Teagasc
Agriculture and Food Development Authority

IRISH FARMERS JOURNAL
farmersjournal.ie

CROPS & CULTIVATION 2017

Teagasc & Irish Farmers Journal

Oak Park, Carlow

Wednesday 28th June 2017

www.teagasc.ie

Foreword

Teagasc Oak Park Crops and Cultivation 2017

Welcome to the Teagasc Oak Park crops open day, where Oak Park researchers and Teagasc colleagues are pleased to be able to show the latest technical innovations on a range of crops including; winter and spring barley, winter wheat, oats, oilseed rape and beans. The focus on these crops, presented over a number of stands, will include; pest, weed and disease control strategies, efficient fertiliser use, precise agronomy strategies such as sowing dates and seed rates and work to develop improved varieties suited to our climate. Up and coming new varieties will also be demonstrated by the DAFM variety testing team.

The Teagasc crops research programme will be the main focus; however, there will be many other areas of relevance to tillage farmers and the farming industry in general, including:

- Farm safety for farmers and families highlighting the dangers for bystanders with very large machines.
- Cultivation and sowing will be the focus of an 'event within an event' supported by the Irish Farmers Journal, and with input from some of our soil experts based in Johnstown Castle. There will be two working demonstrations of a range of crop establishment systems and a static display of controlled traffic systems. There will also be a wide range of other machinery on display from manufacturers and dealers, something for everyone, not just the specialised tillage farmer.
- Field margin management and enhancement of natural pest predators, to try and minimise the impact of loss of insecticide products.
- Catchment management to enhance water quality.

The route enables you to pick out areas of interest so you can start and stop your tour wherever you wish, a map is provided in the centre of the booklet to help you find your way.

I hope you have an enjoyable day; one which will enhance your knowledge and will be beneficial to your business. A lot of effort goes into the research programme to make it relevant and useful to the industry and I wish to thank the Teagasc tillage stakeholder group for the time and effort they devote to this on behalf of the sector. Many of the stakeholder group (listed overleaf) will be on-site today and would be happy to discuss ideas with you that you think are worthy of future research or knowledge transfer activity.

John Spink
Head of Crops Research
Teagasc

Tillage Stakeholder Group Members

Mr Donal Fitzgerald	Goldcrop (Chairperson)
Mr Richie Hackett	Crop Consultant
Mr Paddy O'Toole	Quinns of Baltinglass
Mr John Greene	Farmer, Co. Kildare
Mr Donal Coleman	Department of Agriculture Food & the Marine
Mr Andy Doyle	Crops Editor, Irish Farmers Journal
Mr John Keogh	Irish Agricultural Supply Industry Standards
Ms Maria O'Toole	Glanbia
Mr Willie Masterson	Farmer, Co. Wexford
Mr Stephen Collins	Farmer, Co. Cork
Mr Stuart Wallace	Farmer, Co. Offaly
Mr Pat Ryan	Liffey Mills
Mr Ollie White	Farmer, Co. Dublin

BYDV Control

Barley yellow Dwarfing Virus is spread by Aphids

Risk Factors:

- Early sown autumn crops / late sown spring crops
- Mild winters (Aphids overwintering)
- Mild Autumns (Aphid migration period lengthened)

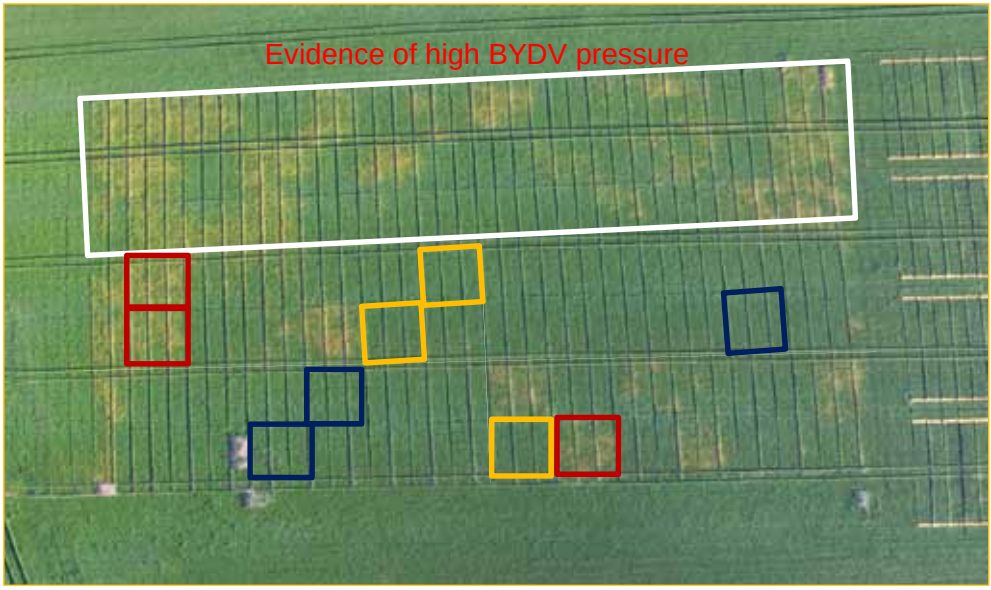
Autumn cereals		
Sowing date	BYDV Risk	Control Action
Early sown (Sept)	High	Seed treatment & Pyrethroid aphicide in Nov Or Aphicide at 2/3 leaf stage & 1st week Nov
Oct sown	Medium to high	Seed treatment Or Pyrethroid aphicide 1st week Nov
Emerging after Nov	Low	Control needed in mild winters where aphids are plentiful or in risk areas

Spring cereals		
Sowing date	BYDV Risk	Control Action
March sown	Low	Aphicide spray may not be necessary
April sown	Medium to high	Pyrethroid aphicide at 4 leaf Seed treatments not permitted for Spring sown cereals

Notes:

BYDV Control

Winter barley, Cassia sown 12th October, Cork

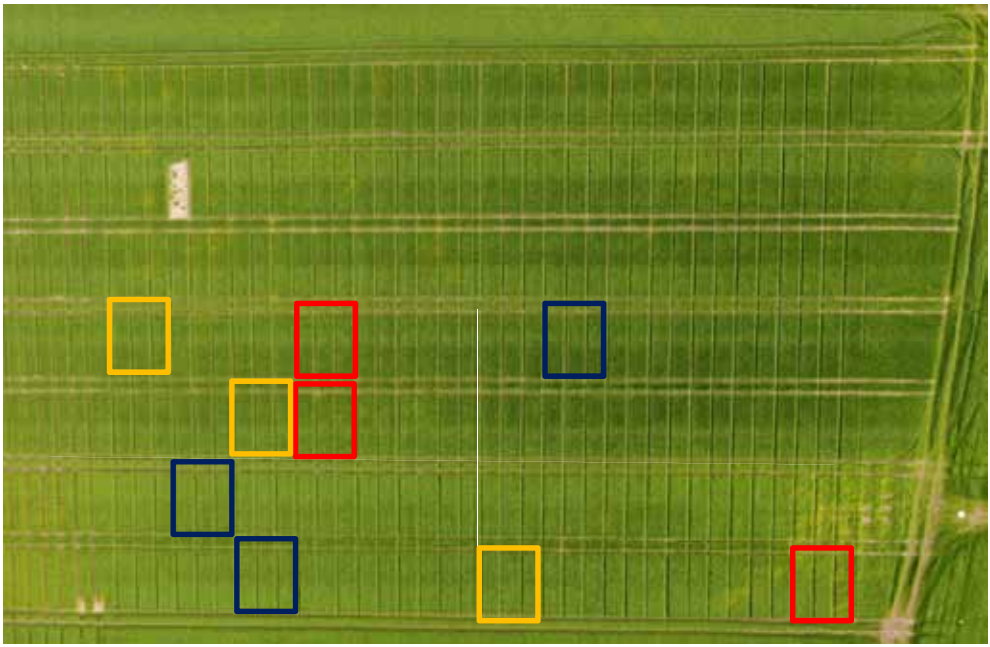


Untreated **Pyrethroid** **Seed Treatment**

Notes:

BYDV Control

Winter barley, Cassia sown 3rd October, Carlow



Untreated **Pyrethroid** **Seed Treatment**

Notes:

‘Knock Down Resistance’

‘Knock Down Resistance’ or ‘KDR’ was first identified in the UK in 2012 and in Ireland 2013

- Aphids with ‘*kdr*’ gene are less susceptible to pyrethroids
- To date, ‘*kdr*’ has only been identified in *Sitobion avenae* (Grain Aphid), an important vector of Barley Yellow Dwarfing Virus (BYDV)
- A single clone of *Sitobion avenae*, SA3 is associated with pyrethroid resistance
- Research indicates aphids carrying the resistance gene occur in all major grain growing regions
- When exposed to full rate applications of pyrethroids, approx. 40-50% of *Sitobion avenae* with the resistance gene will survive to at least 12 days post exposure
- Individual aphids exposed to full rate applications of pyrethroids continue to produce new nymphs post insecticide exposure

EPIC IPM

Notes:

Pest Survey

- Which pests are causing you greatest concern in your crops?
- Are your current control strategies effective?
- What information is most useful when dealing with these pests?

Please complete a survey -
Your input is critical in shaping future research priorities

Notes:

Ecological Focus Areas

Potential Benefits of EFAs

For the Farmer



- Enhanced crop pest control (natural predators)
- Increased pollination
- Decreased soil erosion.
- Prevention of soil nutrient leaching

For Biodiversity



- Increased species diversity.
- Increased habitat and landscape diversity
- Maintenance of 'wildlife corridors'

Social & Tourism



- Public goods (Ecosystem Products and Services)
- Maintenance of historical features and heritage
- Clean, green image

Some Current and Potential EFAs

Fig 1: Hedgerows are the primary EFA on Irish tillage farms, accounting for 68% of eligible EFAs

Fig 2: Drains are widespread and make up 10% of EFAs in Ireland

Fig 3: Buffer strips constitute 9% of EFAs in Ireland

Fig 4: Fallow land is less common, constituting only 2% of EFAs in Ireland

Fig 5: Field Margins are eligible under EU prescriptions but not under Irish regulations, despite occurring in over 80% of tillage farms

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Notes:

Natural Enemies of Aphids For IPM

Sitobion avenae- grain aphid spreads BYDV, feeds on grain heads and can become resistant to pesticides

Wildlife habitats such as field margins support a variety of predators of aphids

- **Hoverfly** larvae eat aphids as well as other soft bodied pests. Each can consume up to 1,200 aphids.

- **Adult hoverflies** feed on pollen and nectar from flowers
- Larvae and adults hibernate

- **Lacewing** larvae eat aphids. Number consumed by each larva varies but can exceed 1,500

- **Lacewing adults** feed on pollen and lay eggs near aphid colonies
- Adults hibernate

- **Ladybird** larvae eat aphids

- **Adult ladybirds** eat aphids and lay their young near aphid colonies
- Adults Hibernate

- **Parasitoid wasp larvae** keep the aphid alive and feed on it until they are fully grown. They then exit the aphid's body, killing it.

- **Adult Parasitoid wasps** attack and lay their eggs inside aphids and repeat the cycle

Robyn.Earl@Teagasc.ie

Notes:

How Farmers Can Help Bees

Why are bees important?

- Pollination of food crops: oilseed rape, peas, beans, apples, soft fruit
- Pollination of wildflowers, trees
- Green image for Irish food
- Production of honey

Why bees are declining?

