

# agrovista

# SELECT

## DEVELOPMENT INNOVATIONS



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## Agrovista's development projects – a practical approach.



The world of agronomy is changing fast. Over the next few years, seed, genetics and bioscience will provide the foundation of many exciting, innovative projects that will revolutionise the way we grow and protect crops.

Synthetic chemistry will continue to play a vital role, particularly in the near future. However, resistance and legislation will affect availability and use.

It's clear that a whole new outlook on development trials is needed to investigate which tools work and, most importantly, how growers can get the best from them. It is vital such trials are practical and the solutions they provide must be relevant and readily usable by farmers.

Simple product comparison trials will still have a place, but the integrated nature of crop production packages in the future – seed and its associated technology, chemistry, rotation, micro-nutrition and establishment, crop imagery and application – will demand a whole new development platform and direction.

Agrovista is at the forefront of this change. For several years we have recognised the increasing need for a combined offer to service our customers' crops, and this philosophy now underpins the Agrovista development strategy.

We believe our approach is different – it considers the problem from a grower's perspective, encompassing all the potential parameters outlined above and other new ideas that hold promise. All this is being investigated and demonstrated at field level to maximise the practical relevance of the work and the solutions it provides.

Much of this work is being carried out at our three major trials sites at Stoughton, Maidwell and Lamport. In addition, we have several more Growcrop Gold sites nationwide specifically looking at oilseed rape.

One of our key projects over the past decade has been blackgrass control. This has largely focussed on herbicide performance, but over the past couple of seasons we have taken a much more holistic approach to the problem.

We are now examining application technology, including drift control, band spraying and new application aids, and recommending key practical advances to improve herbicide efficacy.

We are also looking at introducing cover crops, in particular autumn-sown ones ahead of spring cropping, in a five-year rotational study that includes other cultural control methods to control the weed. Our recommendations are already finding places on many farms, helping to keep winter wheat in the rotation of even the most seriously affected growers.

Our oilseed rape trials are also helping to increase farmers' profits. Long-term establishment work has evaluated various techniques and linear row seed rates using practical farm machinery. These have resulted in revised recommendations to help farmers achieve optimum plant densities, crop structure and yield. The next stage of development is to exploit further the potential for increased rooting using novel growth regulators.

We are also developing the concept of companion planting in OSR, whereby legumes are grown alongside the crop for the first few months to improve crop growth and weed and pest control.

Synthetic chemistry will remain a key focus of our development strategy. Product testing will continue, but we will spend much more time assessing prediction systems and imagery. This will help improve the targeting of chemistry, important as the number of actives diminishes and the usage of those that remain becomes more restrictive.

There are many other exciting projects being carried out and in the pipeline. All this work represents a very significant investment for Agrovista. However, given the increasingly integrated nature of crop production, we believe it is money well spent.

It's an ongoing commitment that will keep Agrovista's development strategy ahead of the competition, giving our farmer customers access to the latest technical information to help enhance yield and profits and maximise business efficiency in the years ahead.

# Update on companion plants

## Increasing yields in oilseed rape

Agrovista are now in the third season of looking at growing companion plants amongst oilseed rape crops. The concept which was born in France, primarily due to environmental restrictions, is that the companion plants are sown alongside the oilseed rape crop in the autumn.

Growing alongside the oilseed rape, they are essentially harvesting sunlight which would otherwise be wasted and converting it into organic matter. Through this process, they mop up nutrients such as nitrogen and hold it in an organic form over winter preventing it being lost due to leaching or de-nitrification. The companion plant mix is designed to be frost intolerant and dies over the winter, releasing captured nutrients back to the growing crop in the spring.

The trials to date have exceeded all expectations. In addition to trapping up to 40 kg/ha of nitrogen over the winter and releasing it back to the oilseed rape crop at the start of spring growth, the companion plants have also demonstrated a number of other benefits.

The first interesting finding was with establishment. For two out of the three seasons at several of the trial sites throughout the UK, there has been very high slug pressure and it is evident that growing companion plants alongside the oilseed rape appears to reduce the slug activity on the oilseed rape. Whilst the reason for this is not clear, a number of theories have been raised including simply that the increased biomass means the slug activity is diluted on the oilseed rape.

Another theory raised from an organic organisation is that a slug satisfies its hunger quicker on a more varied diet hence eats less oilseed rape, and a third theory is that one or more components of the mix are repulsive to slugs. Whatever the reason, it is very clear that companion plants reduce slug activity as the following photos show:



40 seeds m<sup>2</sup> osr



40 seeds m<sup>2</sup> + 20kg/ha companion plants (PCI)

The other interesting pest area with companion plants is their effect on flea beetle. Whilst to date we have no evidence from the UK, French data would suggest up to 60% of farmers who have sown companion plants alongside their oilseed rape have been able to omit at least one flea beetle spray, which they believe is due to a confusion factor.

