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Trials uncover secrets to success

Machinery Innovation Delve

With cover crops becoming a more frequent part of rotations, Claydon Drills and Hutchinsons have been carrying out trials to assess the interaction between different stubble management techniques, establishment methods and cover crop mixes. *CPM* explores the findings so far.

By Rob Jones

As pressure mounts on growers to protect soils and diversify — in terms of what they're putting in the ground — the benefits of cover cropping have gained significant momentum in recent years.

Cover crops can be relatively inexpensive to grow and when used in combination with an effective stubble management programme can deliver significant agronomic, economic, and ecological benefits.

And to explore the full extent of these benefits, crop establishment specialist, Claydon Drills, and Hutchinsons have been carrying out trials at Claydon's 360ha farm in Suffolk to assess the interaction between different stubble management techniques, establishment methods and cover crop mixes.

"The initial findings are very encouraging and mark a significant step forward in our understanding of how to get the best out of cover crops," explains Jeff Claydon. "We've tried cover crops in the past with mixed results and even a couple of years ago were still very much in two minds about their potential usefulness.

Commercially viable

"However, it was early days in the process of identifying what cover crop species were best suited to this farm and we had not reached any firm conclusions, so decided to work with Hutchinsons to identify the best approach going forward. As with every decision on the farm it had to be commercially viable, balancing costs against the potential benefits.

"Previously, on fields that were to be spring drilled, we had simply left weeds and volunteers to act as a no-cost cover crop in the autumn, taking care not to let slug numbers build up, an approach which was partially successful. Then we evaluated a commercial cover crop mix containing a high proportion of black oats, which established quickly, tillered readily, and generated an extensive root network. But that approach did not sit well in our cereals/OSR rotation and clearly if we were to continue with cover crops it

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It's crucial that cover crop mixes incorporate multiple species, advises Dick Neale.

would be necessary to identify more viable alternatives."

Black oats produce large amounts of biomass and more mineral nitrogen than other cover crops like rye, but though they work well in a brassicas/vegetable rotation they're a difficult option where cereals are grown, explains Hutchinsons' technical manager, Dick Neale. "But just because something doesn't work in one situation it might be exactly right in another. That's why each of the species in our cover crop mixes has been specifically selected on technical merit to offer as much diversity as possible, while considering cost and reliability.

"Given this complex interaction, my advice is for growers to involve an agronomist with specialist knowledge of cover crops to help identify the best options for their specific situation."

Optimum results

Looking ahead — and on the machinery side of things — for the 2020/21 season the farm plans to grow just over 200ha of winter wheat, all feed varieties as there are several good homes for those locally, explains Jeff. "The balance of our 326ha comprises 46ha of OSR, 25ha of winter beans and 55ha of spring oats. Last year all autumn-drilled crops were established using our 15m Straw Harrow followed by a 6m Hybrid drill, nothing else, leaving enough spare capacity to take on 400ha contract drilling. It couldn't get much simpler than that, but achieving optimum results requires the right equipment to be used in the right way, at the right time."

And key to this is effective stubble management, which is an essential component of any efficient, sustainable, profitable crop production system, according to Jeff, but operations must be well-timed and carried out correctly to ensure that they are effective and produce maximum benefits.

"One of our primary tasks after harvest is to encourage weeds and volunteers to germinate quickly and then take them out using a combination of mechanical and chemical methods. The Straw Harrow provides the high-humidity conditions necessary to kick-start the process and

Claydon Drills and Hutchinsons have been carrying out the trials at Claydon's 360ha farm in Suffolk.

creates ideal conditions for this to occur," he says.

"It's important to adopt a 'little and often' approach and appreciate the different requirements in winter and spring cropping situations, know how and when to use the Straw Harrow, then tailor operations to your own soils and conditions.

"It's all about having the discipline to go in with the Straw Harrow early, even though few weeds are visible, and it might seem premature.

"If you look closely though, you'll see countless cotyledons just emerging, which is the best time to take them out. Using the Straw Harrow when these cotyledons are less than 20mm tall will kill 70% and repeating the operation several times will dramatically reduce weed populations.

"When, eventually, we apply glyphosate it's as a single, full-strength dose prior to drilling, which maximises its effectiveness and reduces the risk of resistance. Multiple ▸

Jeff believes that effective stubble management is an essential component of any efficient, sustainable, profitable crop production system.

