August on land which had no canopy or root activity to soften it." A month of drought then

"I know it's a cliché but the soil is our most important asset, so we need to look after it," says Nick August.

followed baking land to be much harder than usual, he explains.

Across slope fuel saving

Mr August has long embraced precision farming, using yield mapping and field zoning to

Nick August's land is mostly shallow Cotswold brash – protecting organic matter levels is a priority.

guide inputs. RTK auto-steering on all machines improves CTF accuracy. Field work is generally across the slope saving 8-12% in fuel costs and reducing potential soil erosion down the tramlines. Fertilizer and spray application patterns, via his Kuhn 1141 spreader and Chafer bespoke sprayer, are also more uniform.

"Even with variable pressure nozzles it's hard to keep the spray pattern consistent when working up and down slopes," he says.

To help maintain soil organic matter level all straw is chopped and spread by the combine, and plentiful worm casts are a sign that the land is in reasonably good condition. "I don't need to do worm counts – their casts are all over the fields."

Cover crops

However, another field-scale trial, in this instance to boost the organic matter content further, has been set up in conjunction with Natural England. Now in its second year it is comparing the nitrogen capture of a range of over-winter cover crops drilled between wheat stubble rows. The crops include mustard, winter

Easier soil working is reflected in the drill's pressure gauge.

turnip rape, rye, fodder radish, and vetches. "There's also King's Soil Vitality Mix, a mix of my own, and stubble turnips.

"They're all grazed off by tack sheep before spring cropping, the income paying to establish the various cover crops."

In the first year the rye soaked up a lot of soil nitrogen producing 30t/ha of biomass before being grazed off, raising the soil organic matter to 8%, he notes. "But the following barley yield was about 0.5t/ha down on the other plots, which is so far unexplained."

Such over-winter covers have the potential to support higher crop yields and make the soil more resilient, he believes. "But we don't understand the soil and what's going on in it well enough to be able to feed those higher yielding crops optimally."

ADAS Auto-N project

To improve that understanding he has hosted ADAS's Auto-N project. This aims to bring together information from a wide range of sources to "develop commercially-viable systems for automated, fine-scale adjustment of N applications to autumn-sown cereals".

"There are still a lot of unanswered questions in this area," says Mr August.

One operation rarely required on the farm is subsoiling. "We'll occasionally take out the odd rogue wheeling."

Peas have become an important break crop to help build soil fertility

Any ruts from repeated tramline passes are eliminated, not by subsoiling, but by filling them in using an ancient Lilliston rolling harrow.

"As soon as you go in with any cultivation tool you are potentially destroying soil structure. If it turns wet after subsoiling the tramlines, subsequent field operations are compromised.

"I don't believe there's enough distinction made between tilth and structure. The better the tilth, the worse the structure."

Mr August admits slugs and particularly small snails can be troublesome under his system. "It's one of the reasons why we've tended to keep seed rates high."

"I don't believe there's enough distinction made between tilth and structure. The better the tilth, the worse the structure."

Variable seed

That said, he would like to introduce variable seed rates – much as he is already varying nitrogen fertiliser to suit field zones defined by soil parameters such as stone content and depth.

"Some time ago, when we were having trouble with low bushel weight in Malacca wheat we found we could increase it by reducing the seed rate on the thinner ground."

The impact of various over-winter cover crops grown ahead of spring barley is being assessed

Unfortunately the software on his current twin-hopper drill cannot yet accommodate on-the-move variable rate sowing

"If we could make it work with the Seed Hawk I'd probably increase the rates where we have bad blackgrass and where we have potentially high slug populations."

Blackgrass tends to be confined to specific areas of the farm. "We've got patches in the heavier parts of fields and generally on the clay, but the damage it's doing is generally not an issue."

The Seed Hawk sowing on 10in row spacing moves only 10% of the soil, he points out. "So in theory we're encouraging only 10% of the blackgrass and what is encouraged to grow is in the row."