The species within the companion plant mix are also selected on their root exploration capabilities, and are able to break through areas of resistance in the soil which the oilseed rape root may not. There appears then to be a synergy where oilseed rape roots 'piggy back' on the companion plant roots, and at all sites in each of the three seasons we have seen a consistently bigger root system from the oilseed rape grown alongside the companion plants.

This rooting benefit is also having a dramatic impact on soil structure by using natural 'sun powered roots' to restructure soils. Increasing organic matter in our soils is vital if we are going to increase yields, and companion plants and cover crops could be a very good way of achieving this and bringing some resilience back to our soils.

The following photos show the effects of companion plant roots on soil structure:

“ The trials to date have exceeded all expectations. In addition to trapping up to 40 kg/ha of nitrogen over the winter, the companion plants have also demonstrated a number of other benefits. ”



OSR + vetches



OSR + No companion plants



OSR + berseem clover

# New problems, new opportunities

## Practical solutions to changing regulations

Yield results have also been very encouraging with over a tonne a hectare yield response to the inclusion of companion plants where slugs were particularly challenging. The average yield response across all sites would however mirror the results from the Continent at around 0.4 t/ha.

Whilst throughout all the sites we have not yet seen a negative yield response, smaller yield responses appear to have followed poor establishment of the companion plants particularly in high trash conditions, or where the establishment technique did not provide good seed to soil contact. The yield benefit was also reduced where the oilseed rape crop was too thick in the autumn, probably due to increased competition.

In looking to develop additional solutions for the future, Agrovista have moved beyond the initial vetch & berseem clover mix they have been evaluating over the last three seasons, and have tailored a new, two-species companion plant mix. This new mix is based on a higher berseem clover content, specifically designed to improve rooting and soil structure particularly in a banding scenario, and initial results are very encouraging as the following photos show:



20 kg/ha PC1 overall



5kg/ha PC3 banded in row

**Tightening EU regulation may be threatening the existence of some core active ingredients and the efficacy of many others through label changes, but it is also galvanising researchers to develop novel solutions to maintain profitable arable crop production in the UK.**

This fresh thinking could produce better results than are being achieved by conventional chemistry, believes Craig Morgan, Agrovista's head of technical research and development.

Speaking at the recent CropTec event at Peterborough on the topic of Practical Solutions to Changing Regulations, Craig said some alternative, integrated solutions were already showing plenty of promise despite being in their infancy.

"The political and regulatory landscape is changing, though the full extent is not yet defined. This makes it difficult from an R&D perspective in trying to second guess what might happen, but we are doing our best."

Nowhere is this clearer than in Agrovista's own trials. "We have moved away from simple product comparisons and are now actively looking at solutions and programmes in preparation for the changes that lie ahead," he said.

These include work examining new uses for existing chemistry to help offset the potential loss of cereal and OSR herbicides and fungicides.

"We have taken existing chemistry and introduced it to new crops," Craig explained. "Agrovista already has two patents for use of old chemistry, one as a cereal herbicide, one as an OSR herbicide.

"We are also looking at different timings and techniques, particularly on cereal fungicides, and we are coupling all that in with some imagery technology to help growers identify problems and improve control."

Moving away from chemistry, Agrovista has started assessing different cropping patterns to improve weed control and relieve the pressure on current chemistry, particularly in the blackgrass sphere. The use of a black oat and vetch cover crop to integrate grassweed control with spring cropping on heavy land is showing particular promise.

“This technology could have some big impacts on biological performance of pesticides, and our work is clearly showing some big differences.”

"Our success in year one was phenomenal," said Craig. "We reduced our heavy population of blackgrass to a level below 5 heads/m<sup>2</sup>. In addition, we don't use any ALS chemistry in these programmes and potentially we will use less fungicide too."

Further work aims to improve application technology. Agrovista is using a commercial sprayer rather than hand-held equipment to assess the impact of application speeds, nozzle type, angle, pressure, water volume and drift under realistic commercial conditions.

A key focus is maintaining efficacy when using drift reduction technology in aquatic buffer zones, which could increase to 30m in the near future, said Craig. "There is fantastic work looking at the impact of

drift reduction on non-target areas. But there is no work looking at the effect of this technology on control, and that is one of my biggest fears about this changing legislation.

“This technology could have some big impacts on biological performance of pesticides, and our work is clearly showing some big differences.”

OSR establishment is also being assessed, including the use of wider rows to allow a total herbicide to be applied between the rows. This means selective herbicides are only applied to the rows themselves.

“We are probably using about one-third of the dose that would normally be applied overall, helping to stop these actives getting into water,” said Craig. “Coupled with that, companion planting - sowing berseem clover and vetches in the OSR rows, is massively improving soil structure and there does seem to be some impact on pest control too, which we will explore further.”

Summing up, Craig said some regulatory changes would cause problems, particularly in the fungicide sector but some would also provide new opportunities and spur the industry to do things differently.

“They might make us look at growing crops in a different way, bringing some new thinking that, in turn, could create some new solutions,” he concluded.



Spraying between the rows

“Companion planting is massively improving soil structure and there does seem to be some impact on pest control too.”