- Reduction in flowers: Pollen provides protein and nectar provides carbohydrate.
- Lack of continuity of flowers: Bees need food all year round - a diversity of flowering plants in the landscape.
- Less nesting sites

Irish Bee species

Honeybee (1)

Solitary bees (77)

Bumblebees (20)

	Trees / Shrubs	Climbers	Wildflowers
January	Willow		Primrose
	Hazel		Bluebell
	Blackthorn		Dandelion
	Holly	Dog rose	Clover
	Crab apple	Honeysuckle	Vetches
	Whitethorn	Blackberry	Knapweed
December	Gorse/furze /whins	Ivy	Heather



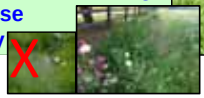


Allow space for a diversity of flowers to grow and flower

- along farm roadways
- around farmyards
- field margins
- field corners

Field Margins

- Fence off from livestock
- Cut or graze after flowering
- Do not fertilise
- Do not spray

Routinely trimmed hedgerows

- Side trim to a triangular shape
- Leave as high as possible.
- Allow individual thorn trees mature at irregular intervals
- Allow wildflowers grow at the base



If spraying insecticides in crops

- Spray early morning or late evening when honey bees are less active
- Notify local beekeepers

Notes:

Campaign For Responsible Rodenticide Use (CRRU)

Why?

To minimize negative impacts of rat bait (rodenticides) on wildlife

- **Effective rodent control is an essential part of farming and food hygiene**
- **Rodent predators can be exposed to rodenticides by feeding on live rodents with toxins in their systems or rodents that died as a result of poisoning**

Rodent Predators

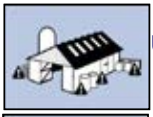
The CRRU Code

Plan

- **Survey the site**
- **Remove alternative food sources**

Record quantity of bait used and where placed

- **Make and keep a site plan**



Use enough baiting points

Collect and dispose of rodent bodies

(Dead rodents carry rodenticide residues)

Never leave bait exposed to non-target animals and birds

Inspect bait regularly

- **Top up bait points as required**
- **Search for dead rodents**

Do not leave rat bait down continuously

(Not more than 35 days)

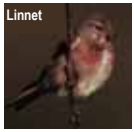
Notes:

GLAS Arable Grass Margins

- **Habitat for invertebrates:**


- **Natural enemies of crop pests** potential to reduce pesticides
- **Watercourse buffer zone -** additional to 2m for Nitrates
- **Site for ground nesting birds**

- **Food source: seeds for**



- **Cover and corridors for fauna**



- **Habitat for small mammals and their predators**

GLAS Seed Mix

At least 60% Cocksfoot and/or Timothy @ 25-30kg/ha

Sowing

- **Sow once at start of GLAS**
- **Retain for 5 years**
- **Precise drilling key in avoiding overlap with cropping area**

Management

- **Fertiliser, lime or pesticides can not be applied to margins**
- **Mulch, mow or graze between 15th Aug and 1st March - Off takes can be removed**
- **Spot treat noxious weeds and invasive species**
- **Keep grass seed labels and receipts**

Notes:

Parasites of the Honeybee

Adult Bee Diseases

Tracheal mite

Nosema spp.

Varroa mite

Brood Diseases

American foulbrood

European foulbrood

Chalkbrood

Viruses (adults+brood)

Deformed wing

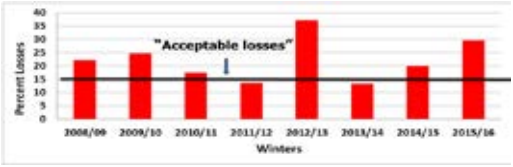
CBPV

Sacbrood

Winter Colony losses being experienced by Irish Beekeepers 2008-2017

(annual survey in collaboration with COLOSS)

Insufficient control of Varroa the main culprit



Aim of the National Apiculture Programme (NAP) 2016-2019

To develop an integrated pest management control system which is effective against Varroa and can be incorporated easily by beekeepers into the day to day management of their colonies

Bee Disease Diagnostic Service, Teagasc, Oakpark, Carlow

Free service (funded by DAFM) to assist beekeepers monitor disease prevalence in their colonies

www.COLOSS.org

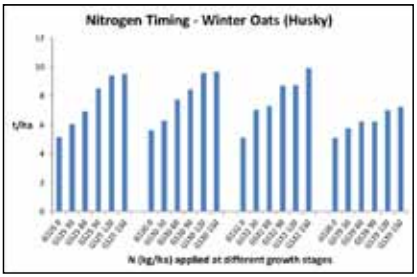
Lead researcher NAP: **Mary.Frances.Coffey@ul.ie**

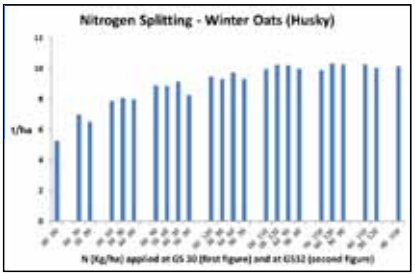
Notes:

Oats – Nitrogen Timing

Winter Oats

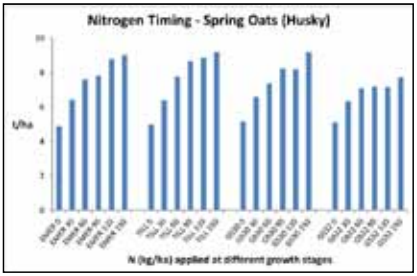
- Timing of N applications to winter oats is not critical if N is applied by GS32
- How N is split is relatively unimportant compared to the rate of N application

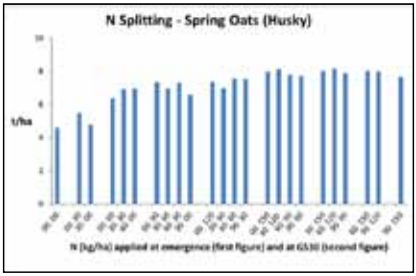




Spring Oats

- Timing of N applications to spring oats is not critical if N is applied by GS30
- How N is split is relatively unimportant compared to the rate of N application





Notes:

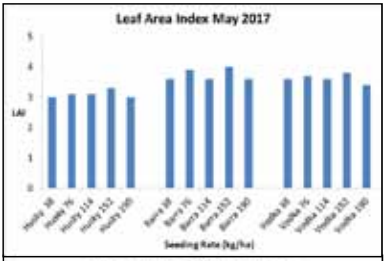
Winter Oat Seeding Rates

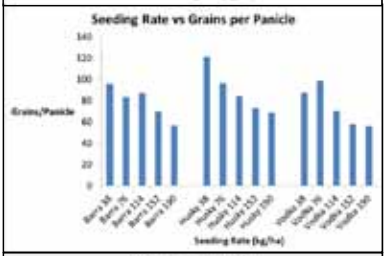
- High seed rates have been recommended for oats but are high seed rates necessary?
- Can oats compensate if lower seed rates are used?

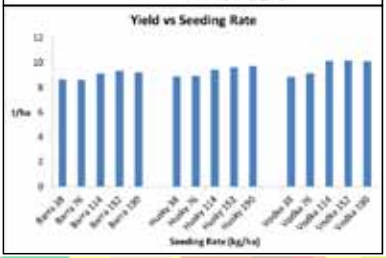
- Seeding rate trials were conducted with three oat varieties (Barra, Husky and Vodka) sown in October at five seed rates (38, 76, 114, 152, 190 kg/ha)

- **%** establishment decreases with seed rate
- No difference in leaf area between seeding rates by GS55
- Grain per panicle decrease with seed rate
- No effect of seeding rate on quality

- Oats can compensate at lower seed rates
- Seed rates of 114 – 190 kg/ha produce similar yield

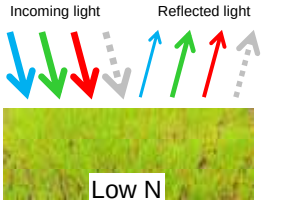


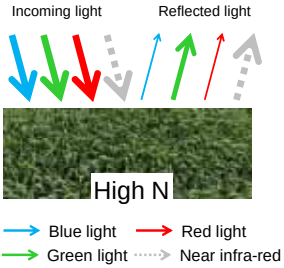




Notes:

Crop Reflectance





Principles of light reflectance used by crop sensors

- During photosynthesis crops absorb more red and blue light than green light
  - More green is reflected
- More (and greener) leaf means
  - more photosynthesis
  - more absorption of red and blue light
  - less reflection of red and blue
- Near infra-red light is reflected by crop structures, more crop = more NIR reflection
- Reflectance of different wavelengths of light gives information on crop canopy size and 'greenness' which can relate to crop nitrogen status/requirement

BUT

- Factors other than N affect reflectance (drought, non-N nutrient deficiencies, spray damage……)

Issues

Sensor readings tend to saturate at high crop N levels

- reflectance better for quantifying N deficiencies than excesses

How much N is required to correct deficiency?

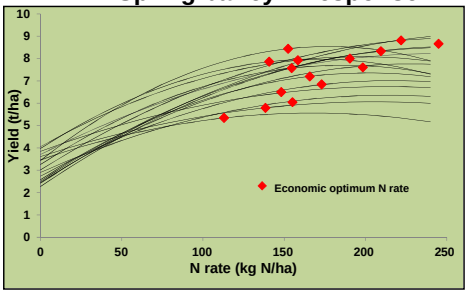
- What about N remaining in the soil?

If a crop is deficient has yield been lost?

Notes:

Can Sensors Improve N Advice?

Spring barley N response



Fertiliser N requirement is variable,
- between sites and seasons
- within sites

Response to N is influenced by:

- Yield (Actual vs historic)
- Soil N supply
- Fertiliser N recovery
- All difficult to predict early in season (with accuracy)

Can the crop indicate N requirement during the season?

Crop N status related to biomass + N content

- both can be determined with samples in a lab
- allows detection of deficiency / excess
- not practical at farm level

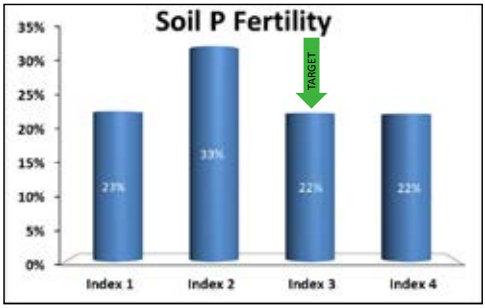
Indirect methods can be used e.g. crop reflectance sensors

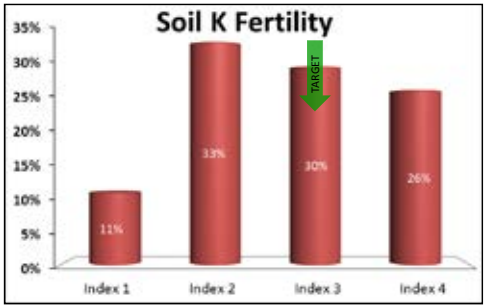
- more practical
- optimum timing for measurements?
- ability to identify correct rate of N?
- suitability for Irish crops?

