



Guide for SRUC Cereals Open Day

Cauldshiel Farm, East Lothian

28th June 2018

*Courtesy of Keith and Scott Maxwell, Cauldshiel Farm
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Introduction

Welcome to our trials open event at Cauldshiel for 2018, courtesy of our host farmers Keith and Scott Maxwell. Tonight we will be showing our winter wheat and spring barley trials as well as demonstration of cover crops that can meet EFA greening requirements and SRDP agri-environment climate scheme options.

Scottish agriculture is in a period of uncertainty with Brexit and it is important farmers secure local markets by providing the necessary quality of grain to our home based cereal markets. Distillers purchases approx 850,000 tonnes of grain per year. Meeting the distillers requirements is vital to safeguard Scottish soft wheat production going forward.

This event will highlight the potential for increased production and use of Scottish grain in Scotch whisky based on market research produced under the Scottish Government RESAS research programme.

Crops have had to deal with a myriad of environmental conditions this season, with a difficult sowing period at the back end of 2017 followed by rain, snow and a prolonged dry spell in the spring, but despite these pressures, the winter crops have shown themselves to be pretty resilient, which is a testimony to the robustness of the varieties that we grow up here in Scotland. However, the spring barley and oats do look stressed and short due to the late sowing and dry weather this spring.

Disease levels in winter wheat were relatively low over the winter months, the cold temperatures keeping disease activity down, although mildew was noticeable on some crops. The snow and the subsequent melt delayed the sowing of spring barley in many areas, however these late crops then took advantage of the warmer weather in May so crops are not really as far behind and was feared likely at the time of sowing.

There have been further examples in monitoring work last season of new septoria mutants in wheat with reduced sensitivity to the SDHI fungicides, and we picked up examples of mutants at all the SRUC trial sites including Cauldshiel, so this is not a problem confined to the south of the UK or to Europe. Trial data also shows that where we applied one SDHI the frequency of mutant isolates increases and confirms that mixtures really do help with that, although even in a mix, two applications of an SDHI still resulted in more mutations.

We are discussing and showing integrated methods of growing crops and managing disease at this open event. Tonight we will discuss the latest issues with septoria and ramularia resistance. Latest SRUC research shows that ramularia has shifted significantly in its sensitivity on the last two seasons.

Using more resistant varieties and tailoring treatments to the actual risk in the crop we can reduce our reliance on fungicides. Integrated Pest Management (IPM) offers potential win:wins in terms of business efficiency and sustainability and is not something that is alien to current grower practices. The use of resistant varieties with improved resistance ratings is already common practice as is walking fields and monitoring crops so that inputs can be tailored to actual risks. For more ideas about

IPM then look around the site this evening and then consider filling out a Scottish IPM plan to assess what the specific risks are on your farm, what you do already and to get ideas on other measures you can take. The plan comprises 30 simple questions (and that includes things like your name and email), takes just a few minutes to complete and your plan will be emailed back to you. The data is of course anonymised so your identity is protected.

Key Principles to consider today

- Look at the best varietal recommendations for Scottish markets
- Hear about and see the varieties favoured by the distillers
- Look at the impact of variety and tailored pesticide programmes on disease pressure at the site
- New alternatives to pesticides that might be developed
- IPM has to be tailored to your site – what have you adopted and what might you do in the future?
- We are losing tools – hear the latest on pesticides at risk and resistance management

Key Recommendations

- Make an IPM plan for your farm at <http://bit.ly/pestmanagementplan>
- Make use of multisite fungicides like chlorothalonil in fungicide mixtures to minimise the risk of fungicide resistance
- Identify your key pest, weed and disease risks
- Where possible select varieties that reduce these risks and are favoured by the distillers
- Plan agronomy to minimise the main risks
- Monitor crops and tailor pesticides to the in-season issues

Grain Market Drivers

Key Principles to consider today

- **World grain stocks to fall to lowest level in 6 years.** With world grain demand set to exceed production for the second year running world stocks are predicted to fall to 77 days of supply in 2018, down by 14 days in two years. This reduces the buffer if production is disrupted. Crop problems are being seen; mainly drought, in most major producers including; US, Canada, Australia, Russia and parts of the EU (including Scotland!). Russia became the world's largest wheat exporter in 2017 so further crop problems would quickly drive our wheat prices higher. A few weeks remain for weather to affect Northern Hemisphere crops especially maize. Oilseeds prices are falling on large expected; US and S American soya crops, EU rape crops are looking poorer than first thought.
- **The Scotch whisky sector needs a good crop of malting barley this year – and there aren't many alternatives to Scottish distilling barley.** Rising

whisky exports and falling spirit stocks indicate good demand for malting barley this harvest. In addition stocks of malting barley in Scotland are understood to be low going into harvest. This puts extra pressure on the 2018 harvest delivering the necessary quality and yield.