Blackgrass

Competition from the crop there is strong because the plant stand, drilled at a conventional 300 seeds/sq m, is thicker than it would be on narrower row spacings, he reasons. "I'd be nervous of cutting seed rates to leave it thinner. Direct drilling is not the most precise of seed placement techniques, and the percentage crop emergence is below average."

When it comes to diseases he believes the direct drilling and wider row spacing, which creates more air circulation within crops, generally helps reduce or delay infections. "But work by independent agronomist Dr Sue Lucas found that early septoria infections were worse in direct

Signet Hill CTF

- 22m three-pass 'Out Track' system set up using GPS with RTK base station
- Tractors, drill, sprayer, spreader and grain trailers follow 2.25m wide tramlines
- Combine on 3m track straddles the tramlines and auto-steered to cut bout between the two tramline passes
- Two full 22m headlands to ease turning and ensure accurate sprayer applications
- Positioning accurate to +/- 2cm

drilled crops than in min-tilled ones – probably because the plants were more prostrate."

Overall Mr August considers his current production system is sustainable. "I think I can continue with it for the foreseeable future. We have a robust rotation.

"I accept that we don't import any organic matter, but that wouldn't fit in with direct drilling, and besides that the options are limited. We could use chicken manure, and slurry nitrogen is another option, but I believe digestate has had most of the goodness taken out of it."

STILL SCOPE FOR FINE-TUNING

Signet Hill's trials are throwing up some intriguing results, according to agronomists involved there.

Sam Clarke, Mr August's independent crop consultant, is not directly involved with the trials but is particularly interested in the cover crop work following CAP reform. "99% of the farms I advise on grow spring barley on the Cotswolds," he says.

"I was surprised at the rye decreasing the barley yield, and we need to look more into this. I suspect the rye's vigour is having a detrimental effect on soil health, which is why we're seeing a yield reduction."

The cover crop trial, being repeated this season, is one of five set up across the south-east by Tim Clarke, Campaign for the Farmed Environment co-ordinator for Berkshire, Buckinghamshire and Oxfordshire, in a partnership project with Natural England's Catchment Sensitive Farming scheme.

He agrees that the yield penalty after rye was significant, and vetch did not appear particularly helpful. "Mustard resulted in the least loss. But there was an extremely good soil conditioning effect from all the broad-leaved cover crops."

However, suggestions that broad-leaved cover crops suppress blackgrass need to be confirmed, he says. "We need to know more about the relationship between them and blackgrass – this will be key to their adoption or not by arable farmers."

The Seed Hawk drill is "close to perfect" for the CTF system but needs fine tuning, according to Sam Clarke. "Its seed placement precision is excellent but, in my opinion, there's still some work to do on its following tines to allow seedbed consolidation after rolling.

"The drill tends to cut a slot leaving the ground around the seed unconsolidated which can, in the correct conditions, lead to split emergence and higher slug and snail pressure.

"Slugs are a problem on Nick's CTF system, but to be honest they are a problem everywhere. As an industry we need to do more research into slug control both chemically and culturally."

Agrii's Greg Taylor notes that direct drilling on brashy soils leaves more stones on the surface. "This can impact on establishment levels compared to min-till which to a certain degree buries them. Stones on the surface can smoother germinating seeds which results in less successful development."

The Auto N trials remain puzzling, he adds. "They're showing wide variations in the response to nitrogen applications in plants close to each other – not just across differing soil zones within a field.

"This doesn't undermine the theory behind variable rate nitrogen, but it does suggest that until we fully understand the plants' requirements there may be no financial benefit.

"We need to find out why individual plants use different levels of nitrogen even when they all look so similar and yield the same."

Seed Hawk is close to perfect for CTF direct drilling system, says independent crop consultant Sam Clarke.

Broad-leaved cover crops are delivering an extremely good soil conditioning effect, says CFE's Tim Clarke.

Auto-N trial results are puzzling, but merit further investigation to tease out reasons why plant responses are so different, says Agrii's Greg Taylor.