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SELECT
DEVELOPMENT INNOVATIONS

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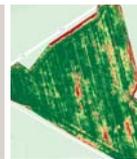
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Companion plant update



Over the last few seasons, companion plants in oilseed rape have been shown to provide a number of advantages in UK conditions. These include improved establishment, nutrient capture, weed and pest suppression, and ultimately increased yields.

Berseem clover as a companion plant can help with all of the above, but specifically has its major impact on improving establishment and rooting of the oilseed rape crop. It can be established in a number of ways, but the most successful is when it is mixed in the drill with oilseed rape seed in batches of 5 ha or less to prevent seed separation. The berseem clover then establishes alongside the oilseed rape. It displays a very erect growth habit, which does not compete with the oilseed rape above ground, but produces a very strong and pivotal tap root. This then penetrates through potential areas of resistance in the soil and allows the rape roots to follow. When combined with berseem clover, rape roots will typically be around 20% bigger. The variety of berseem clover is key for this to work. The variety Tabor is tolerant to most pre-emergence

“ this yield improvement is incredibly encouraging as could lead to significant fuel savings and soil quality benefits ”

and early post-emergence herbicides (with the exception of clomazone), but will be killed off over the winter after it has done its work by frost, so unlike some companion plants will not need removing with synthetic chemistry in the spring. Yields of oilseed rape on stronger land have consistently been up to half a tonne a hectare higher

when established with companion plants. Following on from some of the oilseed rape establishment work carried out at Stoughton last season, Agrovista will be broadening the project to a number of sites throughout the UK to see if berseem clover can really replace steel when it comes to cultivations.

The theory is to use the very strong ‘sun powered’ pivotal root of the berseem clover to penetrate areas of soil resistance allowing the oilseed rape root to follow it and access more nutrients and moisture than it would be able to access alone. At the heavy-land Stoughton site last year, oilseed rape was either direct drilled or drilled behind the leg of a Great Plains 00 planter, both with and without the addition of berseem clover. The oilseed rape established behind the leg yielded half a tonne a hectare more than the direct drilled rape, however where the direct drilled crop included berseem clover, the yield matched that of drilling behind the leg.

This yield improvement is incredibly encouraging as it could lead to significant fuel savings and soil quality benefits. Working with the company Formulanomics, the difference in fuel consumption between the two establishment techniques will be accurately measured at this seasons development sites. The other exciting area which will be evaluated this season will be the difference in grass-weed control between the 2 systems.

Through using the roots of the berseem clover, rather than a sub-soiler leg to break through the soils compacted areas, much less soil will be disturbed which will mean less grass weed will be encouraged to germinate and compete with the oilseed rape crop. This technique is also likely to provide ideal conditions for residual herbicides such as propyzamide to work, as the grass-weed is not going to be encouraged to germinate from depth due to lack of soil disturbance.

Improve grassweed control

Application techniques to help improve grass weed control

As we rely more on residual herbicides for effective weed control it has become increasingly important to maximize the available activity – particularly with difficult grassweeds.

Here we look at the latest best practice application advice for residual herbicides and an update of the benefits that come from the inclusion of Remix as an application aid – in both cases as a result of years of trials with our bespoke specialist application equipment.

Best practice application advice

The key to getting the best out of residual herbicides is to get more droplets to hit the target.



Single line 200l/ha application



Twin Cap 200l/ha application

More droplets delivered by Twin Cap = better herbicide efficacy



Single Line - VP80-04 200l/ha alternate forwards 30° & straight down



Twincap Defy 03 in back + VP80-03 in front

In Agrovista trials, the best results have been achieved by either twin-line or twin cap applications. By spraying with two nozzles at the same time we are able to deliver many more droplets to the target – giving better coverage of the soil which results in better herbicide performance.

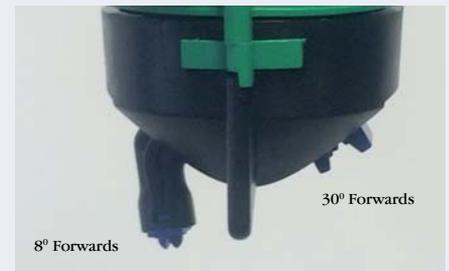
Pre-emergence treatments of Liberator (0.6L/ha) + Remix were applied to a 'difficult' Blackgrass population as below:

- **Single line** (VP80-04 nozzles, alternating forwards and down)
- **Twin line** (VP80-03 nozzles, angled forwards and down)
- **Twin Cap** (VP80-03 & Defy 03 nozzles angled forwards and down)

In each case the total water volume was the same – but the twin-line and twin-cap applications delivered more (smaller) droplets.