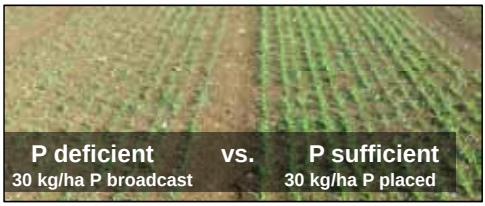
Sensor platforms

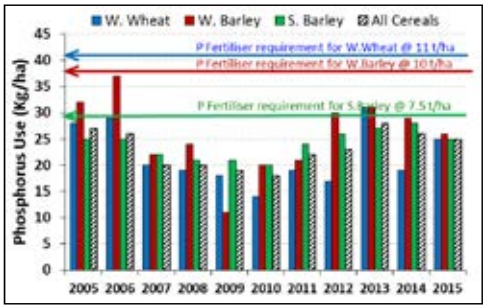
Notes:

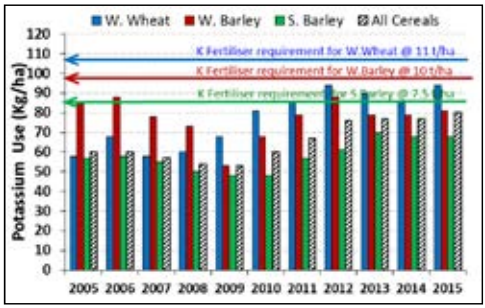
Soil Fertility & Fertiliser Use







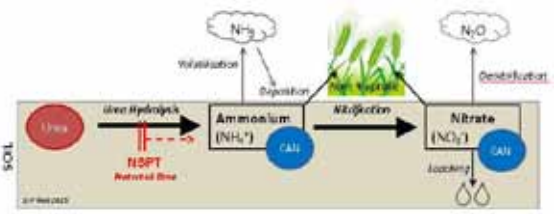




National Fertiliser Use Survey 2005 to 2015 (NFS *Wall & Dillon et al. 2017*)

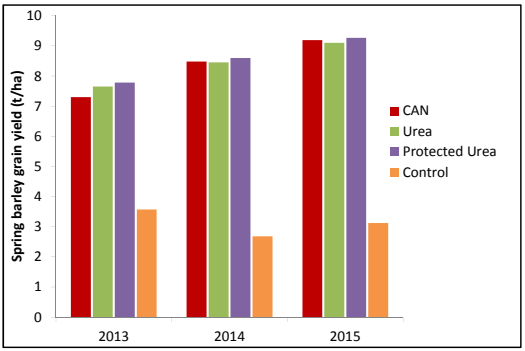
Notes:

Fertiliser Nitrogen Options
CAN, Urea & Protected Urea

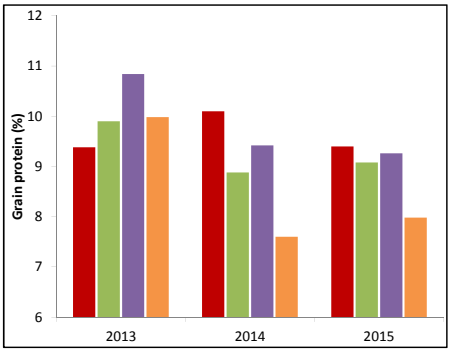


	CAN	Urea	Protected Urea
Cost of N	★★★½	★★★★★	★★★★
Yield	★★★★★	★★★★	★★★★★
N Uptake	★★★★½	★★★★	★★★★★
Nitrous oxide	★★★★	★★★★	★★★★
Ammonia	★★★★	★★	★★★½
Leaching	★★	★★★★	*Not available

Grain yield @ 150 kg N/ha



Grain protein @ 150 kg N/ha



Take home messages

- The yields from all three fertiliser nitrogen options were similar
- Protected urea will safeguard against reduced yields which could occur with ordinary urea under weather conditions favouring ammonia loss

Notes:

Spring Barley Disease Management

Management Strategy

1.Variety → 2.Sowing date → 3.Fungicide timing → 4. Fungicide choice

3. Timing

1st application: mid-late tillering

2nd application: awn emergence

No benefit from additional applications

Notes: _____

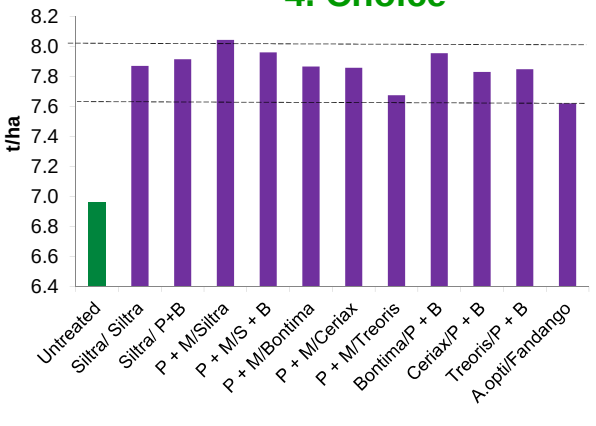
_____

_____

_____

Spring Barley Disease Management

4. Choice



S. Barley programmes trial

- 2015-2016 (5 site seasons)
- Oak Park & Kildalton
- 2 applications
- €40- €100 spend
- No significant difference between programmes
- Max of 0.4t/ha between the programmes

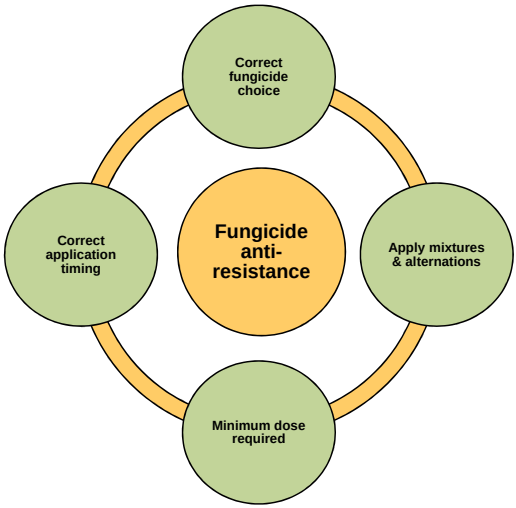
Take Home Messages

- 2 well timed applications
- Base your fungicide choice on a sound IPM strategy
- Use at least 2 actives
- Use justifiable rates
- Alter actives at each timing, where possible

Notes:

Fungicide Anti-Resistance Strategies in Barley

Wide diversity of fungicide active ingredients available for barley disease control



Take home messages

Use husbandry / resistant varieties to minimise disease

Fungicide anti-resistance strategies must provide disease control to be effective

Mix effective modes of action

Apply minimum dose of fungicides required for control

Don't apply unless needed!

Notes:

Current Fungicide Resistance Status for Barley Diseases

Varying levels of fungicide resistance now present in main diseases of barley

Rhynchosporium commune

Ramularia collo-cygni

Pyrenophora teres

Fungicide	*Rhynchosporium Commune*	*Ramularia collo-cygni* **(Chlorothanil essential)**	*Pyrenophora teres*
QoI/Strob	Low (G143A 2014 in Ireland)	High (Resistance widespread in Irish populations)	Moderate resistance present (F129L & G137R)
Azole	Low (shifts detected prothioconazole not affected)	Moderate resistance	Low resistance
SDHI	No resistance detected (as of yet)	Moderate (Resistance widespread Europe)	Moderate (resistance detected in Europe)

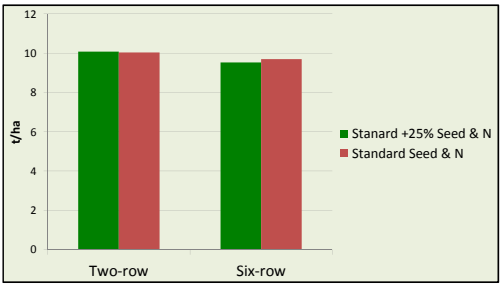
Notes:

Winter Barley Agronomy: Two and Six-Row

Hybrid six-rows are becoming increasingly popular
The yield components are very different from two-row
Should they be treated the same?

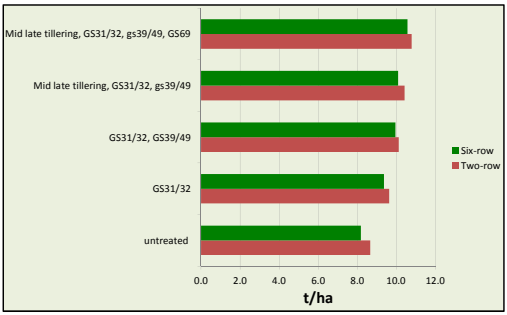
Two and six row yield components

	Ears.m^{-2}	Grains.ear^{-1}	Grains.m^{-2}	TGW (g)
Two-row	1028	18	18750	57.7
Six-row	728	36	26030	40.9



Does increasing seed & N rate increase grain no.?

- No yield increase from increasing seed & N rate in either a two or a six-row variety
- Possibly due to increased lodging at the higher seed & N rate

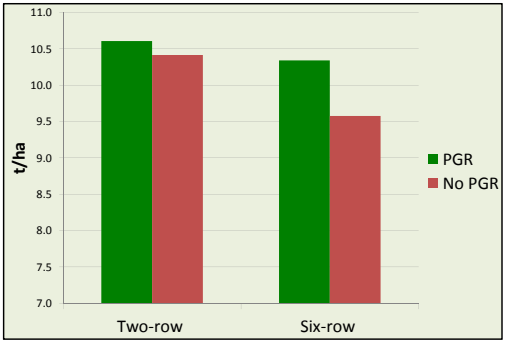


Does fungicide timings need to change due to row type?

- Each row type responded the same to fungicide timing
- Conventional two-row out yielded hybrid six-row

Notes:

Winter Barley Agronomy: Two and Six-Row



Do six-rows have a greater need for PGR?

- Increased yield response from PGR in six-row variety
- Caused by increased lodging in the six-row

Conclusions

- Current recommendations for seed & N rates for both row-types should be followed
- There is no evidence to suggest changing fungicide timing based on row type
- Six-row varieties have a greater need for PGR application

Notes:

Grass Weed Identification

Key traits for identifying grasses

- Auricles/Ligules
- Hair on the leaves/stem/nodes
- Presence of rhizomes
- Colour of leaves
- Head structure

Early identification is the first and most important step in grass weed control

Different weeds require very different control strategies

Spring germinating weeds like wild oats and lesser canary grass pose different problems than winter germinating species

Lesser Canary Grass

- Pale, broad green leaves
- Red sap in the root tips
- No auricles
- Tufted seed spike
- Can remain dormant in soil for extended periods

Wild Oats

- Hairy stems and leaf margins
- No auricles (unlike Wheat and Barley)
- Sturdy, upright growth
- Dark coloured, hairy seeds, arranged in a loose panicle with awns

From L-R: Wild oats, wheat and barley auricles

Notes:

Grass Weed Identification

Sterile brome, soft brome and black grass are all predominantly Autumn/Winter germinating

Including spring crops in the rotation is a useful control measure for Autumn/Winter germinating weeds

Sterile Brome

- Hairy stems
- Red striping at the base of the stem
- Loose, drooping panicle
- Seeds have long awns, arranged in a wedge-shaped spikelet

Soft Brome

- More upright growth than sterile brome
- Seeds tightly arranged in an oval shaped spikelet with shorter awns
- Compact panicle with short branches
- Spikelets are hairy

Black Grass (Mature)

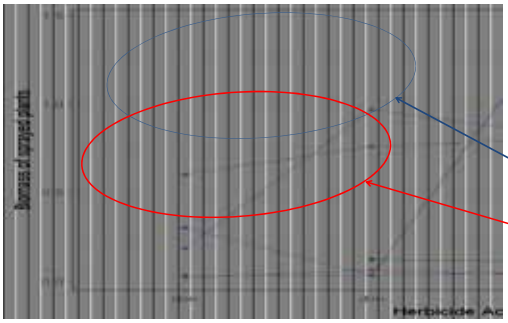
- Too late for effective control at this stage
- Seed heads similar to Timothy or Foxtail, only longer and more slender
- Heads can range in colour from deep purple to green
- Very upright growth

Black Grass (Young)

- Early identification is key
- Red colour at the base of the stem. Long, slender dark green leaves
- Lacks auricles
- Excellent tillering capacity

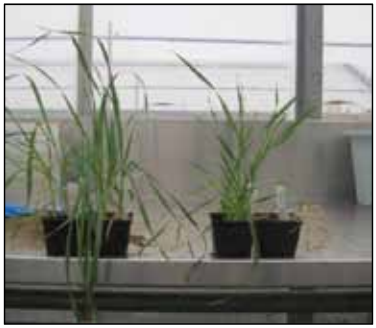
Notes:

Herbicide Resistance and Black Grass



Herbicide resistance is the ability of a plant to survive a dose of a herbicide that would normally be lethal.

