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Optimising resources, different seeds in triple hoppers:

Three hoppers, many ideas

Sowing a main and companion crop at the same time is not a new idea but developments can make the job easier. With a bit of imagination, the technique can now be exploited to allow different varieties of the same crop, as well as other seeds, to be sown together to save on pesticides and fertiliser plus reduce moisture losses. Here we take a look at an innovative approach to a varied drilling system.

Partners Michael Seelmeyer and Jens Woltering use an Amazone Cirrus drill with three hoppers similar to the pictured model.

Agricultural engineer and farmer Michael Seelmeyer and chicken and beef finisher Jens Woltering farm around 300ha in Neuenkirchen near Bramsche in Lower Saxony, Germany. Michael is responsible for the arable side of the business but is keen to challenge more established farm practices to explore his own ideas

"We have numerous challenges. Our land includes dry sandy soils, we face the withdrawal of certain crop protection products and then there is the ever-increasing cost of fertiliser" says Michael. “We need to make better use of available soil moisture and possibly promote soil life too. We need to adapt”.

Five years ago the partners invested in an Amazone Cirrus 6003-2CC seed drill and through exploiting the technology it offers they are on the road to refining their cropping to meet these challenges, with promising results to date.

Three hoppers for drilling versatility

The Amazone Cirrus 6003 is a 6.0m drill equipped with a main 4,000-litre hopper divided 60:40 to hold either seed only or seed and fertiliser, each section having its own electric metering unit. The drill has also been specified so the contents of the two tanks can be divided between the two transfer lines or a separate line can be used for each tank. An optional coulter rail behind the main disc coulters allows crops, such as legumes, to be sown separately, with more on this later.

The third hopper is an add-on Green Drill 501, this 500-litre capacity unit mounting to the rear of the drill. This unit has its own electric metering unit, with integral fan to distribute seeds via the separate distributor head to the splash plates along the rear of the drill. The Green Drill is primarily used to apply fine seed, but it does provide other options that Michel says he is looking into such as applying other materials. "At the moment I choose to sow via the coulter bar which places seed adjacent to the disc coulter rows, but I am still experimenting".

Michael Seelmeyer manages the arable side of the partner business.

The drill is equipped with three hoppers.

Min-till disc

"Our drill is fitted with FerTec single-disc coulters up front and wavy-edge Minimum-TillDisc discs behind them", explains Michael. "The discs are set so they work at the same depth as other elements of the drill but at an angle to minimise disturbance. This is significantly less than would be the case in a classic disc array and meets our key aim of reducing soil disturbance to help protect soil organisms and reduce moisture evaporation". The partners typically sow directly into the stubble, with Michael saying that although they can't drill as soon as the combine has finished, as they bale the bulk of their straw, they have been able to establish excellent stands without any cultivation for several years.

"The soil structure has remained intact with the remaining root structure of the harvested crop producing a network that helps optimise ground moisture uptake as the sown seed germinates. We have found the wavy edges of the Minimum-TillDisc feeds some moist soil to the seed drilled ahead of them. They cut a slit of around 1 to 2cm in depth and this we also think enables the roots to grow down more easily as the seed germinates".

There are limitations to the drilling system, as you would expect. As an example, sowing into a previous crop that produces a lot of organic material, such as grain maize, can see the drill discs press material down into the slot, this 'hair pinning' causing obvious problems. Here a cultivation pass or two is needed ahead of the drill.

Crop rotation

The farm's crop rotation currently includes winter oilseed rape, winter wheat, forage and grain maize and, depending on markets, spring oilseed rape and grass for seed. A cover or grass crop is always sown between spring and winter cropping too. As a lack of rain is now becoming the norm, Michael says the partners continue to refine their approach to growing wheat.

"We now sow wheat site-specifically. Our soils are widely mixed, with an index range from 18 to 40. As we are producing just feed wheat we do benefit from greater flexibility. This enables us, on some of our land, to drill two different wheat varieties together. As an example, on our more drought prone soils we sow a standard feed wheat with varieties such as Grannen from Australia. This can tolerate really dry conditions."

