



Plan spring nitrogen now for best results

In this issue

With drilling drawing to a close and crops generally in reasonable condition despite a challenging autumn, thoughts should now turn to planning spring nutrition programmes. With a particular focus on nitrogen, national crop nutrition technical manager Edward Downing and SOYL's commercial director Simon Parrington explain how to make sure your wheat crops receive the right amount of product at the right time.

The last two years of record breaking yields have demonstrated what can be achieved with modern high yielding varieties when they are grown without limitations. The key now is to assess the amount of nutrients that your crops need to reach their full potential. Obviously the winter and spring weather conditions can influence this, but it's important to make clear plans now and then review them as the season develops. All too often decisions are made too close to the actual application, which usually results in figures varying little from previous seasons.

Use historic farm data to your advantage

Crop nitrogen demand is influenced by several factors, but one of the most important is often overlooked: previous crop performance. Reviewing this can be useful in planning future nitrogen programmes. Previous grain protein levels will give you a good idea of whether wheat crops were under or over fertilised; the optimum level for feed wheat is 10.8%, so levels below 10% indicate that the crop hasn't received enough nitrogen to reach its full potential and conversely, above 12% would indicate that the crop has received too much, or something such as weather has restricted the yield.

Cross checking these levels in crops over the last 5 to 10 years against yield performance and applied nitrogen rates in each year will give you a good idea of your consistency in achieving the optimum rate of nitrogen. Predicted yields can also be used to estimate crop nitrogen demand. This is based on 23kgs/t for feed wheat and 25kgs/t for milling wheat. Again, look at the two best yielding years in the last five or ten for a good idea of the potential of your farm.

Growing for your market

There has been a big increase in group 1 and 2 wheat varieties and it's important to make sure you account for this when planning your nitrogen programmes. To achieve 13% protein will need increased nitrogen rates, especially with new high yielding varieties, as well as changes to the number and timing of applications. Fundamentally, milling varieties will optimise for yield around 12% protein, so you need to supply nitrogen in excess of this to achieve the required 13% level. Reviewing previous performance as described above can be even more important for milling varieties.



Increased nitrogen rates improve protein yield

Check soil N levels

After you've worked out the potential crop nitrogen demand, the next step is to calculate the amount of nitrogen that will be supplied by the soil. This can be done using the look up tables in the fertiliser manual. For more accuracy, soil mineral nitrogen samples can be taken, but this is really only worthwhile if you have intensive grass leys, vegetables or pulses in the rotation and/or are using regular high rates of organic manures, as this will lead to higher and more variable levels of soil nitrogen supply.

The fertiliser nitrogen requirement is the balance after the soil nitrogen supply has been deducted from the crop nitrogen demand and the crop available nitrogen from any manure applications have been accounted for.



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Are you compliant?

It's vital to check compliance with the Nmax limits set out in the NVZ regulations if your farm is within the vulnerable zones; you can [find out here](#) if it is. During discussions about high nitrogen application rates, growers often ask us about Nmax, especially for milling wheat. Often there isn't a full appreciation of the adjustments that can be made for previous high yields and that the limit is based on an average across all fields growing that crop, not individual fields.

In England, the base level for feed wheat is 220kgs/ha for 8t/ha but for 10t/ha this rises to 260kgs/ha and for 12t/ha it's 300kgs/ha. On top of this another 40kgs/ha can be added to milling varieties. In Scotland, the base level varies from 0 to 220kgs/ha based on the nitrogen residue group, but there is still scope to adjust for yield based on the average of your last three years and for milling varieties.

Having worked out your optimum and compliant nitrogen rate, the challenge is to ensure the crop gets the most out of the nitrogen applied. It's vital to monitor the crop and weather throughout the season so that nitrogen applications can be adjusted accordingly.



Improve performance with precision

Applying the nitrogen variably can make a great deal of difference to crop performance, using product where it's needed most while avoiding waste in other areas. Extensive trials of SOYL's

variable rate nitrogen service, SOYLSense, over the last 9 years have shown consistent yield benefits in excess of 3% and proteins improved by 0.4%.

These variable rate applications are calculated by using satellite imagery, which measures crop canopy variation during the growing season, to produce an application map. Satellite imagery can play a major role in prioritising fields for application, as well as when and where to increase or decrease application rates. A whole farm Leaf Area Index (LAI) map shows the fields that are ahead and those that are backward, which is vital to consider before applications.