- Grass weeds screened for resistance to 4 common herbicide active ingredients using full rates
- Wild oats populations found with resistance to one or two active ingredients
- Black grass populations found with resistance to all active ingredients
- If you see black grass on your farm, or suspect herbicide resistance, contact Teagasc to have your weeds screened for resistance



Key steps to identifying resistance on your farm:

1. **Was spraying carried out in correct weather conditions?**
2. **Was the herbicide applied at the correct rate?**
3. **Has good coverage of all tillers been achieved?**
4. **Are live, uncontrolled plants present in proximity to dead ones?**

Black grass head

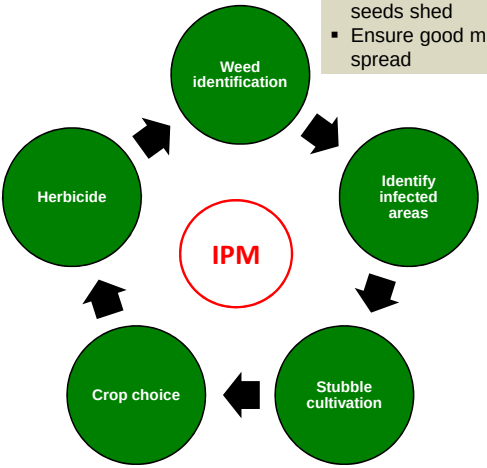
Notes:

Grass Weed Control – Systems Approach

Herbicide Efficacy

Control Measures for this harvest (short term)

- Hand rogue if possible
- Identify badly infected areas for future control
- Desiccate badly infected areas before seeds shed
- Ensure good machinery hygiene to stop spread



Clean machines after harvesting to stop spread

Weed Biology

- Dormancy, germination
- Crop choice & rotation
- Sowing date

Main germination period

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sterile brome												
Blackgrass												
Canary grass												
Wild Oats												

Control Measures (medium/long term)

- Stubble cultivation - needs moisture, shallow cultivation & roll
  - control with glyphosate
  - repeat
- Primary cultivation - plough, deep till/shallow till or no till

Balance required depending on weed to be controlled

Notes:

Virtual Irish Centre for Crop Improvement

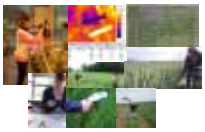
VICCI brings together Ireland's leading crop and plant scientists to address some of the most important challenges to Irish tillage and forage agriculture

Elite and adapted collections of six Irish agricultural crops from a variety of sources

Controlled environment and field-scale phenotyping of target traits for real world relevance

Multidisciplinary "-omics" approach to understand genetics and physiology of traits

Biotechnology-based tools (eg. markers) and advanced germplasm to enable breeding of high performing Irish adapted crop varieties



Web : **www.vicci.ie**
Twitter: **@CropImprovement**

Research Stimulus Fund
Project 14/S/819

Notes:

teagasc

VICCI

Virtual Irish Centre for Crop Improvement

Six Crops Four Challenges for Irish Agriculture

Nutrient Use Efficiency

- Understand the genetics of NUE in breeding germplasm
- Develop high energy, low-N grain for monogastric feed
- Reduced N emissions and crop nutrition costs

Disease Resistance

- Need Irish-adapted varieties resistant to STB and FHB
- Identify germplasm, genes and markers associated with resistance
- Provide tools and information to breeding companies

Abiotic Stress Tolerance

- Low temperatures and flooding can limit productivity
- Investigate breeding germplasm using combined "omics" and field approach
- Develop tools for breeding stress tolerant varieties

Import Replacement

- Beans - potentially useful break crop and could help replace soy meal
- 50K tonnes of potatoes for processing imported annually
- Develop genomics driven breeding for these crops

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University College Dublin
Ireland's Global University

NUI Galway
OÉ Gaillimh

MAYNOOTH

Trinity College Dublin

Notes:

Winter Barley Collection

The collection

- 392 winter barley varieties
- Variety release year from 1904 to 2012
- Extensive phenotypic information
- Extensive SNP genotyping performed

Oldest variety:
Friedrichswerther Berg (1904)

Newest variety:
KWS Discovery (2012)

Countries of origin

Current experiments

The genetic basis of:

- Waterlogging tolerance
- Nitrogen use efficiency

using genetic association studies

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Genotypes kindly provided by

Notes:

MAGIC Winter Wheat Population

8 parents, with different desirable traits
- yield potential
- grain quality
- disease resistance etc.

Current experiments
Examining the genetic basis of:
- Septoria disease resistance
- Nitrogen use efficiency

Multi-parent **A**dvanced **G**eneration **I**nter-**C**ross

Alchemy | Soissons | Claire | Hereward | Rialto | Xi-19 | Robigus | Brompton

Inter-cross 1

↓

↓

↓

Inter-cross 7

Each progeny contains genetic material from all eight parents
400 genotypes

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Notes:

STB Resistance – Yield Maintenance

Objective:

Identifying the genetic basis of

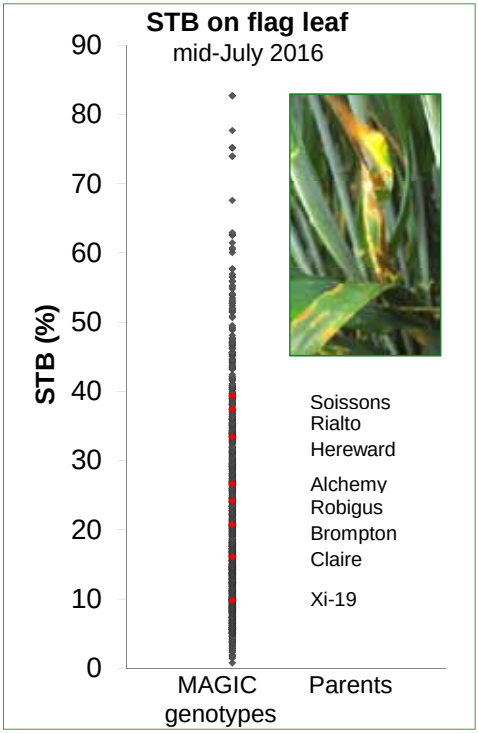
- Disease resistance to Septoria
- Maintaining grain yield under disease infection

Last year:

- More than1,000 MAGIC genotypes screened for STB disease resistance
- Large variation in resistance found
- Some progenies more resistant than any parent

Currently:

- 200 genotypes selected
- Untreated plots: to determine STB resistance
- Fungicide protected plots: to determine yield potential



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Genotypes kindly provided by NIAB

Notes:

Barley Waterlogging Tolerance

- **Climate change means flooding will become an increasing problem in Irish agriculture**
- **We are screening over 380 different barley cultivars that have been released since 1904 in the field for waterlogging tolerance**
- **Our aim is to identify cultivars that are more tolerant, and to understand why they are more tolerant to waterlogging so we can breed even better varieties**
- **These are difficult experiments to do!! During the winter of 2016, we irrigated our trial to an equivalent of over 1,600 mm rainfall!**

Control | **Waterlogged** | **Flooded**

- **We are also trying to generate new barley cultivars that will have a better tolerance to waterlogging**
- **For that, we are using knowledge gained of how the plants respond to waterlogging**
- **In the coming years, we will test these new cultivars in the field**

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Genotypes kindly provided by

Notes:

Nitrogen Use Efficiency - Wheat

Nitrogen use efficiency (NUE) is influenced by:

- Time & density of sowing
- Variety – genetic background
- N available, N uptake
- Climatic factors

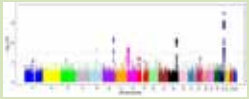
Why investigate NUE in wheat MAGIC lines?

1. To partition the genetic & environmental components
2. To identify superior NUE efficient lines for our climate

One of the early heading wheat MAGIC lines to be assessed for NUE

- NUE trial 2017 & 2018, 1 site
- 2 treatments:
  - 80kg N - low (potential under N starvation)
  - 240kg N – high (potential with plentiful N)
- 2 reps per treatment
- 292 MAGIC lines & 8 parental lines: 300 lines
- Measurements:
  - tillering rate
  - grain yield
  - harvest index
  - N content grain

Alchemy, Brompton, Claire, Hereward, Rialto, Robigus, Soissons, Xi-19 → **8 parents pairwise intercrossed & selfed 7 generations (NIAB)** → **Phenotypic field experiment (Oak Park) & calculation of genome wise associations** → **Search for NUE related genomic regions (2017 & 2018)**



→ **Feed findings back to breeders to improve germplasm in future for NUE**

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Genotypes kindly provided by NIAB

Notes:

Oilseed Rape Establishment

Systems evaluated

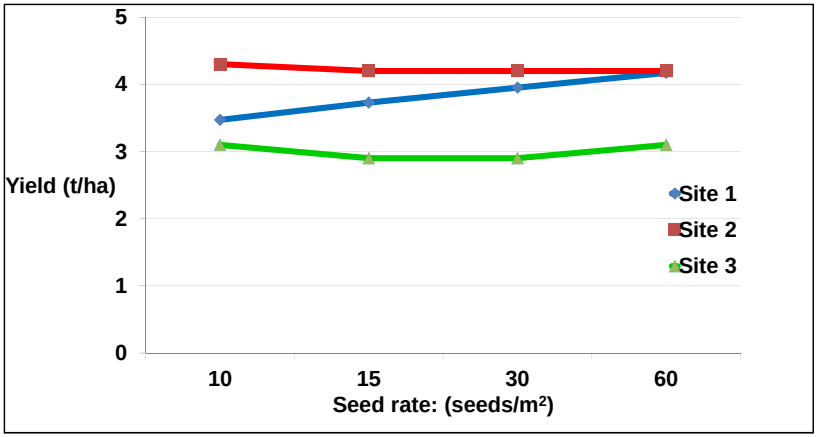
- Plough-based establishment
  - 125mm and 600mm rows
- Min-till establishment
  - 125mm and 600mm rows
- Strip tillage (Heva)
  - 600mm rows
- Row widths 125 to 750mm evaluated
- 3 years: varying yield potential sites

Performance summary

- All systems could successfully establish OSR crops
- Row widths up to 600mm had little impact on crop development and yield.
- Where yield potential was high, very wide rows (750mm) could limit the crop.
- N response was similar across establishment systems
- There is scope to exploit faster and lower cost establishment systems

Notes:

Oilseed Rape Seed Rate



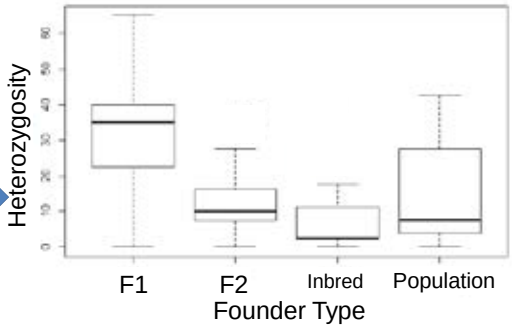
Seed rate

- 2 sites out of 3 had no response to seed rate (10 to 60/m^2)
- On <u>one</u> site increasing seed rate did increase yield – why?
  - Pigeons had completely stripped the biomass over winter.
  - Lower seed rates slowed recovery and reduced yield
- Row width had little impact on optimum seed rate
- Scope to use low seed rates but must ensure even establishment and avoid severe pigeon damage

Notes:

Preliminary Results

Establishment of Outcrossing Foundation Population



Selection Cycle 1

Progeny of most Heterozygous plants selected

Seed yield and weight per plant

CYCLE 1 SELECTION

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Notes:

