

The Yield Enhancement Network 2015



Dr Bob Bulmer (Hutchinsons Trials and Research Manager) reports on the start of this year's YEN competition and factors affecting yield that are under scrutiny.

The Yield Enhancement Network (YEN) has been set up to foster and energize innovation in the arable industry; it aims to understand how high yields of winter wheat can be produced and to encourage novel approaches to crop improvement.

Together with other leading research organisations, Hutchinsons are sponsors of the YEN project and it is an initiative that is gaining momentum. Members of YEN compete to establish new yield records, and get closer to their land's potential. Once record yielding crops are identified, the aim is to work out how they were achieved.

Hutchinsons recently organised a very successful farmer meeting to share ideas on taking yields forward and encourage networking between farmer members. Members are not necessarily 'in it to win it', but rather participating to gather information that will help them to maximize yields in their own farming situation. There was a spirit of friendly rivalry between the farmers who attended the meeting, but everyone was very open in exchanging ideas and comparing approaches to yield improvement. The main points that were discussed in the meeting are reproduced in this article.

To help entrants picture how they can improve yields, a simple equation is used to estimate yield potential:

Yield = Resource x Capture x Conversion

The main resources available for the manipulation of crop growth are **light**, **water** and **nutrients**. Carbon dioxide is the other main resource that plants use for photosynthesis but at the moment it is difficult to influence.

Agro-chemicals largely protect growth although some products like fungicides and plant growth regulators have physiological effects which can increase yield.

Light and water availability are determined by the weather, farm location and the soil type. The capture of resources is under the control of farmers and advisors and we need to manage crop canopies to capture light energy and manipulate rooting systems to improve the capture of water and nutrients. Solar panels can be used to measure the incident solar radiation which, in the UK, is between 800 and 1100 kWh/m²/year or in crop units 30 to 40TJ/ha/year. Contrast this with around 50TJ/ha/year in New Zealand which holds the record for winter wheat of 15.7t/ha. Conversion is more difficult to influence by farmers and advisors and we will have to look to the plant breeders for genetic improvements in this area.

Capturing solar radiation

The YEN target is to create and maintain a green canopy that intercepts 60% of the annual incident solar radiation. Canopy sizes necessary to achieve this are shown below for autumn sown crops compared to normal canopies (HGCA Growth Guide for winter wheat yielding 11t/ha).

	APRIL	MAY	JUNE	JULY	AUGUST
Normal Green Area Index (GAI)	2.0	6.0	6.3	3.0	0.1
GAI for Potential Crops	2.5	6.0	7.0	4.0	1.3
Potential light interception	68%	94%	96%	84%	45%

It is estimated that the best farm crops currently intercept 50% of the available solar energy. The YEN targets are for earlier spring canopy expansion and delayed canopy senescence of ten days so that there is greater light interception in August and during the early part of the season.

Water

In the absence of irrigation, crop available water is calculated from what the soil can hold in the spring, plus summer rainfall. In total this ranges from less than 300mm on droughty soils in low rainfall areas to over 700mm on water retentive soils in high rainfall areas. Crops with low levels of available water will be water limited and good early establishment is important. Crops with high levels of available water will be light limited and maintaining a green canopy for as long as possible will increase yields.

In water limited crops it is important that the crop is able to exploit the available water in the soil to a depth of one metre. At a recent YEN meeting research work was presented showing that current crops often have poor rooting systems at depth. The reasons for this are unclear - possibly varietal or caused by poor soil structure below 30cm. Hutchinsons are keen to investigate this; some deep soil pits are required in this instance.

>>> Nutrients

Good crop nutrition is very important for early canopy development and for maintaining the leaf canopy in August. Sulphur is a very important major element that should be applied to crops to ensure that nitrogen and other nutrients are being used effectively. The results conducted by the British Survey of Fertiliser practice indicate that only 50% of winter wheat crops received sulphur in 2013. Similarly too many crops receive inadequate amounts of phosphate and potash.

There is also interest in the Potash demand in winter wheat. There is the potential for a temporary deficit in potash supply during the May period when uptake of this nutrient peaks. Hutchinsons will be investigating this and other aspects of nutrition at our Regional Technology Centres around the country.