## LOSS OF ACTIVES

### Key factors

- **EU regulatory position – 87 actives under threat:**
  - 17 insecticides  
10 at high risk
  - 35 herbicides  
17 at high risk
  - 32 fungicides  
12 considered high risk
  - 3 others  
2 at high risk
- **Water Framework Directive**
- **Drift control**
- **Label changes**
  - Rates/max number of applications
  - Timings
  - Wider buffer zones and drift reduction technology
- **Weed and disease resistance**
  - New techniques/timings



Developments in application methods

# Improving efficiency of Nitrogen Fertiliser

## Using N-Lock to improve performance



In the presence of adequate oxygen, warm temperatures and some moisture, any nitrogen supplied as a commercial fertiliser is ultimately transformed in the soil to a nitrate form of nitrogen (or at least a significant fraction of that supplied).

Ammonium-N is converted to nitrate-N through a biochemical process (known as nitrification) that requires two forms of soil bacteria. The first bacterium *Nitrosomonas* converts ammonium-N to nitrite-N. The second bacterium *Nitrobacter* converts nitrite-N to nitrate-N. During the process of nitrification, significant amounts of nitrogen can be lost from the rooting zone. First of all as nitrous oxide, one of the most potent greenhouse gasses associated with agriculture, and secondly through leaching

when converted into nitrate form, as nitrate-N is negatively charged and therefore unable to bind to soil colloids and organic matter. Not only are these losses of key environmental concern, but they are also a waste of one of our single greatest variable inputs, nitrogen fertiliser.

Nitrification inhibitors slow the process of ammonium converting into nitrate. This is an advantage because plants can use nitrogen in both the nitrate ( $\text{NO}_3^-$ ) and ammonium ( $\text{NH}_4^+$ ) for growth.

As ammonium-N is positively charged, it is less prone to leaching through the soil. Nitrification inhibitors therefore keep nitrogen available in the root zone for longer, optimising yield and reducing the potential for nitrate leaching losses and nitrous oxide gas emissions.

N-Lock acts as a nitrogen stabiliser to help with N management and N efficiency. N-Lock contains nitrapyrin which inhibits *Nitrosomonas* spp. bacteria slowing down the process of nitrification, therefore keeping applied N in the preferred ammonium form for longer.

Whilst a plant can take up nitrogen in both ammonium & nitrate forms, nitrate requires more energy than ammonium to be converted into usable forms, and therefore nitrate has a higher metabolic cost to the plant and is a less efficient form of nitrogen.

Nitrapyrin has been successfully used on millions of acres in the USA for over 20 years and soil nitrogen retention has been found to increase by over 28%, with significant reductions in nitrogen losses through greenhouse gas emissions and leaching. This has also led to a 5% yield advantage in maize over 20 years.

Agrovista have been trialling N-Lock (nitrapyrin) in large scale field trials across a range of crops for the past two seasons with very promising results. In 2014 the average yield response across a wide range of sites with winter wheat was 0.75 t/ha, with some sites significantly more as can be seen from the adjacent yield map.

### Key benefits

- N-Lock stabilises nitrogen in the ammonium form which reduces environmental impact of N usage by minimising losses caused from leaching and de-nitrification.
- N-Lock keeps nitrogen in the rooting zone for longer maximising nitrogen efficiency, therefore improving yields and quality.
- Unlike most other nitrification inhibitors, N-Lock can be applied alongside or in tank mix with nitrogen fertilisers, slurries and crop protection products.

### Getting the best from N-Lock

For best results crops need to be hungry for nitrogen after flowering: E.g. Cereals, OSR, Maize.

Best results on lighter soils with high potential crops.

Apply as close as possible to first nitrogen application and moisture post application will bring best out of product.

# Growcrop Gold Oilseed Rape Development Sites

The Agrovista Technical team will be at various events across the country as we head into 2015, providing an opportunity to see first-hand some of the results and techniques from the work highlighted in this edition of Select.

The Growcrop Gold sites continue to develop well and provide interesting data on the impact of soil structure and establishment method on oilseed rape crop establishment. The companion plants will shortly be removed at those sites where insufficient winter weather has been experienced to take them out for us, but their effect on soil structure has again been impressive. We await the yield results with interest.

Meetings will be held this spring at three of the sites with varying agendas depending on the points of interest locally. These agendas will cover the Growcrop Gold OSR trials, but will also pick up other topics of interest to growers such as crop nutrition; canopy management; cover crops; spring crop varieties and establishment among other topics.

9th March 2015: East Linton

10th March 2015: Doncaster

11th March 2015: Croft

To book a place on one of these meetings please contact the site co-ordinator or book online at [www.agrovista.co.uk](http://www.agrovista.co.uk) and click on Events

All the results and information are available from your local Agrovista agronomist or by contacting us at [enquiries@agrovista.co.uk](mailto:enquiries@agrovista.co.uk)

Those sites which are not holding spring meetings are still available to see, please contact the site co-ordinator for your local site if you are interested in arranging a visit.

Meetings are planned at all of the sites in the summer.

Dates will be available shortly on the Agrovista website.

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