Breeding for Faba Bean Yield and Disease Resistance

Benefits of Faba bean:
- Rich source of protein
- Suitable for animal feed
- Valuable, N-fixing break crop

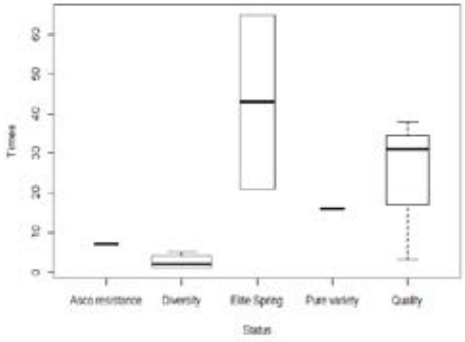
Current situation:
- Disease resistant winter varieties have little yield benefit
- Autumn-sown spring varieties prone to yield loss due to diseases, particularly Ascochyta blight

Project Aim: To breed a high-yielding, disease-resistant spring variety adapted to autumn sowing

Method: Recurrent Selection
Reselection generation after generation, with intermating of selected plants to produce new genetic combinations for the next cycle of selection

1. Foundation Population
2. Ensure high levels of outcrossing using captive bee colony
3. Measure plant performance
4. SELECT superior plants (1-2%)
5. Selection Generation *n*
6. Repeat *n* times

Composition of Foundation Population



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Notes:

Beans Agronomy

Sowing Date → Early Feb. to Mid March, as soon as soil conditions allow

Seed Rate → Sow 35 – 40 seeds/m^2 to achieve optimum plant density of 30 – 35/m^{20}

T.G.W. → Can vary by up to 30%: adjust seed rates (150- 250 kg/ha) based on TGW and germination %

Nutrition → Apply P, K as per soil index
Watch Mg, Zn, Mn

Weed control → Pre-emerge Nirvana or Stallion. Linuron no longer available.
Basagran only post emergence BLW option.
Graminicides suitable for grass weed control.

IFA Grain Levy Funded Research

Notes:

Beans Agronomy

Disease ➡ Chocolate spot biggest threat. Spray at early flowering and repeat 2 – 3 weeks later
Signum, Rover 500, Fezan Plus, Amistar
Ascochyta and Downy Mildew also of concern

Pests ➡ Bean weevil cause U shaped notches on leaves. Larvae feed on roots and can cause substantial damage to young crops. Apply insecticide if notching seen across field
Black bean aphid: only spray if greater than 5% of plants infested

Harvest ➡ Late August – Mid September
Aim for 18% moisture content

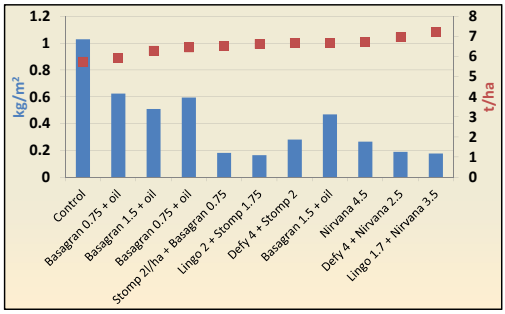
IFA Grain Levy Funded Research

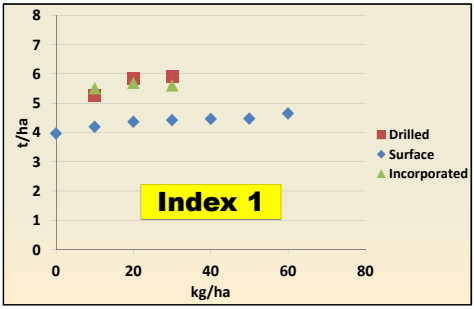
Notes:

Bean Agronomy Trials

Weed control:

- Options limited
- Mostly pre-emergence
  - Need moist, fine seedbed
- Product comparison 2016
  - Weed biomass on 20th June
  - Final yield
- Product comparison 2017
  - 15 products/combinations





Phosphorus rate and placement method:

- Index 1,2 & 3 soils
  - Drilled
  - Incorporated
  - Surface broadcast
- On low Index soils placement of P close to seed is very important

Further research
- Winter and spring varieties
- Flowering control
- Fungicide product and timing
- Rhizobium

OPTI-BC
- Nationwide survey of bean and OSR production
- Establishment systems
  - Plough and one pass vs direct drill

IFA Grain Levy Funded Research

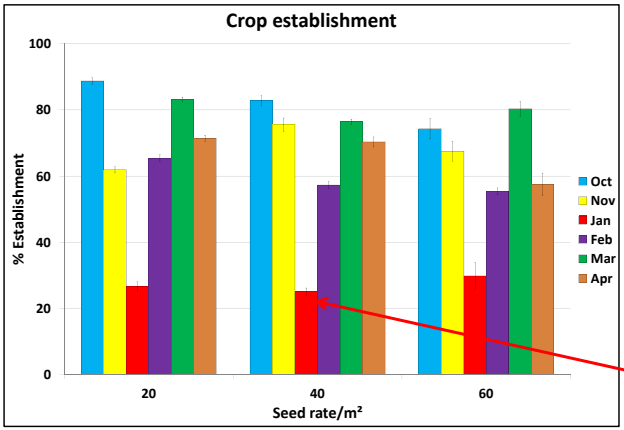
Notes:

Time of Sowing and Seed Rate

Field Trials:

- Impact of sowing date and seed rate on crop growth, canopy development and dry matter accumulation
- 6 sowing dates from October to April
- 5 seed rates – 10, 20, 40, 60 & 80 seeds per m²
- 2 varieties – Fuego (Spring) & Wizard (Winter)

20 seeds/m² (left) vs 80 seeds/m² (right)



Future impacts of research:

- Improve field bean agronomy
- Better understanding of crop growth and development
- Improve and optimise yield by adopting appropriate agronomic practices

IFA Grain Levy Funded Research

Notes:

Teagasc
Agriculture and Food Development Authority

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Forest Service

Considering Afforestation?

- **Forestry offers many opportunities**
  - Attractive grant scheme
  - Annual premium paid for 15 years
  - Maximises return from marginal land
  - Flexible land management option
  - Environmental benefits on the farm
  - Ties in well with other Agri Schemes e.g. BPS
- **Learn more from Teagasc**
  - Attend Forestry events / courses
  - Visit www.teagasc.ie/forestry
  - Contact local Forestry Development Officer
    - Consultation – phone / office
    - Site Visit
  - Teagasc will offer guidance
- **Plan for the Future**
  - Get it right first time
  - Make an informed decision
  - Apply for Forestry Grant Aid

Notes:

Continuous Cover Forestry

- Forest Management approach which allows for the production of commercial timber while ***retaining a forest cover at all times***
- It is referred to as ***'close to nature'*** forest management – working with 'natural forest process'
- Timber is viewed as ***'interest generated by the growing forest capital'***
- CCF requires ***planning and specific management on suitable sites***

Benefits of CCF:
- ✓ Regular income
- ✓ Market flexibility
- ✓ No large-scale clearing/planting
- ✓ Soil and water protection
- ✓ Enhanced biodiversity
- ✓ Long term carbon store
- ✓ Opportunities for alternative forest uses

Oak Park forest management plan 2017 – 2021 aims to:
- Remove invasive species
- Rejuvenate old woodland
- Produce timber
- Establish research trials
- Demonstration site for CCF

Notes:

Potato Breeding Scheme

1. Selection of parents

2. Fertilization

3. True potato seed

4. Young seedlings

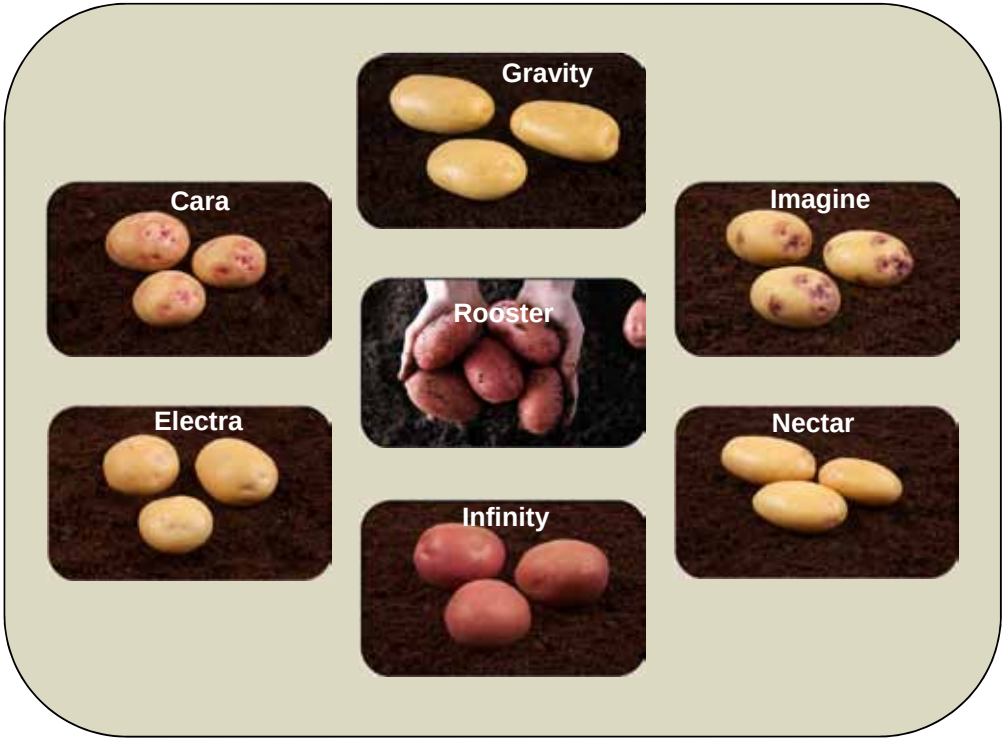
5. Evaluation trials

6. New variety

IPM POTATO GROUP

Notes:

Teagasc Bred Varieties



IPM POTATO GROUP

Notes:

Main Potato Diseases

LATE BLIGHT
Phytophtora infestans


PCN
Globodera pallida/rostochiensis


VIRUS
PVY, PVS,PVA,PVX,PLRV

BLACKLEG
Pectobacterium spp


COMMON SCAB/POWDERY SCAB
Streptomyces spp/Spongospora subterranea


RHIZOCTONIA
Rhizoctonia solani


IPM POTATO GROUP

Notes:

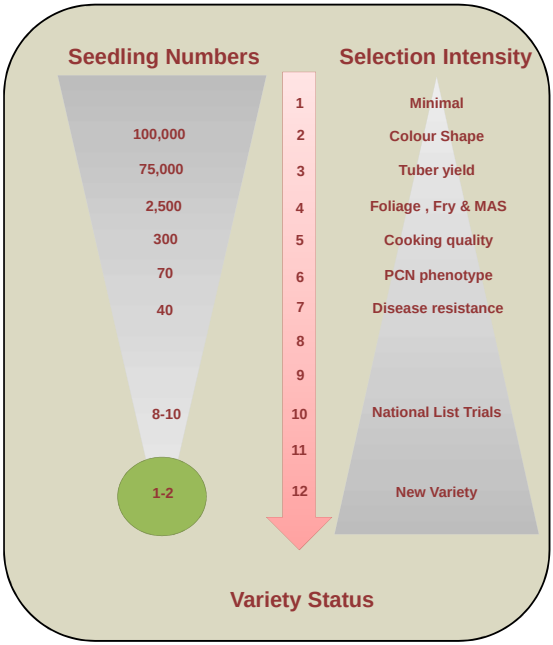
Potato Breeding Time Scale

Trial Site Locations

Years 1-11

Years 7-11

Years 7-11



IPM POTATO GROUP

Notes:

Traits, Selection and Technology

Yield

Data Analysis

Cooking Quality

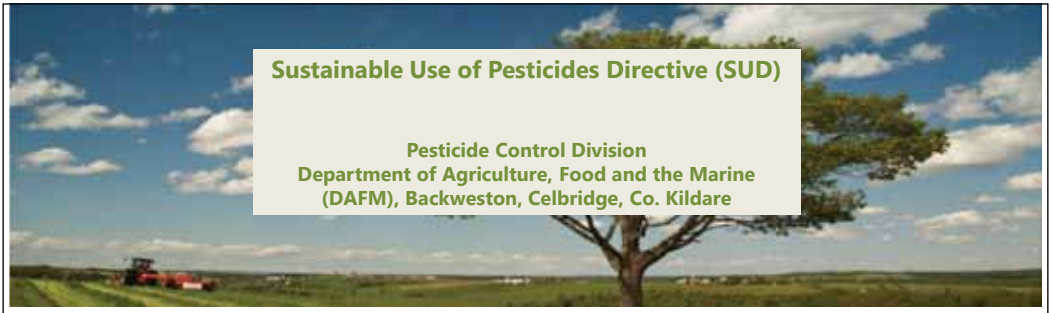
Automation

Disease/Pest Resistance

Genetic Markers

IPM POTATO GROUP

Notes:



Sustainable Use of Pesticides Directive (SUD)

Pesticide Control Division
Department of Agriculture, Food and the Marine
(DAFM), Backweston, Celbridge, Co. Kildare

Professional Pesticide Users - who needs to register with DAFM?