Nitrogen is a very difficult nutrient to get right, wheat crops must acquire 23 to

25kg N per tonne of grain to avoid nitrogen limitation. Theoretically with most crops only achieving 60% nitrogen recovery, crops yielding 15t/ha or more require 400kg/ha. This is not supported by field trials last year where the optimum nitrogen rate applied was around 220kg N/ha. The best advice is to use the HGCA's Management guidelines for Wheat to calculate nitrogen requirement and to consider applying a proportion of the nitrogen at flag leaf to delay canopy senescence. Grain protein levels can be used as a cross check to calculate whether the nitrogen rate was too high or too low - this is especially useful if data is available from a range of situations and years.

Other influences

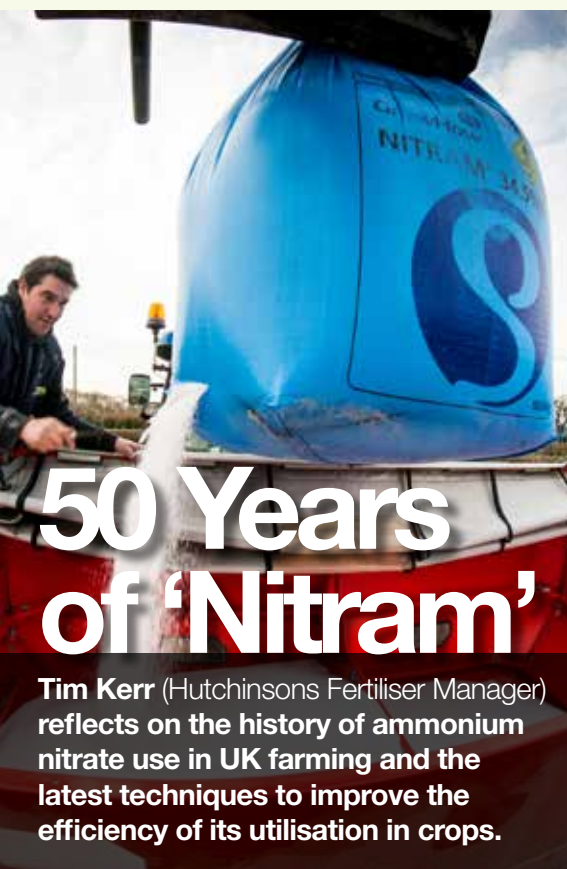
There is increasing interest in the use of strobilurin fungicides, either early at T0 to influence photosynthesis and canopy development or later at ear emergence to delay senescence.

SDHI fungicides also have important physiological effects and they offer exceptional levels of disease control.

Plant growth regulators are known to increase rooting and to reduce the dominance of the main tiller leading to yield improvements. Plant growth regulators are very important in high yield potential crops to reduce the risk of lodging.

Hutchinsons will be following some of the growers throughout the season as they implement different strategies to maximise wheat yield in their competition entries. Please check our website for further news and video updates.

The YEN competition this year is still open for applications - if you are interested in taking part, please contact Dr Bob Bulmer by emailing: information@hlhlt.co.uk



50 Years of 'Nitram'

Tim Kerr (Hutchinsons Fertiliser Manager) reflects on the history of ammonium nitrate use in UK farming and the latest techniques to improve the efficiency of its utilisation in crops.

Back in 1965, in Britain, the average house price was £3,300, the average annual wage £960 and the price of a pint of beer just 8p. Feed wheat was trading in the mid £20s and the average wheat yield was around 4 tonnes per ha - half today's figure.

1965 also saw the launch of a new concentrated nitrogen fertiliser... 'ICI Nitram'. The launch price was £32 and 5 shillings per tonne (and government subsidies helped to pay for one third of this cost!).

Since then the blue bag has become ubiquitous in UK agriculture and 50 years on Nitram remains the leading domestic brand for ammonium nitrate. A symbol for quality and reliability and increasingly rarely - British manufactured fertiliser.