- While spring barley sowings are higher this year in Scotland, late sowing and a dry early growing season have left concerns over yield and quality. If the crop is poorer than average it is likely maltsters will widen acceptable specification for example on nitrogen levels to ensure as much of the local crop can be used as possible. The dominance of brewing varieties elsewhere in Europe and England, and the fact that Scandinavia has suffered the same dry spring as Scotland, limits options to import malting barley if the Scottish supply is tight.
- **Grain distilling sector vital to Scottish wheat prices, need to compete against maize.** In 2017/18 wheat prices in Scotland and the north of England have been at a strong premium to the English average (+£6/t). This has been due to strong ethanol demand in the north of England and strong distilling demand in Scotland. The Edinburgh North British distillery switched from maize to wheat in summer of 2017 adding around 12,000t of wheat demand per month to Scottish demand. However, a reported lack of consistency in spirit yield from Scottish wheat is likely to have been one factor prompting North British to return to using maize in spring 2018. To secure this vital local market, in future more emphasis needs placed on growing only the most suitable wheat varieties for distilling.

Key Recommendations

- **Crops in the ground this autumn will be marketed into a post Brexit market environment – good or bad.** You can now sell grain forward post-Brexit through to May 2020. Start limiting your exposure. Consider covering the cost of your inputs by selling 20-30% of your crops forward this autumn sowing time.
- **Focus on local markets that will need supplied irrespective of Brexit outcome**
 - Malting and distilling have one of the most robust outlooks of any sector – prioritise wheat and barley varieties that fully meet this sector's needs.
 - Speak to your local buyers; maltster, feed mill, livestock farmer and find out what they want and how you can supply it.

Site information

Winter Wheat RL Varieties – field details and agronomy						
GRID REF	NT476655		PREVIOUS CROPPING:	Winter Oil Seed Rape		
ELEVATION	165m		1 YEAR AGO	Winter Barley		
SOIL TEXTURE	Loam		2 YEARS AGO	Spring Barley		
SOIL SERIES	Humbie					
SOIL ANALYSIS:						
pH	6.2					
P	80.2 (VH)					
K	448 (VH)		PLOT SIZE	10m x 2m		
Mg	201 (H)					
S	49.0 (high)		SEED RATE	340/m ²		
Mn	*		DATE SOWN	30.09.17		
Cu	*					
Organic Matter	3.96%					
ROUTINE APPLICATIONS						
	N	P₂O₅	K₂O	S	DATE	GROWTH STAGE
FERTILISER (Kg/Ha)	0	70	70	0	10.10.17	GS09
	80	0	0	20	22.03.18	GS23
	120	0	0	0	26.04.18	GS30/31
	PRODUCT	RATE		DATE	GROWTH STAGE	
HERBICIDE:	Picona	2.5 L/ha		27.10.17	GS10	
FUNGICIDE	Cyflamid +	0.35 L/ha		16.04.18	GS30	
T0	Cherokee	1.33 L/ha				
T1	Elatus Era+	1.0 L/ha		09.05.18	GS31/32	
	Bravo +	1.0 L/ha				
	Talius	0.15 L/ha				
T2	Adexar +	1.75 L/ha		30.05.18	GS39-45	
	Bravo	1.0 L/ha				
T3	Proline +	0.72 L/ha		22.06.18	GS65	
	Amistar Opti	1.0 L/ha				
PGR	3C Cycocel	2.0 L/ha		03.05.18	GS 30/31	
	Moddus	0.1 L/ha		03.05.18	GS 30/32	
	Terpal (*)	0.5 L/ha		18.05.18	GS 35	
OTHER	(*)Activator 90	40 mls/100L		18.05.18	GS 35	
	Appeal	2.0 Kg/ha		13.10.17	GS 09	
	Appeal	2.0 Kg/ha		17.11.17	GS 11/12	