Training and Registration:

- All professional users (PU) must be registered
- A PU is anybody who applies 'Professional Use' products:
  - in any quantity
  - using any method of application
- Teagasc (QQI/FETAC) City & Guilds or Lantra certification
- List of providers available at http://www.pcs.agriculture.gov.ie/sud/professionalusersprayeroperators/training/
- www.agfood.ie for DAFM clients
- Otherwise http://www.pcs.agriculture.gov.ie/sud/sudreg/

Responsibilities of Professional Users

- Maintain usage records
- Practice general principles of IPM
- Observe buffer zones and protect water
- Retain proof of qualification

Notes:

Testing of Pesticide Application Equipment

Testing of Pesticide Application Equipment

Since 26th November 2016

- All boom sprayers > 3m and blast and orchard sprayers over 5 years old must be tested before use
- Farmer's responsibility to ensure sprayer is tested
- Test cert remains with sprayer if sold
- Tested every 5 years up to 2020
- Tested every 3 years after 2020
- Must be tested by a DAFM-registered Inspector of Pesticide Application equipment http://www.pcs.agriculture.gov.ie/sud/equipmentinspectors/
- Knapsack sprayers are exempt

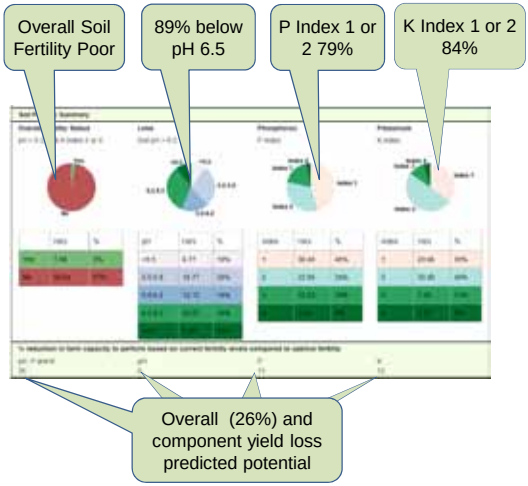
Notes:

NMP Online – Fertiliser Planning

Know your Soil Fertility
- pH and lime requirement
- Soil P
- Soil K
- Overall Fertility

NMP Online Fertiliser Plan Combining
- Teagasc Recommendations
- Nitrates Limits

Into easy to follow maps



Soil pH and Lime Map

Soil P Index and Organic Manure Map

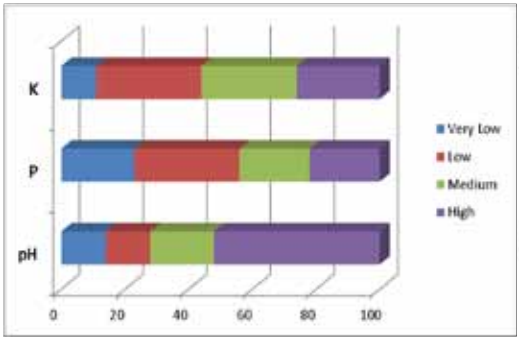
Plan your Lime & Fertiliser to
- Build soil fertility
- Maximise crop yields

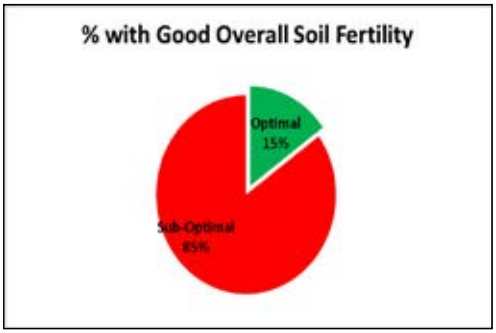
Notes:

Soil Fertility Management

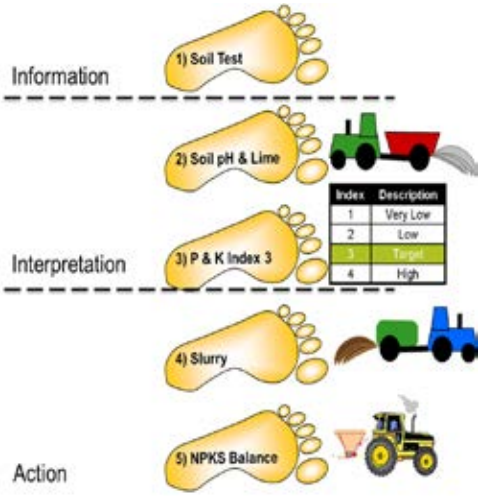
National Tillage Soil Fertility Status

Results of Soil Samples from Tillage Farms in 2016





5 Steps to soil Fertility Management



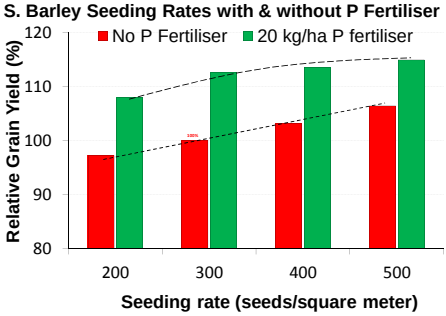
Take Home Messages

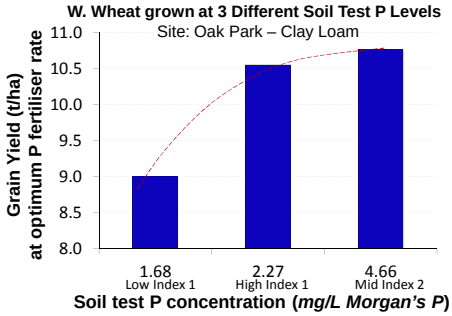
- ✓ Crop yields limited on 85% of tillage soils by pH, P or K
- ✓ Sample fields for soil fertility every 3-5 years
- ✓ Aim for target soil pH 6.5 by applying lime
- ✓ Build soil P & K to Index 3 over time
- ✓ Utilise organic manures where available as cost effective sources of P and K

Notes:

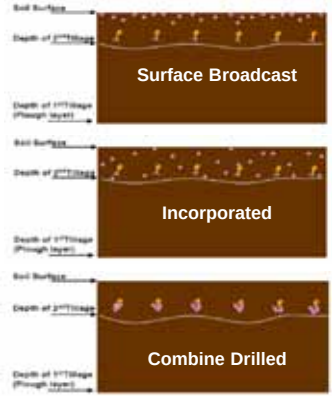
Phosphorus Fertiliser Studies

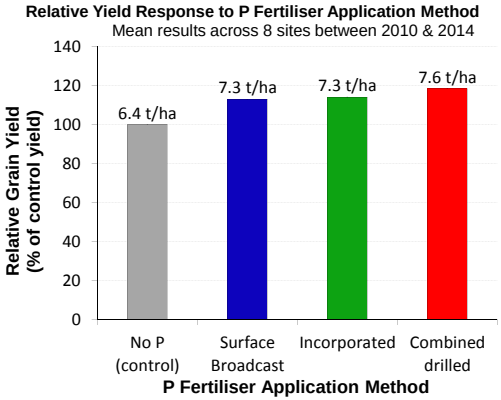
Importance of Adequate P Availability for Crop Establishment and Soil P Fertility for yield





Efficiency of Different P Fertiliser Application Methods on Low P Soils





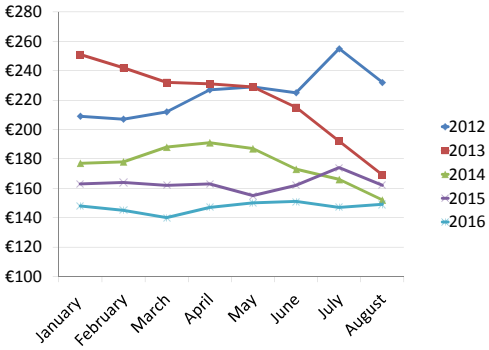
Notes:

Financial Risk Management

Risk:
- What is an acceptable level?
- Probability v Impact
- How likely is an event likely to happen?
- What is the impact of the event?
- Are you risk adverse or taker?

*Risk is personal, we all have a different thresholds, we **must** make informed decisions.*

Dried Feed Barley Historical Prices 2012 - 2016



Reducing Risk

- Forward sell grain, instead of building storage
- Hire machinery instead of purchase
- Machinery share / contract systems
- Grow crops on contract
- Share farm (shares the risk & return)
- Partnerships with another enterprise
- Grow a broader range of crops
- Grow artisan crops

Take home message*: Can you reduce the risk and increase the return?*

Notes:

Farm & Financial Planning

Do you have targets for your…

- Cash Flow?
- Farm Profit?
- Wealth?
- 5 – 10 years in the future?

*Goals are personal, we all have different ideas of what we want, but we **must** make informed decisions, to achieve targets*

Have you Investment priorities in the correct order?

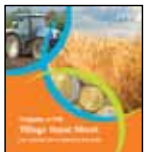
- New machine or building ◯
- Lime and fertiliser ◯
- Rented land ◯
- Leased land ◯
- Time spent planning ◯
- Land maintenance ◯
- Education ◯
- Expertise ◯

What order are these items in on your farm?

Do You?...

- **Measure** your overall financial performance
- **Measure** the financial performance of the different enterprises on your farm
- **Compare** the current and previous year's performance
- **Compare** your performance with the best farmers in the area and nationally
- **Plan** for a viable future in farming

Are you using financial tools to influence your decision making?