Twin Cap - set up

To set up the Twin cap nozzles to maximize performance, the VP80-03 should be in the forward aperture, facing 30 degrees forward. The Defy 03 should be fitted in the back aperture, also facing forward. See images below.



With this configuration, using 200 litres per hectare water volume will allow a forward speed of 14.4kph. Increasing the volume to 300 litres will need a forward speed of 9.6kph. The higher water volume is best used if conditions are marginal to give a greater coverage.

Water volume / speed

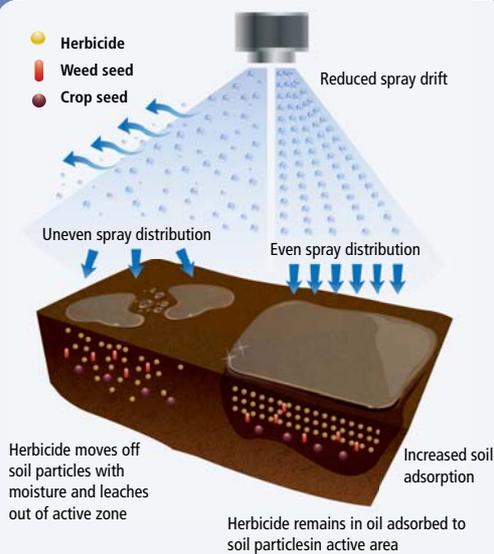
14.4kph = 200l/ha at 3 bar

9.6 kph = 300 l/ha at 3 bar

(9.6kph preferred if marginal conditions or unstable boom at 14kph)

REMIX ADJ0765

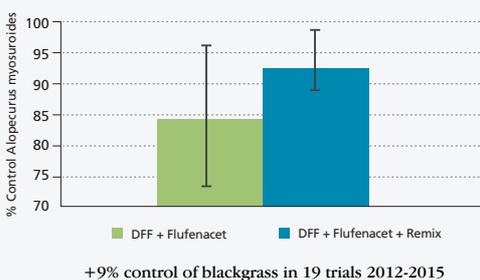
Remix is a specialist application aid for enhanced residual herbicide performance & improved crop safety. Simply mixed with the residual herbicide, it will enhance spray deposition and improve the ability of the active ingredient to adhere to the soil particles resulting in improved herbicidal activity.



Remix works in 3 ways:

- Reduces spray drift
- Improves spray deposition
- Increases adsorption to soil particles

The oil in Remix is a long carbon chain C20-C50 and is considerably different to other adjuvants. This long chain oil is designed to increase adsorption of the active ingredient to the soil (rather than foliage). It also contains surfactants which further help improve spray coverage and soil adhesion.



Reducing soil erosion

Trials on under sowing maize with cover crops showing promise

The challenge of growing maize with less environmental impact has focused the industry into developing practices that try to reduce the risk of soil erosion and nutrient loss from bare soil exposed after the crop is harvested.

Maize has for some time has been designated as a high risk crop but the regulators and the water industry are increasingly concerned about the impact of the crop is having on water courses especially in high risk catchments.

Establishing a green cover crop to reduce the area of exposed soil is seen by many in the industry as a practice that would achieve an improvement in the environmental impact of the crop and is being actively promoted by groups such as the Maize Grower Association (MGA). The MGA is promoting within crop under sowing based on trials and development carried out in Denmark for Danish conditions and growing practices.

Agrovista are leading the way in developing techniques and evaluating cover crop species adapted for UK conditions and growing systems as there are challenges to under sowing a cover crop into a standing maize crop. So John Ball and Phil Campion in collaboration with Reasheath College and Pöttinger UK have set-up a trial on the College's farm to evaluate an alternative technique. This was initiated by a former Reasheath College student Robert Yardley who recognised that under sowing a standing maize crop meant an extra machinery pass to spread a cover crop at extra cost.

By searching the internet he found that Pöttinger had developed a drill the Aerosem with its Precision Combi Seeding (PCS) system that allows the maize to be precision drilled whilst drilling the cover or companion crop at the same time in one pass. Early competition before maize plants get established can cause problems for the crop but the Intelligent Distribution System (IDS) of the drill allows the maize to be drilled at 75 cm row widths and 15cm gap between the maize and companion crop drills (see Fig 1 & 2.) which has been shown to minimise any effect of competition.

Figure 1



Figure 4. Under sown 16 June



Hybrid Ryegrass – Abernichte

In addition to the drilling technique a number of different companion crop mixtures are being evaluated for their suitability to UK growing both using the one pass Aerosem system and drilled later with an adapted precision drill when the maize crop was 8 to 12 inches tall.