Spring barley RL varieties – field details and agronomy

GRID REF	NT473656	PREVIOUS CROPPING:	Winter wheat			
ELEVATION	140m	1 YEAR AGO	Winter wheat			
SOIL TEXTURE	Loam	2 YEARS AGO	Winter rape			
SOIL SERIES	Humbie					
SOIL ANALYSIS:						
pH	6.7					
P	8.75 (mod)					
K	138 (mod)	PLOT SIZE	10m x 2m			
Mg	242 (high)					
S	4.5 (low)	SEED RATE	360/m ²			
Mn	*	DATE SOWN	20.04.18			
Cu	*					
Organic Matter	4.69 %					
ROUTINE APPLICATIONS						
FERTILISER (Kg/Ha)	N	P₂O₅	K₂O	S	DATE	GROWTH STAGE
	120	60	60	15	26.04.18	GS05
	PRODUCT	RATE	DATE	GROWTH STAGE		
HERBICIDE:	Concert SX	50 g/ha	25.05.18	GS 24/30		
	HighLoad Mircam	1.0 L/ha	25.05.18	GS 24/30		
	Compitox Plus	0.33l/ha	25.05.18	GS 24/30		
FUNGICIDE	Siltra Xpro	0.6 L/ha	30.05.18	GSZ 31		
T1	Bravo	1.0 L/ha	30.05.18			
T2	Priaxor +	1.0 L/ha	22.06.18	GS 53		
	Bravo	2.0 L/ha				
OTHER	Manganese	1.0 L/ha	18.05.18	GS21/22		
	Manganese	1.0 L/ha	25.05.18	GS 24/30		

Trials demonstrated

Wheat varieties

- Soft wheat varieties in nabim Group 4 remain the most important choices for Scottish growers and are potentially suitable for distilling. The established varieties are Leeds, Myriad, Viscount and Revelation, supported by the newer varieties LG Motown, LG Sundance, Hardwicke, Moulton and Savello. Two new varieties; Elation and KWS Jackal are now on the recommended list.
- In nabim Group 3 for biscuit-making variety, there is only one variety that suits distilling, this is Zulu. Note that the biscuit-making varieties KWS Barrel, KWS Basset and the new variety Elicit are rated poor for distilling.
- For hard feed wheat varieties, the best options include Grafton and Evolution. The newer varieties Freiston, Dunston and Shabras show promise as high yielding options, with the addition of RGT Gravity and Gleam to the recommended list for 2018/19.
- The requirement for Scottish-grown milling wheat is small, but high yielding varieties in nabim Groups 1 and 2 can be considered for feed use. These include: Skyfall, KWS Trinity, KWS Siskin and KWS Lili. There are no new varieties in this group for 2018/19.

The full list of wheat varieties is available as a separate hand out.

Spring barley varieties: AHDB Recommended List

[AHDB and Scottish Government funded]

- Concerto is the clear market leader for malting in Scotland, supported by Odyssey and Belgravia, with Laureate likely to become increasingly important in 2018.
- Octavia, Sienna and KWS Sassy also have Full Approval from the IBD, but their future market uptake is uncertain. Check seed supply and maltsters' requirements for 2019.
- Waggon and Scholar are preferred feed options, though Waggon is now longer in trials. Propino is also often grown as a high yielding feed variety. Likewise, new high-yielding malting varieties are good options.
- KWS Irina and RGT Planet are high yielding brewing varieties that make good choices for feed use.
- LG Tomahawk and LG Diablo are currently being evaluated for malting use.

The full list of spring (and winter) barley varieties is available as a separate hand out.

Winter Wheat Fungicide Trials

The wheat fungicide trials has established septoria in the autumn and like many crops this year have also had mildew and yellow rust threatening. Earlier sown plots had much higher levels of disease while late sown plots had much lower levels and therefore showed potential for reduced levels of fungicide inputs. The exceptionally dry spring in East Lothian however dramatically reduced septoria levels and these remain low at the site. Fungicide inputs can be tailored in an integrated way to suit the varietal ratings and disease pressure in individual crops but are essential to maintain wheat yield. The wheat trials we are showing this year are looking at combinations of fungicides which will test the best methods of stewarding fungicides, whilst maintain yields and margins. The site was tested for SDHI and azole septoria mutants in the spring so that we know what the base levels are. The programmes demonstrated will let us see if combinations of fungicides can manage the mutants that are there or whether some programmes increase their frequency. We will discuss what latest thinking is and show where alternations and combinations have best managed disease. Yields from these trials will be presented at winter meetings.