Michael plans seed maps using the mydataplant.com platform. Although this is not perfect for his needs, as the application allows you to change the seed rate but not to select a hopper, it is still useful. "I initially create an application map that specifies 100%, 50% and 0% seed rates. Based on these, I then make a second map for fertiliser application but use it to set the sowing rate for the second seed variety. This allows me to mirror the seed rates between the 'seed' and 'fertiliser' hoppers so the two different seed varieties are drilled together."

Two different wheat varieties are sown together to suit varying soils using an application map.

Michael Seelmeyer can sow legumes via an additional coulter bank which runs behind the seed coulter discs.

KEEPING IT BRIEF

It takes a combination of skill and expertise to exploit the potential of companion crop drilling.

Cooperation between two partners sharing ideas has produced positive results.

Minimising soil disturbance by reducing drilling passes conserves moisture.

Mixing varieties to cope with dry conditions with positive results.

Experience with two varieties

"In our lightest soils, we harvested up to 6t/ha in what was a really dry summer last year and this was down to our two-variety approach, the Australian varieties doing well" says the Michael. "We haven't had any problems with uneven maturity yet but, in a more 'normal' year, we do appreciate the impact of weather conditions and varying soil conditions may have. We will have to determine if we can always achieve even maturity in a mixed variety crop."

He adds, however, that as the bulk of the wheat produced serves as animal feed the partners don't have to face the same problems as those producing a milling wheat. Nevertheless, Michael would like to see wheat seed producers listing more detailed information relating to a given varieties soil requirements as is the case with certain maize seeds.

Left: oilseed rape without companion crops. Right: oilseed rape with companion crops. There is a difference in both yield and vigour.

Break crops

When it comes to establishing cover/catch crops, the approach is to again drill directly into the stubbles, with careful attention being paid to moisture conservation. Key here is preparing ahead of drill, which starts on the combine. Here the aim is to minimise loses and resultant volunteers. Reduced wheeling and taking care to minimise trafficking during baling are also important, with a policy of not trying to erase the existing tramlines.

“Thanks to using GPS, tramlines are always in the same place in our fields," says Michael. “We drill using a crossboard ahead of the coulters as it levels straw heaps and lumps left by the cultivator section better than a tyre packer. Our key aim is to minimise soil disturbance but this does mean you need to take care of the ground ahead of the drill”.

Soil nitrogen mineralisation and hopper diversity

It is not just moisture retention that is a consideration, Michael saying he has also seen an improvement in soil nitrogen retention. "We don't incorporate straw or stubble, which means the nitrogen that is potentially lost in the breakdown of organic matter is available for the cover crop. We have found there are differences when sowing wheat relative to minimally tilled and direct sown cops too. In February last year we measured 16kg per ha more mineralised nitrogen in fields that had seen no cultivation when compared to those that had been tilled in some way."

The partners increasingly seek to further exploit the benefits of using up to three ‘seed’ hoppers on the drill. "Multiple hoppers and different points placing seed accurately in the ground gives us great flexibly," says Michael. “Buying small seeds in individual varieties is typically less expensive than opting for a blend. We have found the latter can result in larger seeds getting segregated in the hopper, leading to inconsistent drilling. We can choose what we want to sow together more precisely and adjust the sowing rates to suit the soil and conditions”.

Legumes are sown via the drill’s FerTec single-disc coulters, with vetches, buckwheat, radish or sunflower fed to the soil via classic TwinTec+ double disc coulters. "Without oilseed rape in the rotation, the variety of break crop partners would be even greater," adds Michael.

He uses the Green Drill unit for establishing crops to include niger, linseed, phacelia or clover. "It of course follows that some plants need significantly more germination moisture than others, and seed rates vary greatly, too".

Speaking of seed rates, Michael favours dense intercrops that suppress weeds and volunteers. He sees no issues for the following crop due to volunteers and lack of stubble cultivation. "Some volunteers emerge but are well suppressed, other seed remains dormant with the balance rotting by the time the sown crop emerges."