A number of species are being evaluated including creeping red fescue, tall fescue, perennial ryegrass and different varieties of hybrid ryegrass mixed with and without clover and vetch. The true value of the cover provided by these companion crops will not be assessed until after harvest but establishment has shown promise with no significant impact on maize vigour (see pictures in figures 3 & 4). The companion crop treatments will be demonstrated to growers at an event on the 18th October.

Figure 2



Figure 3.



Hybrid Ryegrass – Abernichte



Tall Fescue

Figure 5.



Abernichte + Clover + Vetch



Figure 6. Under sown 22 June:



Abernichte



Abernichte + Clover + Vetch

Antony Wade is carrying out a second trial at Hillely Farm, Pentre, Shropshire sponsored under an initiative by Shropshire Wildlife Trust evaluating and demonstrating 'low cost' techniques of under sowing maize using equipment already on-farm. A Stocks fan jet seeder box was mounted on a 6m 'grass rake' and tines removed to work in between the maize rows to lightly cover the grass seed that was broadcast on the 22nd June when the maize was 12-18 inches tall (see Figure 5).

A similar range of cover crops are being evaluated to the Reasheath trial so that we can build confidence in the choice of cover crop across different sites and soil types. Despite the drilling technique being less precise establishment has been equally impressive demonstrating the potential of using this under sowing technique even on heavier soil types (see Fig 6).

“ Agrovista are leading the way in developing techniques and evaluating cover crop species adapted for UK conditions ”

Further treatments will look at establishing a cover crop immediately post harvest of the crop however this has a more limited use for reducing soil erosion due to the slower growth and ground cover from this late establishment. So fast growing species such as black oats will be evaluated at this timing. All of the treatments will be demonstrated at a grower event on the 10th November.

As a result of these trials it is hoped that Agrovista will be able to offer clients a technically evaluated companion and cover crop offer to help grow maize more environmentally friendly whilst enhancing their soil health and making their growing practices more resilient to challenges from regulators and climate alike.

Drone development update

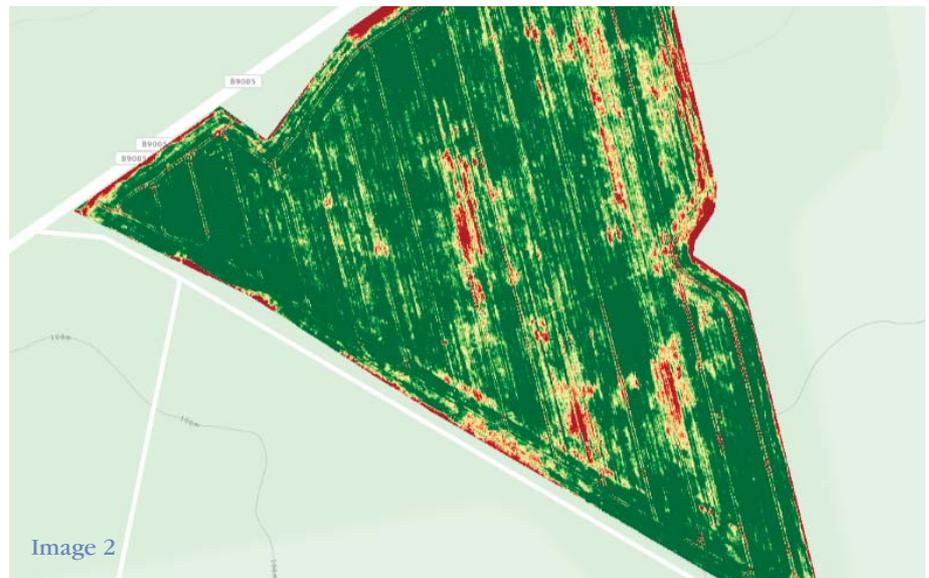
Drone technology - How can it work for you?

Quadcopters on farm are becoming a more common sight; some being purchased for getting great aerial pictures and videos of the farm and machinery and some for inspecting large areas of land or checking on animals from the air.

One of Agrovista's UAV development projects this year was to compare professional fixed wing drones to the popular 'hobby' multirotor drones to see if the basic camera gear on the latter could be effectively used for weed mapping and biomass maps as opposed to the expensive specialist camera gear on the former. One of the aims is to deliver practical advice to growers who want to utilise their own equipment to capture the data when it suits them.

Results from our initial work have been very encouraging. Drone technology and software progress in the last 12 months has been very impressive to watch as software companies sink millions into development. As a result of this work, Agrovista have been able to develop the Axis MapIT Pro software to handle the processed drone data and deliver it back to the grower to use for applications like variable rate nitrogen, or even patch spraying glyphosate with high resolution accuracy. Future developments will see yield prediction models coming into the software to allow a yield forecast to be made a few months before harvest.