"After working out an optimum and compliant nitrogen rate, the challenge is to ensure the crop gets the most out of the nitrogen applied."

Edward Downing

National crop nutrition technical manager

Each part of the field then needs to be considered. A typical UK arable field will have a variation in N requirement of around 40 kg/ha. This means if your main dose is 80 kg/ha, parts of the field could need 50-60 kg/ha while other parts may need up to 110 kg/ha.

Satellite imagery can be used for every nitrogen application or just the main dose. The table below shows the optimum programme for wheat.

SOYLSense variable rate nitrogen – recommended approach for optimum yield and protein		
First dose	Use field average model to even out tillering.	More on behind field average areas, less on ahead of field average areas.
Second dose	Use canopy model to even out canopy growth based on target leaf area index for that growth stage.	More on behind growth stage target areas, less on ahead of growth stage target areas.
Third dose	Use field average reverse model to push areas of high yield potential and maintain protein levels.	Less on behind field average areas, more on ahead of field average areas.

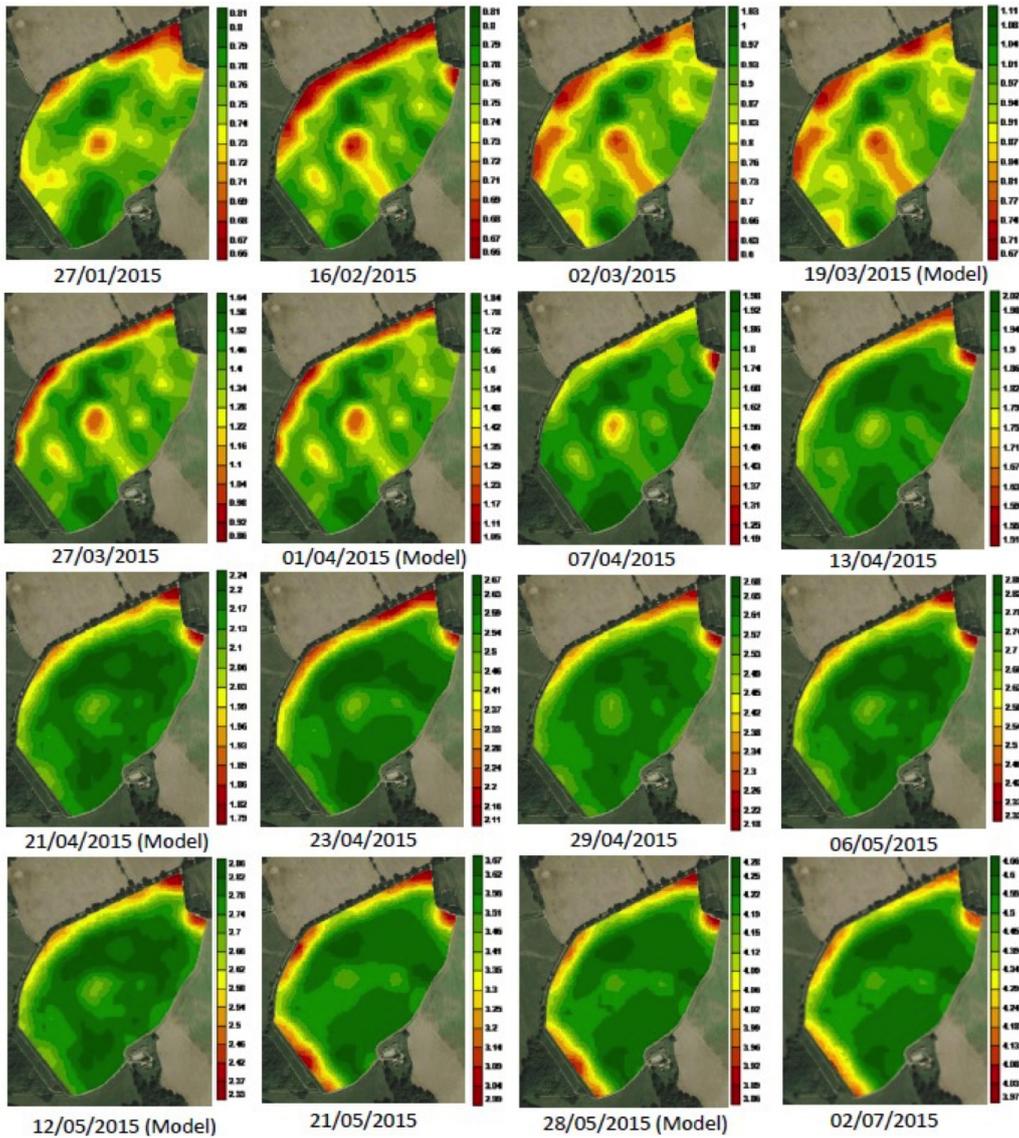
The future of variable rate nitrogen

Increasing availability of satellite imagery has been key in enabling growers to improve yields. When SOYL first used satellite imagery in 2004, each farm would receive approximately three images; in 2015, even those in very remote areas were able to obtain ten images, with most growers receiving an average of 12 images and as many as 17 for some. The technology will continue to improve in the future as a number of new satellite constellations come online, providing additional imagery and even more detail to inform nitrogen applications and boost yields.

Crops can't perform on nitrogen alone

It must be understood that to maximise crop performance and nitrogen use, crops need to take up optimum levels of all nutrients. With the drastic reduction in atmospheric sulphur deposition, we are now reliant on sulphur fertilisers to supply the significant crop demand to achieve optimum yield and grain quality. For crops to reach their full potential, they need to take up tens and even hundreds of kilos of phosphate, potash and magnesium per hectare. Make sure you know the exact levels of these nutrients in every one of your fields. This will enable you to target the appropriate fertiliser application to complement the soil supply and achieve the best possible crop.

The images below show a field in Berkshire. In 2015, 11 satellite images were acquired and a further five images were modelled using weather and ground measurements to predict crop growth. The LAI figures on the right of each image show the different growth stages of the crop in each area of the field. Those areas shown to be on target would receive the planned dose, while areas behind the appropriate growth stage would receive an increased dose to encourage growth, producing a more even crop and boosting yields. The improvement in consistency across the field can clearly be seen when comparing images in the top row to those in the bottom.