Take home message: ***Analyse your business and make plan for your future***

Notes:

Better Farm Programme

Focus on Precision Farming

"How to achieve maximum field performance through Smart farming"

John Collins

Kevin Nolan

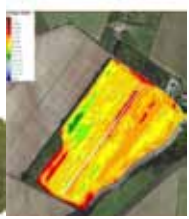
Derek Keeling

Universal precision tools

- Develop a toolkit to identify and manage soil variation
- Focus on soil characteristics and nutrition
- Role of organic manures & catch crops
- Measure performance against crop benchmarks

Hi-tech precision tools

- Use of specialist tools to aid decisions
- Role of hi-tech precision equipment
- Focus on crop recording and record keeping
- Evaluate new technologies on farm



BETTER farm
crops programme

Notes:

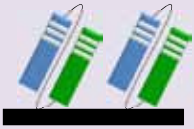
How Biosensors Work

Antibodies

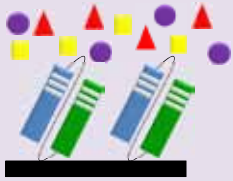
Example of a scFv Antibody

- Are naturally produced within the body
- Can be generated in a lab for use in detecting crop diseases e.g. Leaf Scald, Potato Virus Y
- Can detect disease before symptoms appear on plant
- Are used in sensors to recognise disease-causing agents

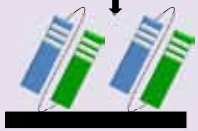
Antibodies on a Sensor



Antibodies are attached to sensor surface



Plant sample is introduced to sensor



Antibody will only detect plant disease

Sensor result indicates if plant is diseased

Notes:

Biosensing Crop Pathogens

***Rhynchosporium commune* (Leaf Scald)**

- Fungus which affects barley
- Reduces yield by up to 45%
- Can survive in fields without detection

Potato Virus Y

- Virus which affects potatoes
- Reduces yield by up to 100%
- Makes seed potatoes unmarketable

Current Detection Methods

Visual Inspections

- Difficult to detect early stage pre-symptomatic disease
- Time Consuming
- Labour Intensive

Lab Testing

- Costly
- Slow result turnaround times
- Requires highly trained personal

Future Detection Methods

Antibody-based Sensor

- Cheap
- User friendly
- Rapid result (in minutes) turnaround times
- Field-based

Notes:

Safety in Tight Spaces

Hazards:

- Poor visibility close to tractors/ large machines: Bystander risk
- Entrapment at hitching
- Entrapment/impacted by parked machine moving
- Entrapment between machine and buildings/structures

Which driver has the best view?.

Particular Challenges

- Large machines: blind spots to front, sides and rear
- Poorly designed yards for modern equipment

Notes:

Reducing the Risks

Visibility solutions

- Clean windows, good mirrors, good lighting
- Blind-spot awareness
- People position awareness
- Good operator practice: stop and check
- Good yard design
- Reverse warning beeper
- 360 degree overhead view camera system

Entrapment solutions

- Secure handbrake and transmission lock
- Quick attach couplings and safe external linkage control
- Safe implement hitching routine:
  - Implement parked safely
  - Methodical safe approach to implement attachment
  - Avoid entrapment when linkage is used
  - Particular care when two people involved
- Use chocks/ trailer handbrake if trailed equipment must be parked on slopes
- Never stand under loads without secondary safety support

Notes:

Soil Cultivation

Why Cultivate?

- Create seedbed
- Retain moisture & provide drainage
- Control weeds
- Incorporate residues
- Seed placement

System Impacts on:

- Crop establishment and growth
- Power, energy, labour, costs
- Soil and structure
- Weeds: grass and broad leaved
- Pests, beneficials (earthworms)
- Diseases
- GHG emissions

Notes:

Depth, Intensity, Inversion

Systems

- Plough-based
- Min-till (eco-till, reduced till)
- Strip till
- Direct drill

Intensity ↓

But:

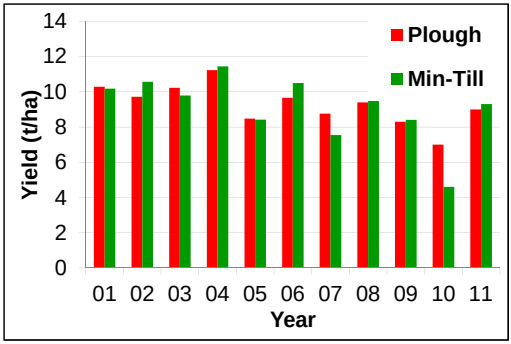
- Continuum of systems
- All can vary in depth
- Vary in intensity
- Deep 'min-till' = plough

Impacts on:	Plough/Intensive	Min-Till / Ext
Yield Winter crops	✓✓✓	✓✓✓
Yield Spring crops	✓✓✓	✓✓
Establishment	✓✓✓	✓✓
Machinery costs	✓	✓✓✓
Earthworms	✓	✓✓
Grass weeds	✓✓✓	✓
Soil Carbon	✓	✓✓

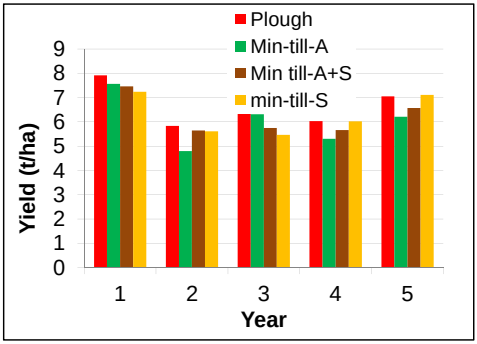
Notes:

Oak Park Research

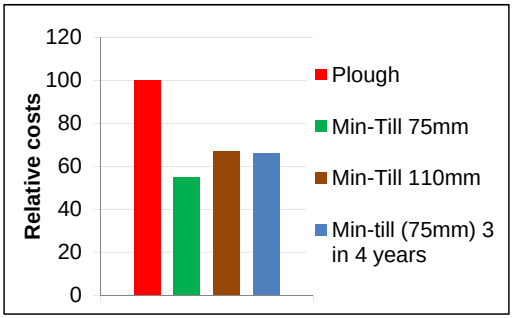
Winter Wheat



Spring Barley



Machinery costs



Challenges

- **Grass weeds (Winter + Spring)**
- **Wet autumns (Winter)**
- **Slow establishment (Spring)**
- **Better management**

Notes:

Soil Structure Damage

Threats

- Heavy machinery
  - Excessive axle loads
  - Inadequate tyre size
- Continuous annual cropping
- Working in wet conditions

Solutions

- Avoid wet conditions
- Reduce cultivation intensity (stronger soils)
- Reduce axle loads
- Fit larger tyres
- Lower tyre pressures
- Headland management
- Controlled traffic systems

Identifying the problem

- Examine your soils
- Visual soil assessment techniques

Notes:

SQUARE
Soil Quality Assessment Research Project

Soil Quality impacts on crop productivity and other soil functions

Objectives

- Evaluate the status of soil structural quality in Ireland
- Assess impact of soil structural degradation on functional capacity of soil
- Develop a toolbox for farmers to assess structural quality

SQUARE How?

- **Field campaign – 160 grassland and tillage sites over three years**
- **Farmer surveys to assess ranges in soil management practices**

Outputs

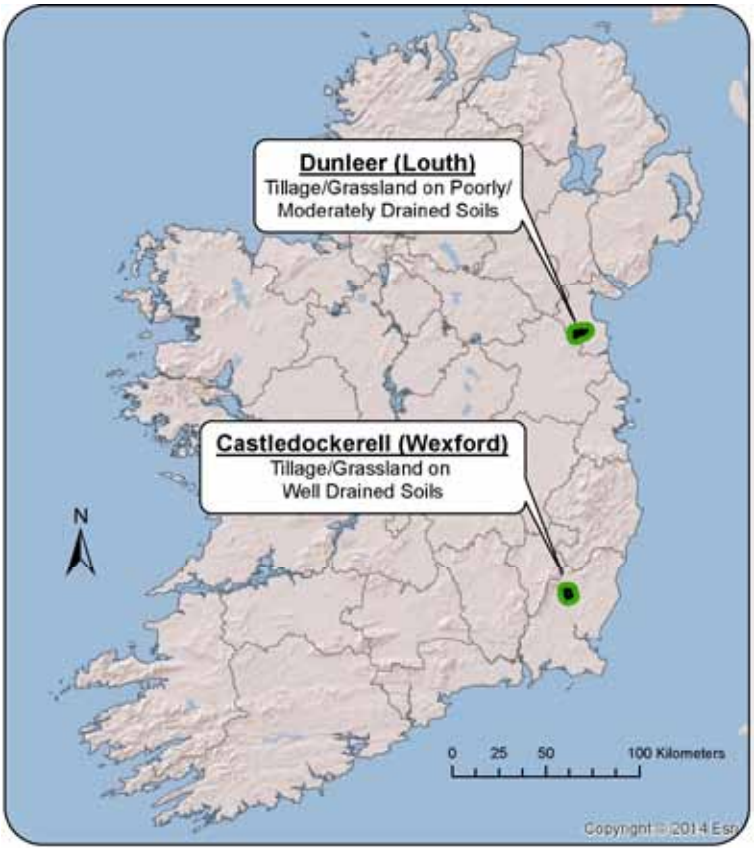
- Visual Soil Assessment for Irish soils and in-field toolkit for farmers
- Knowledge and scientific understanding to facilitate improved management practices

SQUARE supports the co-existence of environmental sustainability with increased food outputs

Notes:

Two Arable Catchments

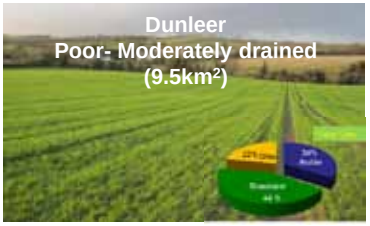
Two different water quality pressures



Notes:

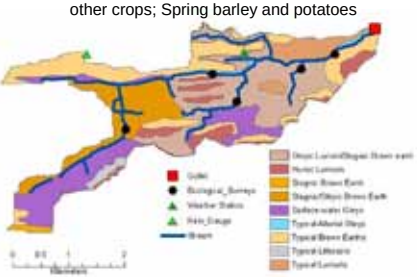
Two Arable Catchments
Two different soil fertility trends

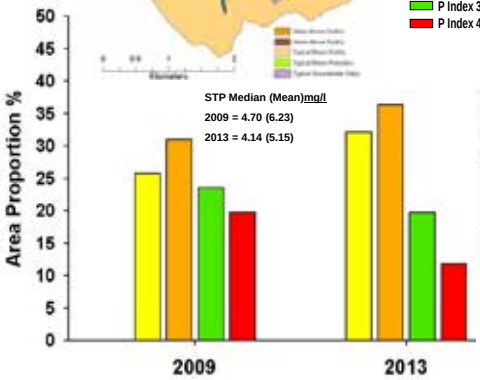
Spring Barley is the dominant crop, also Winter Wheat, O. S. Rape

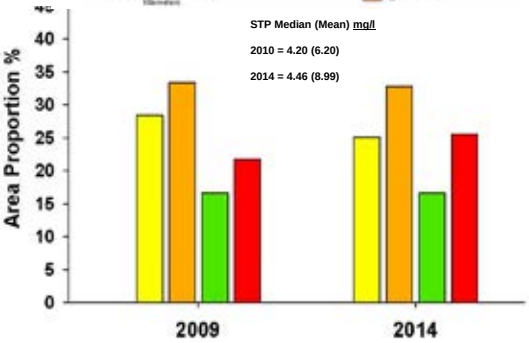


Winter Wheat is the dominant crop type other crops; Spring barley and potatoes

P Index 1 (Very deficient)
P Index 2 (Deficient)
P Index 3 (Optimum)
P Index 4 (Excessive)







Notes:

Two Arable Catchments
Two different soil profiles

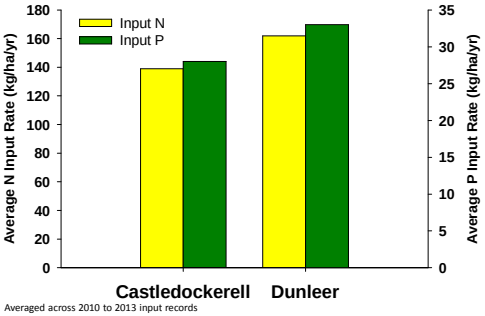
Typical Brown Earth
Clonroche Series
Well Drained
Fine loamy drift with siliceous stones

Typical Surface-Water Gleys
Kilrush Series
Poorly Drained
Fine loamy drift with siliceous stones

Notes:

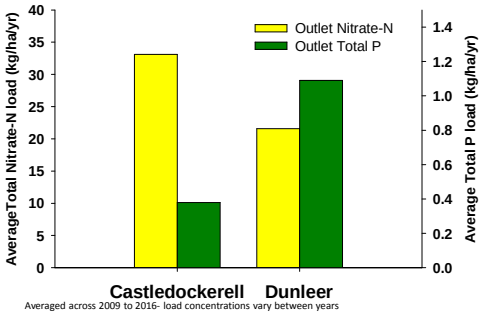
Two Arable Catchments
Two different water quality results

Average Nutrient Inputs rates within the catchment



Averaged across 2010 to 2013 input records

Average Annual Nutrient loads from the catchment to stream



Averaged across 2009 to 2016- load concentrations vary between years

Take home messages

- The risk of nutrient loss can vary according to soil type
- Loss of valuable nutrients can be reduced through correct nutrient management practices;
  - Regular soil sampling (3-4 years)
  - Follow a nutrient management plan
  - Follow the 4 R's- Right: Source, Rate, Time and Place
- Green cover crops can reduce N loss at vulnerable times and improve soil structure

Notes:

Controlled Traffic Farming

What is CTF?