Spring Barley Fungicide Trials

Spring barley crops this season are at risk of ramularia and SRUC data shows that ramularia has declined in sensitivity to both SDHI and azole fungicides. The step change happened in 2016 and it is almost unprecedented to see such a shift in two fungicide groups in a single season and very concerning. We are continuing to work on alternative control measures and to develop more robust resistance ratings for varieties. It is essential both to crop yields and to the future efficacy of the SDHI and azole fungicides and so we recommend that the multisite fungicide chlorothalonil is included in programmes. The trials at the site this year look at fungicide options and discuss how useful these have been in such a dry early part to the season.

One of the major drivers of IPM is to investigate the use of alternatives to conventional seed treatments and foliar fungicide applications. At this site we have a trial comparing 5 seed treatments in combination with a conventional fungicide programme and an elicitor/reduced rate fungicide programme. Results from 2017 indicated both an elicitor and biological seed treatment combined with fungicides and elicitor/reduced rate fungicides controlled Ramularia leaf spot and increased yield in Propino and controlled Rhynchosporium and increased yield in Laureate.

Rationalising spring barley fungicide use according to rhynchosporium risk

Using more resistant varieties and tailoring treatments to the actual risk in the crop we can reduce our reliance on fungicides. In spring barley the aim of disease management is to first protect the canopy during stem extension in order to

maximise the number of grains produced. After that, the aim is to minimise effects of disease on grain filling. One of the major justifications for using fungicide at the start of stem extension (T1) is the risk of rhynchosporium epidemics developing which can be difficult to control later. However, if the risk is low and no disease is visible in the crop at T1 there may be scope for omitting this treatment and relying on applications during booting (T2) to provide the required protection during grain filling. Trials funded by the Mains of Loirston Trust are being conducted over four sites and three years to investigate effects of fungicide timing in situations where the risk of rhynchosporium ranges from low to high. The risk is being varied by using varieties of contrasting resistance and by conducting trials at low and high risk sites. The results from the first year of trials will be discussed.

Using varietal mixtures as an IPM tool

Scottish winter barley crops are predominately grown for animal feed. The lack of emphasis on grain homogeneity make varietal mixtures a considerably more viable option than it would be for malting barley growers. Varietal mixtures may offer a solution to the problem of needing to maintain productivity in a reduced input system, however, testing of their ability to perform under reduced fungicide input has not been thoroughly investigated. This study investigates whether combinations of winter barley varieties can achieve both high yields and high quality feed products (straw and grain) under a reduced fungicide programme. The approach will involve disease monitoring of crops to identify the presence and severity of diseases such as Rhynchosporium, Ramularia and powdery mildew. Mains of Loirston funding will be used to conduct field experiments at two sites in Scotland differing in disease pressure over three growing seasons to compare the suitability of different mixtures and monocultures for an IPM approach in which fungicides are used sparingly. This study, which is currently in its first year of trials, will provide the evidence needed to inform farmers on the potential suitability of barley mixtures to be incorporated into their production systems as part of an IPM approach.

Cover Crops and EFA Greening

There is a continuing interest in the establishing of cover crops post-harvest when roots of the sown plants help to trap nutrients, limit nitrate leaching and reduce soil erosion. The roots keep the soil structure open and active during the autumn and winter with the resulting biomass releasing the trapped nutrient to the following crop and contribute to soil organic matter.

At the site several plots have been sown to demonstrate some of the plant species being used in mixtures.

Cover crops can also be used to meet EFA greening requirements and SRDP agri-environment climate scheme options. To comply with EFA greening requirements, two or more species need to be sown before the 1st November (previously 1st October) and maintained until the 31st December (inclusive). The extended sowing date will help ease the pressure following a late harvest like 2017, however the benefits to be gained from later sowings are lower.

Previous in-field evaluations of post-harvest cover crops found a considerable range in crop biomass and unsurprisingly sowing date is critical. As a rough guide for Lothian's and Borders, the dry matter yield of root and top growth falls dramatically after mid-September with little contribution from small seed plants such as lucerne, vetch and phacelia sown at this timing. If late sowing mixtures need to feature large cereal seeds which are more able to establish and grow. The effects of latitude (as you move up the country) and to a lesser extent altitude (as you move up the hill) also need to be considered. Slug feeding and site fertility (residual nitrogen) are also factors affecting establishment and potential biomass yield.