“Variable rate nitrogen can make a great deal of difference to crop performance, applying product where it’s needed most.”

Simon Parrington
SOYL commercial director





Selecting spring varieties

As the spring drilling window approaches, Frontier's northern seed manager David Waite and barley trader Westly Garner explore the best options for a range of grower requirements.

Spring barley

Barley is the most popular spring crop. The market divides neatly into four main markets: beer brewing (domestic and export), malt whisky distilling, grain distilling and animal feed (domestic and export). The volumes required for brewing have declined in recent years while those for distilling have increased; a proportion of the distilling malt required in Scotland is currently produced in England. The deciding factors in choosing the right market are primarily nitrogen content, protein level, variety and geography.



Barley is the most popular spring crop

For harvest 2016, East Anglia will remain a deficit area of malting barley and continue to command a premium over the export market for brewing varieties. It's therefore vital that customers grow the correct varieties to keep access to these premium markets open. In the North of England and Scotland, barley should be grown for the distilling market if <1.65% N can be consistently achieved. If this is not realistic, the brewing market should be seriously considered for both domestic and export opportunities, or if geographically suitable, consider high Diastatic Power (DP) for 1.75-1.95% N. Southern and western areas are dominated by export markets and **Propino**, **KWS Irina** and **RGT Planet** will dominate. Taking expert advice to find the best market available is essential.



"Nitrogen content, variety and geography are key to choosing the right barley market. Take expert advice to find the most suitable for your crop."

Westly Garner
Barley trader

Grain distilling is still dominated by the use of wheat, though some maize has been used this season. Both types of grain require around 10% malted barley to be added to the process to assist fermentation. A naturally occurring enzyme, diastase, is present in certain varieties at higher levels and this can be further increased by raising the grain nitrogen content. This sector is currently dominated by **Belgravia** and the specification required is 1.75-1.95% nitrogen. **Olympus** is currently under evaluation for this market.

Feed barley for domestic or export consumption completes the picture and a specification of 15% moisture, specific weight of 63 kilos per hectolitre and admixture levels below 2% is required. High output varieties with good quality straw are ideal for this. **Waggon** currently dominates but **Scholar** will also perform well. In reality, any barley variety is suitable and agronomic considerations will generally dictate what is grown.