▸ passes with the Straw Harrow will also knock out slugs and destroy their eggs, helping to create ideal conditions for drilling and crops that germinate evenly in seven to 10 days."

Effective stubble management has become particularly important following the loss of neonicotinoid seed treatments and some products to control grassweeds as there is a fear that the aphid vectors of Barley Yellow Dwarf Virus (BYDV) will increase significantly.

However, Jeff believes that this can be reduced considerably by managing stubbles and taking away the green bridge

Choosing the right mix

Within their portfolio, Hutchinsons offer three over-winter cover crop mixes:

- MaxiCover, a general-purpose mix which is drilled at 12.5kg/ha, suits a wide variety of situations and soil types.
- MaxiN, which is used at 15kg/ha maximises the fixation of nitrogen through its higher ratio of legumes, allowing rates of applied N to be reduced in the following crop, subject to correct management.
- MaxiRooter, sown at 12.5kg/ha, uses species with larger rooting systems and is designed to break up light soils or bust through shallow compaction.

All incorporate the same eight species, the ratios of each being adjusted according to the situation in which they are used. This enables them to work consistently, so growers can be confident of good results, explains Dick.

"The diversity of species in these mixes means that, regardless of weather, soil conditions, field aspect and establishment methods, you'll end up with a viable cover crop, because even if a couple don't thrive because conditions aren't right for them in that particular situation, others will grow.

"MaxiCover, which was used in this trial, should be drilled as soon as possible in the summer after the previous crop has been harvested, and certainly no later than mid-Sept. It contains linseed (28.5%), buckwheat (8%), phacelia (11%), daikon radish (2.5%), fodder radish (5.5%), brown mustard (13%), hairy vetch (7%) and crimson clover (24.5%). This provides a wide diversity in terms of crop cover and the rooting structures, which penetrate both vertically and horizontally, help to structure the soil and create drainage channels.

"Having various plant canopy profiles provides good soil armour and weather protection which has a positive effect in terms of controlling grassweeds, as well as further improving soil condition."

The mix also contains legumes and brassicas which provides a varied food source for soil microbes, while its diversity and the low inclusion rate of each plant type reduces the risk of exacerbating rotational pest or disease issues, he adds.

"The buckwheat in MaxiCover is extremely reliable and will grow almost anywhere, but very susceptible to frost. The heavy calcareous clay soil on the Claydon farm has a high calcium base and this attracts phosphate and locks it up, so plant roots can have difficulty in accessing this vital nutrient. Buckwheat produces acids which help to release phosphate and therefore plays a valuable role in achieving a correct nutrient balance in the soil.

"Fodder radish aids weed suppression, while its large taproot helps to improve soil structure by breaking up compaction and scavenging nitrogen from the soil. This is stored in the tubers which rot away quite quickly once the crop is sprayed off, so the nitrogen is given back quite rapidly and benefits the following crop.

"However, where farms grow OSR it's important not to include too high a proportion of seeds from the brassica family, such as radish, as these encourage slugs. That's the case on the Claydon farm, which is why we used a mix containing higher levels of crimson clover, berseem clover and hairy vetch."

Linseed can also be a helpful addition as it's an excellent indicator of soil conditions, which have to be good for it to thrive, points out Dick. "The occurrence of linseed was noticeably higher in the plot which was drilled using the Claydon leading tine followed by the twin tine than in the no-till area. While the soil right across the Claydon farm is in excellent condition, it was still noticeably more difficult to dig into the no-till plot and the structure of the soil was 'blocky'. Under those conditions a higher seed rate would be needed to compensate and to achieve the best results, 14kg/ha compared with 12.5kg/ha where the Claydon leading tine/twin tine set-up was used."

Buckwheat is an extremely reliable crop, grows almost anywhere and the acids it produces help to release phosphorus locked-up by calcium in the soil.

Though there are some obvious benefits, cover crops are still a relatively new concept in the UK, so most farmers and agronomists are still evaluating what works and what doesn't, adds Dick. "This is an ongoing process, and we are continually reviewing results from trials then adjusting the formulation of our bespoke cover crop mixes as additional information becomes available. In each case it is important to use the recommended amount of seed to achieve the optimum plant density and avoid spending more on chemicals later.