Cover crops can pose a disease risk, allowing a green bridge for take-all and club root. A common ingredient of cover crop mixes is rye, due to its fast growing nature which creates a rapid cover. Unfortunately rye is a host for take-all, so a better choice for the cereal component of a mix would be oats, which are not affected by the same take-all species. Mustard is a host for clubroot, so if you have high value brassica crops or oilseed rape in the rotation it is best to stay clear of mustard and opt for radish or phacelia.

If the primary goal is to increase soil organic matter; chopping straw and importing bulky organic materials maybe a more cost effective option. For example 5 t/ha of hen manure delivers around 1.75t/ha of dry matter, where as some of the best autumn sown cover crops we measured produced a dry matter yield of 1.5t/ha. Once you factor in fertiliser contribution and the gross margin benefit of winter cereal the decision may be easy to make.

Cover crops do have a place and can provide many benefits to soil, pollinators and the water environment, but before venturing in growers need to consider carefully what it is they are trying to achieve.

Loss of neonicotinoid cereal seed treatments

The latest news on the future of the neonicotinoid cereal seed treatments confirms that they are likely to go by the end of 2018. This will have an impact on the management of Barley Yellow Dwarf Virus (BYDV) and slugs in autumn sown cereals from 2019 onwards. Clothianidin, which is the neonicotinoid in seed treatments like Deter, Redigo Deter and NipsIT INSIDE, will no longer be available after the end of this year. Consequently there will be a reliance on the use of pyrethroid insecticides for the management of aphids and the transmission of BYDV into cereals. Grain aphids in Scotland are demonstrating resistance to the pyrethroid aphicides. Consequently reliance on a pyrethroid aphicide spray alone is a risk as grain aphids may not be controlled.

The most effective way of managing the 'green-bridge' of aphids on volunteers and stubble is to kill off any aphid host plants before sowing. Ideally stubble from the previous crop should be desiccated with a herbicide, ploughed in 7-10 days later and left for another 2 weeks before sowing the next crop. This will ensure that any aphid host plants will be dead and any aphids on them will have starved to death.

Alternatively, stubble can be ploughed in and sowing delayed for 4 weeks to allow enough time for plants to die along with the aphids.

Both of these approaches will reduce the threat from walking aphids by killing off their host plants that could keep the aphids (and BYDV) ticking over. Aphids are quite resilient and can work their way up to the soil surface after ploughing, so killing off the plants is essential so that they won't have anything to feed on underground.

A combined approach of tackling the 'green-bridge' and using an aphicide seed treatment (which is the 'last hurrah' for the seed treatments) on winter cereals is recommended this autumn, to reduce the risk of BYDV. Bear in mind that seed treatments are not available for spring cereals, so reducing the availability of BYDV reservoirs in winter cereals and volunteers/stubble, and aphids overwintering on winter cereals will reduce the risk to spring cereals, where a pyrethroid aphicide spray at early crop emergence is the only option currently available, and this won't take care of the grain aphid due to widespread resistance.

There is a new aphicide in the pipeline, so this issue may be temporary, but for the time being, a 'belts and braces' approach is recommended.

There are also some BYDV tolerant barley varieties currently being trialled by KWS (confusingly called Amistar, not to be confused with the fungicide) and Limagrain (Rafaela), so these and other BYDV tolerant varieties may be available in the next few years.

The useful effect of the neonicotinoid seed treatments on reducing seed hollowing by slugs will be lost after 2018, so use of slug pellets is likely to be the only option available. Generally, a pre-emergence application of slug pellets with a follow up post-emergence if damage is seen tends to do the job in both wheat and winter oilseed rape. However, further treatments may be necessary if the crop is slow to emerge or slug pressure is severe.

Ferric phosphate slug pellets are on a par with metaldehyde pellets in terms of efficacy – the slugs tend to crawl away to die so success of ferric phosphate pellets should be judged on reduction in plant damage, not dead slugs on the surface! With the restriction on use of metaldehyde within a minimum of 10 metres of any field boundary or watercourse, it would make sense to consider use of ferric phosphate products as an alternative, especially in fields adjacent to water courses.

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For further information about Scottish Government funded R&D at SRUC contact:

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