Much has changed in agriculture since 1965, yet ammonium nitrate remains the popular choice for the UK farmer. Not in 50 kg bags or 'Dumpy bags' anymore, but still produced using the same basic manufacturing process developed half a century ago; albeit in modern day, more efficient and environmentally clean production facilities.

It would be easy to speculate that scientific development should have seen ammonium nitrate consigned to the history books, but the fact remains there is no better proven source of nitrogen fertiliser for our temperate climate.

The combination of readily available nitrate and slower releasing ammonium help to provide crops with a consistent supply of nitrogen without the risk of ammonia volatilisation associated with urea.

Can we improve on the efficiency of ammonium nitrate?

One way we can potentially improve the utilisation of this resource is through the use of nitrification inhibitors.

Slowing down the soil-borne processes that help to convert ammonium N to nitrate N can reduce the risk of nitrate leaching and also provide a phased release of nitrogen over a longer period.

This can afford the opportunity to reduce the number of separate nitrogen applications necessary - providing savings on fuel and man-hours. What it can also do is elongate the period of nutrient availability - something that can be extremely valuable in certain cropping situations.

One particular scenario where this can pay dividends is in maize.

A maize plant will take up half of the nitrogen it utilises from July through to September. The nature of a maize crop means it is not normally possible to safely apply nitrogen fertiliser through this period without risking physical damage

to the crop. Therefore, if it is possible to extend the availability of nitrogen applied earlier in the season, as a consequence it can significantly improve the yield potential.

In recent times most maize in the UK has been produced to form part of a livestock diet, but with increasing numbers of AD plants, or 'concrete cows', being commissioned, there are many new maize growers in the UK keen to learn how to get the best out of this crop.

Nitrification inhibitors

Trials with 'NLock' - a nitrification inhibitor from Dow AgroSciences - showed a 13% positive yield response on maize in 2014. Inhibitors such as NLock will not only help to improve the efficiency of applied fertilisers but also, and very importantly, help to improve the nitrogen use efficiency of organic matter applied. This would help to reduce the risk of Nitrogen losses from the cycle of producing feedstock for the digester and recycling the digestate on the ground used to grow subsequent crops for the AD plant.

In the United States where maize is the major cereal crop and is referred to as 'corn', this approach of using nitrification inhibitors has become well established. It was fascinating to hear recently from a US based agronomist grappling with the issue of yield plateaus... in corn.

There were many similarities with our own YEN competition to overcome a lack of progress in improving average corn yields. As a result of this research work, adopting the use of nitrification inhibitors has been one significant change to growing corn.

This is potentially a valuable lesson for us to learn from the Stateside farming community - that the use of products such as NLock can make a real difference.

It could well be the proverbial icing on top of a 50th birthday cake?

Early Disease Control in Winter Cereal & Oilseed Rape Crops

In this article Dr David Ellerton (Hutchinsons Technical Development Director) considers the importance of early disease control in winter cereals and oilseed rape following a relatively mild and damp start to the season.

Weather conditions in autumn and winter 2014/15 have been fairly mild and damp compared to the 30 year mean and this, combined with relatively early drilling and establishment last autumn, has had significant consequences as far as crop growth and disease levels are concerned.

Winter Wheat

Most crops are exhibiting relatively high levels of *Septoria tritici* on established leaves at present and there have also been reports of yellow rust and mildew on a range of varieties across the country. Stem base and root diseases such as eyespot, *Fusarium* and take-all are also present in many crops.

Early diseases significantly limit growth and yield potential and priority should be given to keeping disease in check during the spring. April marks a key stage in managing disease control in cereals with Growth Stage (GS) 32 heralding the appearance of final leaf 3 which is usually the trigger for the crucial T1 fungicide timing.

The T1 wheat fungicide inputs should be based on a strong triazole (e.g. epoxiconazole or prothioconazole), especially where varieties are particularly susceptible to *Septoria*. The inclusion of tebuconazole will improve curative control of rusts, as will the use of a strobilurin. In addition, strobilurins such as azoxystrobin, fluoxastrobin or pyraclostrobin can affect plant physiology increasing nitrogen utilisation and promoting rooting while the first two also help plants overcome take-all.