"When choosing a cover crop always consider which is best suited to your individual situation, taking account of a range of factors, from how much time it will have to grow to whether a cultivator-type drill will be available to cut through the mass of roots that will be created, otherwise this approach might not be realistic."

One area of cover crop was established using the Claydon Twin Tine kit in combination with the standard leading tine.

effect. "It also enables drilling to be delayed, but to do that with any degree of certainty you must be able to get the crop in the ground quickly, which means not having too many operations before sowing.

"After harvesting oilseed rape during the final week of July last year we immediately got to work with the Straw Harrow to distribute the chopped straw evenly and create a fine, level, 2cm-deep tilth.

"It covers 20 ha/hr, and the operation uses a little over 1 l/ha of diesel, so it's fast, low-cost and should be repeated every seven to 14 days when soil conditions are favourable. Little soil is moved, so if the weather does turn wet this mini tilth will dry out quickly, allowing another pass with the Straw Harrow or drilling with a Claydon Hybrid."

This season, on 55ha destined for spring oats, the farm has used Hutchinsons' MaxiCover cover crop mix costing approximately £35/ha. "This was drilled on 9 Aug, at 12.5kg/ha, using three approaches, including the new low and no-disturbance LD options for Claydon Hybrid drills, explains Jeff.

"With a few simple, quick modifications any new or existing Hybrid drill can now be used for conventional sowing, lower disturbance establishment and zero-till seeding, with or without fertiliser placement between or in the seeded rows, directly into stubbles, chopped straw, cover crops and grassland," he notes. "This makes them a much more versatile, cost-effective solution compared with having to purchase a strip till drill and specialist low-disturbance type.

One area of the trial plot was established with the standard Claydon Opti-Till set-up, comprising the leading tine which relieves compaction and aerates the soil followed by a seeding tine fitted with a 20cm-wide A-share. In another area, the farm used the same leading tine followed by Claydon's new lower-disturbance 'LD' twin-tine kit and finally double front-cutting discs ahead of the twin-tine kit to minimise soil disturbance.

But of course, the question is — how did these different establishment methods compare in the field?

Tilthy soil

"From what we have seen so far, the leading tine in combination with the A share or twin tine set-up seems to suit our conditions best, as the front tine creates an area of tilthy soil with moisture retained into which the seed is sown so that it germinates reliably and quickly," explains Jeff. "We're finding this produces a better plant take and more species survive where the cover crop is drilled, which maximises the value and benefits derived from the seed. But, as with the choice of cover crops, other options may be more suitable in other situations.

"What's certain is that in all cases the cover crop has produced a mass of roots, but the above-ground cover is not overly thick and will be easy to drill with any of the Hybrid configurations. The cover crop was sprayed off with glyphosate at the end of Nov, taking out most of the blackgrass that was in there, by which time the buckwheat had been killed off by the first frost. The field has been left over winter and another full dose of glyphosate will be applied before drilling just to take out any remaining vegetation. The spring oats will be drilled from the end of Feb onwards, depending on conditions.

Where no cover crop was established the soil was much "tighter" and "blockier".

"These trials have confirmed that cover crops will provide a valuable management tool for the future. Where they have been grown surplus moisture has been extracted from the soil, leaving it drier, warmer, and fizzing with earthworms. That could buy us several additional weeks of drilling time in the autumn, allowing greater latitude in terms of drilling dates and further reducing weather risk." ■

Trial summary and findings

- Trial using Hutchinsons' MaxiCover mix (containing linseed; buckwheat; phacelia; daikon radish; fodder radish; brown mustard; hairy vetch; and crimson clover).
- 15cm Straw Harrow was used across OSR stubble to kick-start the process of germinating volunteers and weed seeds as part of the stubble management programme.
- Establishment techniques included:
  - The standard Opti-Till set-up
  - The Claydon Twin Tine kit in combination with the standard leading tine
- Where no cover crop was established, the soil was much 'tighter' and 'blockier'.
- The most successful method on Claydon's farm was using a Claydon Hybrid equipped with the standard Claydon set-up of leading tine followed by a 7" A-share on the seeding tine.

Fodder radish aids weed suppression, while its large taproot helps to improve soil structure by breaking up compaction and stores the nitrogen it scavenges from the soil.