Propino

- Again set to be the most popular variety
- Widely accepted by English maltsters as well as being an export variety
- Used for brewing and accepted at a wide range of nitrogen levels
- First choice spring malting variety unless low N can be consistently achieved.

Concerto and Odyssey

- Fully approved for brewing and distilling, though high N brewing demand is limited
- No export demand
- Should only be chosen if low N can be consistently achieved (<1.65N); if so, distilling premiums should be higher than those for low N brewing varieties
- Speciality wheat futures related contract available for Diageo in Norfolk/Suffolk
- Demand for distilling varieties is and will likely remain sensitive to whisky demand
- Growing without a contract can be high risk but potentially high reward
- High yields and low N in recent seasons have resulted in smaller premiums for grain not grown on contract and low demand for higher N samples.

Tipple

- Continues to be in demand on the export market for 2016
- Opportunities into East Anglian maltsters will be non-existent
- No reason to recommend for next year.

RGT Planet

- Promising early reports
- Likely to be a mainstream variety for 2017 and expected to be Propino's successor in time
- Caution urged for next harvest, however, as demand and seed availability will be limited
- Trading on the export market but domestic demand is thin.

KWS Irina

- Acceptance by East Anglian maltsters for 2016 remains unconfirmed
- Premiums may be limited and likely to trade at a discount to Propino
- Many domestic maltsters likely to pass over Irina to wait for more promising Planet.

Quench

- Should be treated as a feed variety only
- No domestic demand and has lost its position as an export variety.

Sanette

- Not popular with UK or EU maltsters
- Should be considered a feed variety only; look at Propino as an alternative.

Belgravia and potentially Olympus are destined for the high DP market where 1.75-1.95%N is required.

Spring wheat

The spring wheat market is much smaller than that for spring barley. Mulika dominates with an excellent complement of grain quality, agronomic characteristics and end market acceptance. Spring wheat generally achieves a higher protein level than winter sown wheat and **Mulika** is now preferred by most flour millers and bakers.

Bred in the UK by John Blackman, **Belepi** was introduced in 2015 and can be sown from October to April. Harvest '15 yields were high and with great tillering capacity and early maturity too, Belepi is a superb variety for smothering black-grass. It's already flourishing in the UK and France.

Spring oats

Oats offer a useful break crop alternative and are always in demand by millers since oats and oat based food products are seen as healthy alternatives. **Firth** dominated for nearly ten years, but **Canyon's** increased yields, good mildew resistance and early maturity has moved outputs forward in recent seasons. **Aspen** was added to the AHDB Recommended List this year and again moves the yield potential forward.

Spring pulses

Pea and bean seed demand has risen significantly after CAP reform changes stated that a percentage of cropped land must be allocated to greening crops.

Spring beans can be exported to North Africa for human consumption, or sold to animal feed compounders in the UK. Increased demand for fish food production is providing healthy support for this crop and many growers now favour beans as their primary spring break crop. **Vertigo**, **Fanfare**, **Fury** and **Fuego** are all acceptable for both markets. Vertigo and Fuego may be mixed in store, as can Fanfare and Fury, but size differences mean this is not appropriate for other combinations.



Bean seed demand has grown following changes to CAP reform

Spring peas split into three main market sectors. Marrowfat varieties are for human consumption processing which includes the chip shop market. Blue peas, which are actually green in colour, are micronised for the small animal and pet food sector and yellow, or really white peas, are used as a protein source for animal feed. **Prophet** is the market leader in England, with **Zero4** preferred for the north due to its standing ability and early maturity. Securing a contract is highly recommended before committing to peas.

Finally, spring oilseed rape and spring linseed make up a small specialist proportion of the spring area. Spring oilseed rape is generally grown when the winter crop has failed or when weather has prevented it from being sown the previous autumn.

Crop establishment is crucial to the success of growing any crop. Recent studies have shown that the addition of manganese and phosphite seed treatments is hugely beneficial to establishment and early spring growth. Best results have been achieved with a follow up foliar application of the same product. Frontier strongly recommends these products on spring seed where appropriate. For advice tailored to your individual circumstances, speak to your local Frontier contact.

"Following legislative changes and with ample domestic and export demand, many growers now favour beans as their primary spring break crop."