Where foliar disease pressure is high in the spring canopy (carried on the overwintered leaves), choosing one of the new SDHI products such as fluxapyroxad or penthiopyrad can improve curative control of *Septoria* while products based on isopyrazam can prolong persistence of protection, particularly important should the flag leaf spray be delayed. In second-wheat crops

the established SDHI boscalid will give good control of both strains of eyespot, although the newer SDHI penthiopyrad has also shown strong activity in addition to an increase in rooting.

SDHIs should always be used in conjunction with a triazole to extend the range of diseases controlled and give protection against the development of resistance. In order to avoid the need for strong eradicator control of *Septoria* later in the season, growers will need to ensure that the disease is prevented from spreading within the crop by adopting a robust protectant approach from early on in the spring.

For winter wheat, the inclusion of the multi-site active ingredient chlorothalonil, ideally at both the T0 (mid to late tillering) and T1 (GS 30-32) timing, will pay considerable dividends over relying on curative control of *Septoria*, once it is established within the crop.

In order to avoid foliar diseases infecting newly emerged leaves, it is vital that the gap between any T0 and T1 sprays should not exceed 3 to 4 weeks. Where the gap is likely to be longer, consideration should be given to an additional T1.5 spray based around chlorothalonil or another multi-site active ingredient, once leaf 2 has emerged around GS 35-37, in order to increase persistence of control.

Winter Barley

In winter barley, the T1 fungicide timing during stem extension and early node formation (GS 30-31) has been shown to be crucial in optimising yield potential by maintaining tiller survival.

As with wheat, disease levels in many barley crops are high this season and trials have shown that SDHI based products are particularly effective against the key diseases of *Rhynchosporium* and net blotch and in most cases programmes should be based around this new chemistry.



Where *Rhynchosporium* is the main disease present prothioconazole should be included wherever possible.

Winter Oilseed Rape

For oilseed rape, the green-yellow bud growth stage marks the start of the *Sclerotinia* control programme, as well as the second part of canopy manipulation. Tebuconazole, metconazole or cyproconazole will impact on both aspects, while prothioconazole or boscalid adds to *Sclerotinia* control. The inclusion of azoxystrobin will increase *Sclerotinia* control further, as well as increase crop greening and oil content.

This season marks the launch of a new fungicide based around boscalid and dimoxystrobin which trials have shown to be particularly strong against *Sclerotinia*.

Where crops are particularly thick, consideration should be given to the newly introduced growth regulator for oilseed rape containing metconazole and mepiquat chloride. The product influences the structure of the canopy to allow more light penetration to the pods as well as reducing the risk of lodging and may be applied any time from the start of stem extension up to and including yellow bud stage.

Where pollen beetles are present at threshold levels at the green bud stage, a pyrethroid insecticide may be included, although if resistance is suspected then alternative, effective products to switch to include indoxacarb, thiacloprid or pymetrozine. It is important to avoid spraying crops when bees are foraging, or once the crop starts to flower.

In conclusion, with no new groups of fungicides likely to appear on the market in the foreseeable future, care will be needed to use our current chemistry wisely and avoid further build up in disease resistance for UK cereal crops.

As with last season, disease control is likely to play a crucial part this spring in protecting gross margins in both winter cereals and oilseed rape. By utilising information from last season's trials, your Hutchinsons agronomist will be able to provide expert guidance on suitable fungicide programmes to adopt over the next few months in your crops.

HUTCHINSONS

Regional Technology Centres Summer Demonstration Events

This summer Hutchinsons will again be hosting a series of open days for growers to view our demonstration sites around the country. On show will be new and established varieties of cereals and winter oilseed rape, along with a demonstration of techniques to improve establishment, yield and quality.

In addition to the existing regional sites, one new technology centre is available at Morton-on-Swale, in North Yorkshire, focusing on winter oilseed rape and winter wheat. The other sites will also concentrate on the areas of winter wheat and winter oilseed rape production. At our St. Mabyn site in Cornwall, winter and spring barley varieties along with winter wheat will be demonstrated. The Badwell Ash site will also feature hybrid barley production and growing techniques for spring beans and peas.