Oilseed rape with a companion crop

All three hoppers are used for sowing winter oilseed rape. The two farmers are members of the German Agro-Nordwest Experimental Field Project which sess them explore growing different varieties and companion crops together. For now, they have adopted a mixed sowing regime that is delivering advantages. "Last summer was exceptionally dry but we harvested 5.0t/ha, without the using any insecticides. We have also been able to reduce other plant protection products and even managed without any fungicides this past autumn, with one application of a grass herbicide. This was followed by two fungicide applications at reduced rates in spring. Whether this will always be possible remains to be seen, but it is promising.”

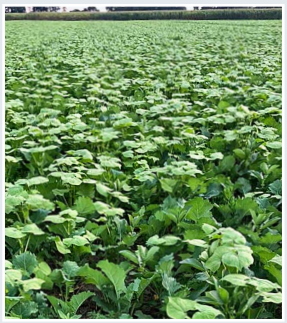
Companion crops fix nitrogen

Field beans are sown at rates of around 80kg/ha at average depths of 7cm as companion crop, with the double-disc coulters drilling a mix of oilseed rape, buckwheat and linseed. White clover and phacelia are broadcast via the Green Drill at the same time. While part of this mix matures to deliver benefits for insects, the bean and white clovers are sown to fix nitrogen.

"In our experience, the spring beans fix around 30 to 50kg of nitrogen per hectare. This will be available to the oilseed rape when conditions are too dry for the crop to take up applied mineral fertiliser. The white clover is the only winter-hardy component in the mix, with the fixed nitrogen benefit covering the seed costs," says Michael. “From about the end of September, the buckwheat visually dominates. It grows rapidly, has a tufted, medium-deep root system and mobilises phosphorus. But it freezes quickly with first night frosts”.

COMPANION CROPS

Briefly after drilling



In early autumn, the oilseed rape plants are barely visible.

Which seeds go into which tank? And what sowing rates are appropriate? Adopting a multiple seed system will take experience.

Eyes need to tune in to changing fields

Depending on the weather, the field beans continue to develop for another four to eight weeks, a few days of heavier frost killing these plants off, with the linseed and phacelia following suit to leave the oilseed rape to grow on. Michael says he has yet to find the beans harmful competition to the oilseed rape but visually it can be difficult to get used to the diversity within the mixed cropping.

That said, the oilseed rape does seem to grow taller in the mixed crop than conventionally drilled seeds, which may seem to put them at the risk of frost damage. Michael, however, suggests individual plants seem resilient, the frozen companion crops creating a microclimate to protect them. Michael adds he deliberately refrains from using fungicides in autumn as these would also strengthen the companion crops.

A few weeks after the start of vegetation in the spring, there is hardly anything left of the companion crop except for a few bean stalks. The positive effects carry through all the way into the harvest. "The fields we have tried with the mixed cropping see the oilseed rape have lusher leaves in dry years, which is a plus for yields".

Other aspects in brief

- Michael Seelmeyer would welcome a quick-change system to allow an easy switch between the disc coulters on the drill.
- After oilseed rape and before maize, slurry is applied in a strip-till application.
- When sowing legumes as a cover crop before maize, Michael places the seeds close to the following maize row.
- Since switching to minimum tillage, Michael has noticed an increase in mouse populations in dry years.

Summary:

Partners Michael Seelmeyer and Jens Woltering have been pioneering new approaches to arable farming by using a drill with three hoppers. These allow them to adopt strategies that they have seen safeguard their yields, saving on crop protection products with an increase soil fertility. Using a seed drill with cultivating elements that minimise soil movement helps retain soil moisture, a key plus in free draining soils in dry conditions.

Sönke Schulz

IN OILSEED RAPE

Ahead of the first frosts, buckwheat looks to be the dominant crop.

In late autumn, it's the turn of the beans to make a push.

By the time flowering sets in, some of the companion crops have largely disappeared.

White clover develops close to the ground, surviving as the next crop follows.

Mid-December, and the buckwheat and field beans have been severely affected by frost.

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