David Waite
Northern seed manager





Growing for greening and getting rid of grass weeds

Spring cropping is on the increase due to legislation changes and adoption of cultural control strategies as growers recognise the role that spring crops have to play within their rotation. Crop production specialist Dr Paul Fogg examines how spring crops can help to provide crop diversification under new CAP reform rules, as well as the management of difficult grass weeds and black-grass in particular.

Greening

Early in 2015, the familiar Single Payment Scheme was replaced by the Basic Payment Scheme (BPS). This includes new greening rules, which could put up to 30% of the BPS payment at risk if contravened. There are three key areas.

The first refers to permanent grassland and most growers won't need to do anything differently to meet this element. If permanent grassland in England falls by more than 5% compared to the area of agricultural land, farmers that have ploughed permanent grassland may have to reinstate it and restrictions on permanent grassland ploughing could be introduced. Ploughing of any permanent grassland covered by the Wild Birds and/or Habitats Directives (Natura 2000) is also prohibited.



Wet grassland

Crop diversification

The second element has been a topic of much discussion since its announcement: crop diversification, also referred to as the two or three crop rule. This states that unless qualifying for an exemption, farmers with 10 or more hectares of arable land must grow a minimum number of crops across a specified area:

1. Less than 10ha of arable land: No requirements
2. 10 – 30ha of arable land: At least two different crops on the arable land, with the largest crop covering no more than 75% of the arable area
3. Over 30ha of arable land: At least three different crops on the arable land, with the largest crop not covering more than 75% and the two largest crops together not covering more than 95% of the arable area.

Spring cropping has become especially advantageous due to the definition of 'different crops' in this context. For the purposes of crop diversification, spring and winter varieties count as separate crops. Spring and winter crops are defined by their classification on the National List ([Plant Varieties and Seeds Gazette](#)) published by the Food and Environment Research Agency (FERA). Within the National List, winter varieties are called forma hibernalis, with spring varieties recognised as forma aestiva. Any varieties not classified as either are counted as a spring crop. AHDB uses this information to define whether a crop is a winter or spring variety.

Ecological Focus Areas

Ecological Focus Areas (EFAs) are the third key area under greening. As features that the EU considers beneficial for the climate and environment, these must be incorporated on at least 5% of the total arable area of farms with over 15 hectares of arable land, unless an exemption applies. A range of options is available, including buffer strips, hedges, fallow, catch and cover crops as well as some designated nitrogen fixing crops. The timescales for these crops to be in situ mean that, with careful planning, a profitable spring crop can be grown while also meeting EFA criteria; the regulations around cover crops, for example, state that they can be destroyed after 15th January, which would then allow spring drilling. Expert advice should be sought, however, to ensure that the crops will meet requirements, suit farm needs and most importantly, establish successfully. For more detail, read [DEFRA's EFA crop guidance](#) or speak to your local Frontier or Kings contact.



80% of black-grass tends to germinate in the autumn

Spring vs autumn sowing

As well as meeting legislative requirements, including spring crops in the rotation has a whole host of benefits over autumn sown crops, particularly in the management of grass weeds.

Black-grass can emerge all year round, particularly if soil is disturbed, but 80% tends to germinate in the autumn, meaning it can be addressed before sowing in spring. Managing high black-grass populations requires high expenditure on herbicide programmes, particularly in winter cereals, which is unsustainable and necessitates more integrated approaches, such as spring cropping. Spring crops also allow increased use of stale seedbeds over autumn and are less dependent on the weather to produce quality seedbeds and activate residual herbicides.

Frontier trials at Staunton showed that two sequential spring crops had a significant impact on a high black-grass population, while work carried out by Rothamsted states that spring cropping gave an average 88% (78 – 96%) control of black-grass.

Consideration should also be given to the cost per tonne of production and not always which crop gives the highest yield. Spring crops typically have lower variable costs, which often cancels out any yield deficit. As well as the financial aspects, it's important to take into account the physical benefits to the farm, which could include grass weed control and improved performance of future winter sown crops in the rotation.

Establishment

Spring barley is considered the most competitive, whereas spring linseed and sugar beet should be avoided in most circumstances as they are unable to compete with grass weeds. Spring wheat, oats, oilseed rape and beans all have a role to play too. Whichever spring crop you choose, giving it the best possible start is essential to its success. Heavy land should not preclude spring cropping and if targeting black-grass, this generally comes as a matter of course. Seedbeds should be overwintered and any rotational ploughing must be done in autumn. The aim should be a well drained seedbed that can be drilled with minimal soil disturbance in spring.