The central themes for the sites this year are yield improvement and precision farming. A wide range of new and recognised varieties of winter wheat and winter oilseed rape will be on display. Alongside varieties, the oilseed rape demonstration will include crop nutrition and fungicide management. In the winter wheat variety plots you can also find out about crop nutrition, fungicides and breaking through the winter wheat yield plateau.

National and Regional advisors will be available to discuss a wide range of agronomic topics.

[Continue overleaf >>>](#)

For tours 3rd - 4th June 2015

National Black Grass Centre of Excellence

HUTCHINSONS



Name(s): _____ County: _____

Trading Name: _____ Postcode: _____

Address: _____ Mobile: _____

E-mail: _____

Please complete your contact details and then nominate the day and time you wish to visit below:-

Wed. 3rd June

.....places for tour

10am	12noon	2pm	4pm
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Thurs. 4th June

.....places for tour

10am	12noon	2pm	4pm
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Memory Jogger

The site is located on the west side of the A1 at Brampton, just south of the intersection of the A14 with the A1 (see map overleaf).

I have booked to visit the site on:-

Wednesday 3rd June

10am	12noon	2pm	4pm
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Thursday 4th June

10am	12noon	2pm	4pm
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Where to find us:

National Black grass Centre of Excellence

Brampton, Huntingdon, PE28 0DB



Business Reply Plus
Licence Number
RTGZ-YKZK-LUTA

2

Carla Baker
(Responses Co-ordinator)
H L Hutchinson Ltd
Weasenham Lane
WISBECH
Cams
PE13 2RN

HUTCHINSONS

> Unique Precision Farming Services

At all of the sites we will be demonstrating our unique Omnia precision agronomy services, which utilise multiple layers of field information to split fields and create smaller management 'zones'. This technique significantly enhances the agronomic benefits from the variable application of a wide range of inputs, leading to increased yields and reduced costs, whilst meeting environmental objectives.

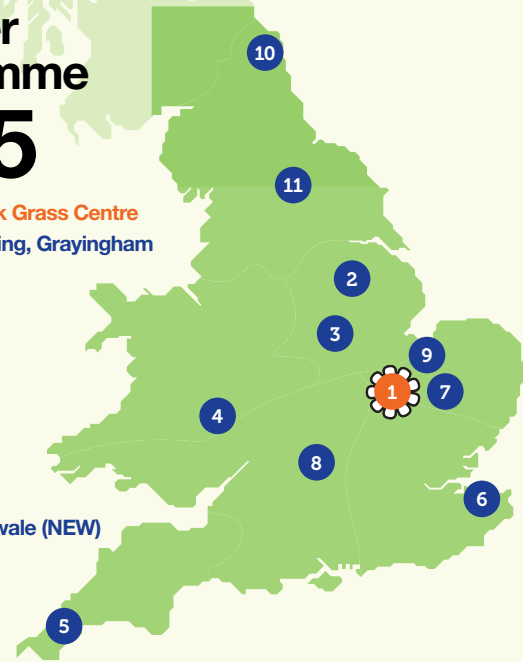
Our summer demonstration programme extends from the beginning of June to early July (see table of dates below and map locations).

Please look out for an invitation to your local event, which we will be sending out during May.

For a preview of the National Black Grass Centre of Excellence event in June, please see the back page.

Summer Programme 2015

1. National Black Grass Centre
2. Warden Farming, Grayingham
3. Little Ponton
4. Ludlow
5. St Mabyn
6. Adisham
7. Badwell Ash
8. Great Tew
9. Stow Bridge
10. Alnwick
11. Morton-on-Swale (NEW)