The example alongside shows a field of barley that had an infestation of sterile brome which was flown with an off the shelf DJI quadcopter running a standard visual camera. One of the major steps forward this year has been the release of easy to use flight planner apps for tablets and smartphones. Once the boundary has been set, the quadcopter flies a pre planned route capturing high resolution images autonomously, even taking off and landing without any operator input. In this example field, 13.9 Hectares was completed in just 10 minutes. Looking at the actual images, the first is the 'stitched' visual image from the 223 individual images. The second image shows the image after it has been processed by software to effectively zones the field with the green being crop and the



“Future developments will see yield prediction models coming into the software”

red being the brome. From here the red zones can be singled out to spray off with glyphosate or even create a cultivation map for a stale seed bed in the worst patches.

Agrovista are now ready to take captured drone pictures and data, process them and give them back as a shapefile ready for sprays, or to overlap with soil maps to use in VR seed plans.

Speak to your local agronomist who will put you in touch with one of our specialists who can talk you through the process from image capture to the end result.

Cover crop trials

Understanding all the benefits of cover crops

In addition to featuring in the grass-weed control development work, which this year includes difficult rye-grass sites, we are evaluating other benefits associated with cover crops.

Cover crops have a wide range of benefits. An essential component in difficult grass-weed control programmes, cover crops provide significant soil benefits, improving nutrient capture and re-cycling.

The idea of these trials is to put some facts and figures behind some of these claims to give us a more measured and tangible outlook on the benefits of cover crops. Up to 12 different cover crop mixes are being compared on a number of sites throughout the UK & a range of measurements are being undertaken.

Soil organic matter (SOM) is one of the key areas we are looking to influence. Although a hugely complex subject, it is generally recognised that in arable rotations, you are likely to see yield benefits up to 5% SOM. In the UK, a large proportion of arable fields have declined to less than 3%. This decline is largely due to intensive cultivations combined with lack of grass leys or bulky organic manures being applied throughout the rotation. Therefore, there is massive potential to improve UK arable soils by increasing SOM.

Usually 1-5% of SOM consists of soil organisms. The rest is formed of high carbon molecules such as Humic acids. These molecules are often very complex, but yield a high level of nutrients for both microbiology and plants. Essentially, the SOM is both the habitat and food source of soil biology, with the simple compounds being decomposed quickly mainly by bacteria and the more complex compounds being broken down over a longer period mainly



“Cover crops is an essential component of the difficult grass-weed control programme”

by fungi, and macronutrients like Nitrogen being recycled by predation of these two groups of organisms by protozoa and other higher organisms. A good example of how plant nutrients are released through this food chain is demonstrated by the fact that the Carbon:Nitrogen ratio in bacteria is approx. 3:1 but in protozoa (the next level up in the chain) it is approx... 10:1. Therefore, as protozoa prey on bacteria, the excess N is released in excreta as a plant available form.

SOM also builds structure to the soil by increasing soil porosity, improving drainage and providing aeration channels, allowing plant roots greater access to water and nutrition which aids growth of soil biology, and provides a stable environment to prevent nutrients being lost due to water erosion

The potential improvements in the soil are being measured in a number of ways. To start with we are using a Veris Sensor Cart to map the field for the soil's electro conductivity, pH and organic matter. This will give a good background picture to the field before cover crops are established, and will be repeated throughout the project to see what effects the different cover crops can have on improving soil organic matter. Regular soil bulk density measurements will be taken across the different systems. Earthworm counts and middings will also be compared between the different systems, as earthworms are a useful indication of good soil biology.

Taking this a stage further, pioneering full soil biology tests are being carried out from the different strips. There are a multitude of microorganisms in every handful of soil. If the soil is to be healthy, fertile and productive, then this population of bacteria, fungi, protozoa, nematodes and arthropods should be of adequate size, diversity and activity. These new soil biology tests are able to measure the ratios of active bacteria, fungi and protozoa in the soil. Determining this microorganism balance of the soil allows the efficiency of existing farm practices to be benchmarked, and enables the success of any future action to help improve soil fertility such as adopting cover crops to be assessed.

Across these sites, we have also been working with the company Formulanomics employing new technology which can measure all aspects of tractor performance on the go. On the strong land site in Northumberland, using a power harrow combination drill, we have already seen a 13 litre per hour difference in fuel consumption between the zones mapped with the highest and lowest levels of organic matter. This technology will now be employed when the next commercial crop is drilled across the various cover crops to measure fuel consumption and power requirement in order to put a value on the benefits of the soil conditioning effects from the 'sun powered' roots of various cover crops.