Establishing a cover crop in autumn has been shown to help with spring crop establishment, particularly on heavy soils. Several varieties are available and with careful selection appropriate to the needs of your land, they can make noticeable differences. Deep rooting species, for example, can help alleviate soil structure issues and once established, a cover crop can help mitigate surface run-off and nutrient leaching over winter, with the added benefit of nutrient retention for subsequent release in the following crop. The competitive nature of cover crops can also help with the management of weed species and prior to establishing the following crop, the incorporated biomass acts as a 'green manure', helping to increase soil organic matter. These factors could all give your spring crop a boost, though land that is not spring drilled could likely benefit from cover crops too. Take expert advice to find the right crop for your rotation.

Poor establishment is the biggest risk to spring cropping. Sowing spring barley too early into poor seedbeds, for example, can compromise establishment but this needs to be offset by the fact that spring barley compensates less if sown too late, so take care if using reduced seed rates. In a good seedbed, establishment is typically between 80% (early sown) and 95% (late sown) but in poor conditions this can fall to 55% and 70% respectively.

The rotational benefits of spring cropping may not be realised in just one season, particularly as in general the seed bank will be significant, but they have a significant role to play in the war on grass weeds, can help to meet regulations and are profitable too.

“As well as meeting legislative requirements, including spring crops in the rotation has a whole host of benefits.”

Dr Paul Fogg
Crop production specialist





Farming inevitably results in emissions into the surrounding environment. More accurately, emissions above certain pre-determined cut-off levels deemed as environmentally damaging are classified as diffuse pollution, as emissions can never be completely avoided. Regulators divide diffuse pollution into that which affects air, soil and water so that measures can be designed for managing it. Technical manager Reuben Morris takes a look at some of the key areas.

Nitrate Vulnerable Zones

In a national regulatory scheme employed by government to control diffuse pollution from agriculture, Nitrate Vulnerable Zones (NVZs) have been introduced to manage nitrate levels in water. Land that contributes to nitrate levels exceeding 50 mg/l in water is included in the NVZ area and management of N on that land must be in accordance with the scheme. While there has been some debate over the implementation of NVZs, they have proved manageable for regulators and growers and it could be argued that this approach has increased competence in N management across the industry. Government will undoubtedly see the NVZ scheme as a successful model for future schemes for managing other diffuse pollutants from agriculture.

Water Framework Directive

A great deal of regulatory and industry effort is currently going into improvements in water quality to comply with the Water Framework Directive. In affected areas, targeted measures are expected to reduce levels of some Plant Protection Products (PPPs), especially where drinking water is abstracted. Land managers will already be aware of the Environment Agency 'What's in Your Back Yard' online maps that show where metaldehyde and other PPPs are reducing water quality.

This work has been supported by industry development of stewardship programmes such as [Get Pelletwise](#) and the annual training of thousands of operators at [National Register of Sprayer Operators Roadshows](#).



The future

In September 2015, regulators published [Pesticide Risk Mapping and Catchment Interventions](#) to advise how they intend to target measures for keeping metaldehyde and mobile herbicides out of surface drinking waters in future. The risk maps for movement of these PPPs into surface waters take into account the risk factors: climate, soil, slope, connectivity to water bodies, drain status, landcover and pesticide properties and usage. The risk maps lead to a situation similar to NVZs, with rules applied to land identified as at risk aimed at reducing levels of metaldehyde and mobile herbicides in surface drinking waters.

How can we influence the chosen measures?

The straightforward answer is to follow the stewardship programmes promoted by the agricultural industry. For example, ferric phosphate (SluXX etc) is an effective alternative to metaldehyde for slug control and should be used in areas where metaldehyde is causing issues in drinking water. If the decision is made to continue using metaldehyde, the Metaldehyde Stewardship Group guideline of 210 g/ha metaldehyde from 1st August to 31st December should not be exceeded and this should be reduced to 160 g/ha where possible. Metaldehyde is a cheaper option, but the future cost of not switching to ferric phosphate where required could be more regulation.

“To help shape future regulations, it's important for growers to follow the stewardship programmes currently promoted by the industry.”

Reuben Morris
Technical manager