Summer Open Day Demonstration Dates - 2015

LOCATION	DATE	TOUR TIMES
National Black Grass Centre	Weds/Thurs 3rd /4th June	10am to 4pm
Great Tew, Oxfordshire	Tues 16th June	10.00am to 1.00pm
Truro, Cornwall	Wednesday 17th June	3pm – 7pm
Canterbury, Kent	Wednesday 17th June	10.00am to 1.00pm
Ludlow, Shropshire	Tuesday 23rd June	3pm – 6pm
Badwell Ash, Suffolk	Thursday 25th June	10.00am to 1.00pm
Stow Bridge, Norfolk	Friday 26th June	12 noon to 3.00pm
Little Ponton, Lincolnshire	Tuesday 30th June	10.00am to last tour 2.00pm
Warden Farming, Grayingham, Lincolnshire	Wednesday 1st July	5.30pm to 8.30pm
Morton-on-Swale, Northallerton	Wednesday 1st July	10.00am to 1.00pm
Alnwick	Thursday 2nd July	12.00 noon to 4.00pm

National Black Grass Centre of Excellence

- your invitation to visit 3rd & 4th June

Dick Neale (Hutchinsons Technical Manager) gives a preview of this year's black grass trial work at Brampton and explains how results from the research work to date are integrating into the commercial farming operation.



It is time again to warmly invite you all to visit us at our black grass research site at Brampton. This year the site continues the story of the holistic approach to grass weed control, and after the previous four years of control technique development, this season sees us address some of the issues encountered when drilling into late October and early November.

Because the Brampton site has developed predominantly around the commercial application of the researched techniques, we are able to identify real life issues and adapt our management to reduce the impact as far as possible.

- Wet headlands are the dominant issue in preventing delayed drilling on clay based soils.
- Alternative cultivation strategies and cover cropping are discussed.
- Volume & Fletcher hybrid winter barleys can be a key tool in competing with black grass, winter barley varieties are compared and herbicide inputs investigated.
- Spring Barley is the dominant spring crop for competing with black grass. Herbicide inputs are investigated along with agronomic input on the heavier, moisture retentive soils at Brampton to optimise the output from this crop.
- Drainage has become a very real issue since autumn 2012 with older systems and their support structure found to be wanting across the UK.
- Drainage contractor and Nuffield 2012 scholar Rob Burtonshaw will be on hand to discuss all issues drainage related.

The trials at Brampton still focus on integrating the latest research from all areas into the commercial farming operation. This allows us to identify the consequences of one operation upon other operations planned for later in the year, or the infield impact across the rotation.

Small plot trials alone do not allow for these issues to develop, as field operations are not fully mirrored under small plot conditions.

Delayed drilling is a key tool in suppressing black grass populations but all growers recognise that accessing heavier soils for later sowing is often very difficult. Our work at Brampton has identified that headland stability is the primary failing with modern cultivation techniques, the field can be drilled in the centre but turning the drill on headlands is what stops the overall operation from continuing. Understanding this allows us to focus in on the real issues rather than just accept that delayed drilling is the problem in itself.

During the past five years we have trialled, tested and developed cultivation tools and establishment techniques that optimise both black grass cultural control and herbicide impact. We are continuing to develop this area with popular machinery already on farm and hope to have developments to show in June.

Varieties, seeding rates, sowing dates and herbicide interactions have all been investigated during the past five years; each year sees us move on to the next commercial stage utilising the optimum approach indicated by this work, however we do not repeat this work continually at Brampton.

To get the full picture why not make it a full day of black grass on the 3rd of June.

NIAB's black grass site at Hardwick, Cambridgeshire is open on 3rd June from 9.30am-12 noon and remains focussed on the small plot trial aspects of black grass control. Variety interactions, seed rates and sowing dates are all explored and it is an ideal grounding before spending the afternoon at the Hutchinson's black grass site at Brampton, to see the commercial application across our 100 ha site.

Early booking is advised as group size is managed to optimise the visitor experience at both sites.

To book your place at Hutchinsons' Brampton open days, please either return the tear-off reply card from this newsletter, or simply book online via the 'forthcoming events' section on our website: www.hlhltd.co.uk

For more information on any of our products or services please contact your local Hutchinsons agronomist or contact us at:

HUTCHINSONS

H L Hutchinson Limited • Weasenham Lane
Wisbech • Cambridgeshire PE13 2RN

Tel: 01945 461177

Fax: 01945 474837
Email: information@hlhltd.co.uk

www.hlhltd.co.uk