- Limiting wheeled traffic to discrete areas
- Avoiding compaction / structure damage
- Alternative approach to massive tyres for heavy machinery
- Most suited to, and beneficial to, non-plough systems

Benefits

- Depends on system, site, crops and trials
- Reduced compaction, improved porosity
- Reduced power requirement ~ 50%
- Yields variable: 0 to 35% improvement

CTF Systems - original

- Gantry system, permanent paths
- Expensive, poorly developed
- Main concept prior to GPS
- Some interest for high value crops

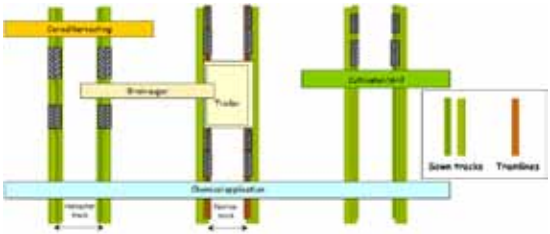
Notes:

GPS Based CTF

GPS – RTK and Autosteer – enable CTF today

Compatible working widths

- Cultivation
- Spraying/spreading
- Trailer transport
- E.g. 3m, 6m and 24m widths



Variants

- Wide-track system (3m+)
  - minimises wheeling areas
  - extra costs and machine width
- Standard track widths
  - no modification
  - more wheelings
- 'In season' CTF
  - Plough conventionally
  - CTF for remaining operations

Notes:

CTF Optimove Project

EU project (ICT Agri Eranet)

- Focussed on developing CTF systems across Europe
- Irish component examining field headlands and soil sensors

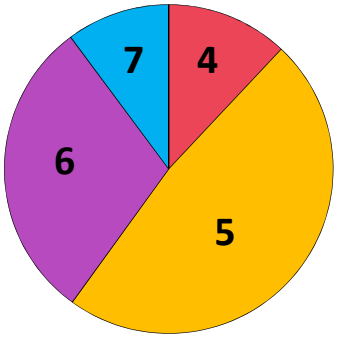
Headland studies: Survey

- Headland 'Zones of difference' attributed
- Soil structure assessments in each zone
- Crop performance assessments
- Input application assessments
- Scope for improved headland management will be determined including CTF variants

Notes:

Value Of Varietal Resistance

Winter wheat seed 2016 – Septoria ratings



90% available seed rated between 4-6

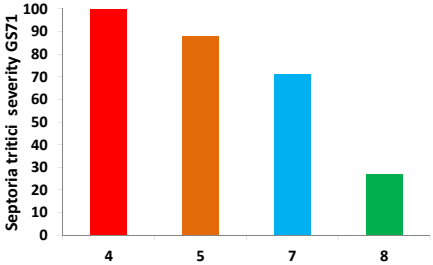
Source: DAFM

What are the benefits of selecting a variety with better resistance to Septoria tritici blotch?

3 *potential* values:

1. **Reduced disease incidence**
2. **Reduced risk of yield losses when untreated**
3. **Reduced requirement for fungicide**

Study aim: Evaluate the values gained from selecting varieties with higher Septoria resistance

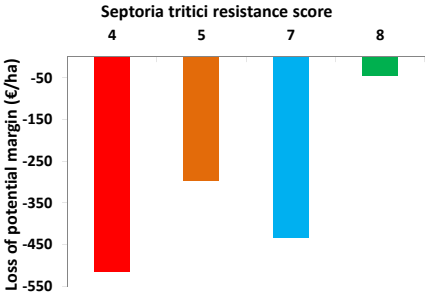


Value 1: Septoria tritici infection

- **Selecting for Septoria tritici resistance reduced disease pressure**
- **30% difference between varieties rated 4 and 7**
- **73% difference between varieties rated 4 and 8**

Notes:

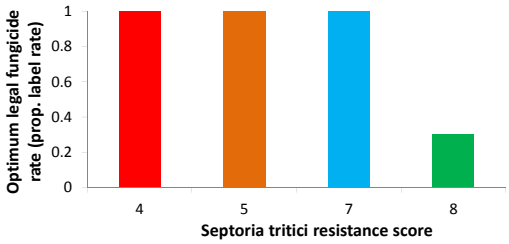
Value Of Varietal Resistance



Value 2: Risk of yield loss when untreated

- Varieties with higher resistance ratings can still incur high yield losses if protection is poor
- Very resistant varieties (8) may reduce risk

Value 3: Fungicide requirement in high pressure



- Varieties rated 4-7 had high optimum rates
- Very resistant variety had a 70% lower optimum rate

Take home messages

1. Select varieties with higher Septoria resistance ratings to reduce crop infection
2. Most varieties currently available have high fungicide requirements
3. Reliable varieties with very high Septoria resistance would have substantial value in Ireland

Notes:

Investigating Cost of STB Resistance

Background
Genetic resistance of cv. Stigg is being bred into new commercial varieties but little is known about the cost of this source of genetic resistance

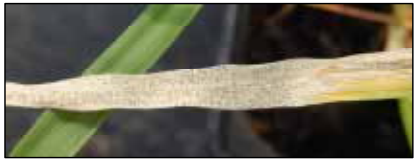
Stigg

Kielder

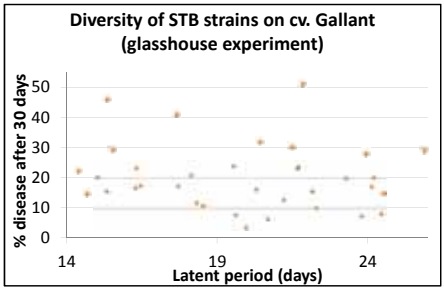
Project goals
Comparing cv. Stigg against 9 other varieties-

- Investigate the impact of an extended latent period on field performance
- Understand in more detail the mechanisms that support the strong STB resistance trait of cv. Stigg in absence of fungicides

Data shows diversity of latent periods and % pycnidia from multiple strains on same variety



Septoria fruiting bodies (pycnidia) on wheat leaf



Take home messages

- Pathogenicity of STB strains very diverse
- Genetic resistance is valuable in a high disease environment
- Resistant cultivars must be balanced with fungicide use to maximize yield and preserve durability of STB resistance

This project has received funding from the European Union's Horizon 2020 research and innovation programme

Notes:

Latent Period- A Factor That influences Resistance To Septoria Tritici Blotch (STB)

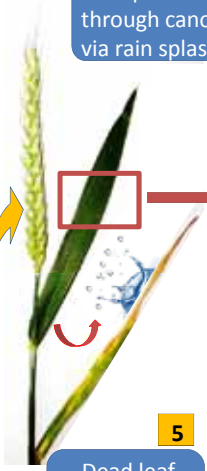
What is Latent period?

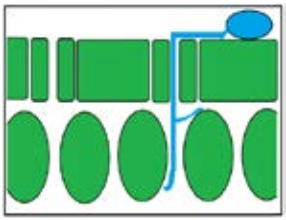
Time it takes from STB landing on the leaf – to first sign of visible symptoms

1 STB spreads up through canopy via rain splash

2 Spore entry via Stomata pores on leaf surface

3 Flag leaf appears clean while pathogen is in a dormant phase known as the Latent period

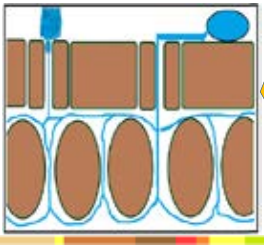




Surface layer

Inner Layer

4 Latent period can last from 7 - 28 days before switching to feeding lifestyle, killing leaf and producing spores

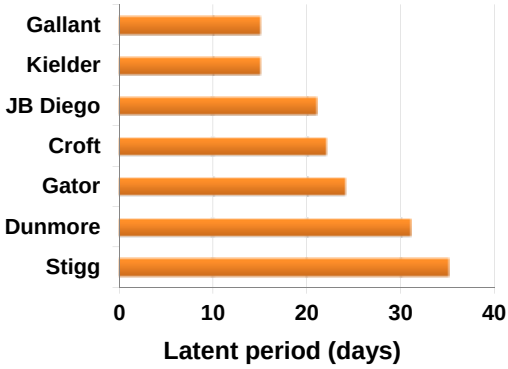


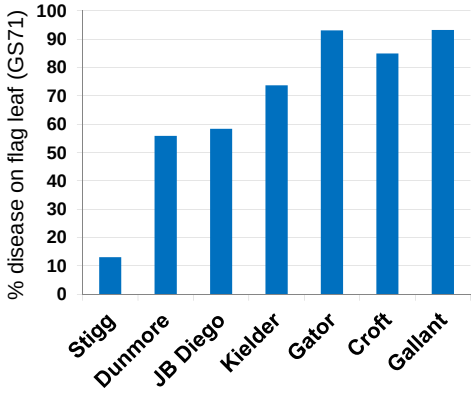
5 Dead leaf bearing pycnidia spores

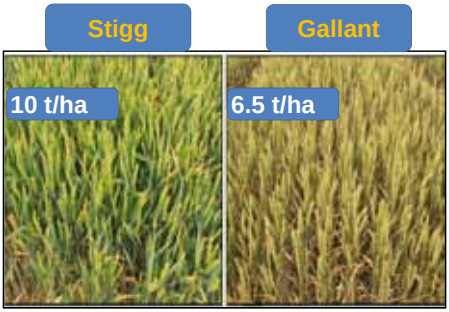
Department of Agriculture, Food and the Marine
Research Stimulus Fund
Project 14 S 819

Notes:

Latent Period Data







Take home messages

- Varieties with longer latent period are agood indicator of resistance
- Longer latent period reduce disease in the field and ultimately increase yield
- Fungicide timing critical- Although flag leaf may appear clean, disease may already be present

Research Stimulus Fund
Project 14 S 819

Notes:

Fungicide Resistance

The 1, 2, 3 of Fungicide Resistance Management

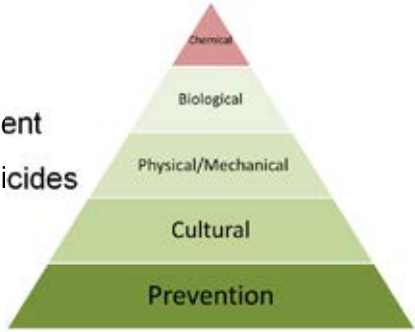
1. **Limit Number of Applications**

2. **Use Effective Rates**

3. **Mix Modes of Action**

IPM Strategy

- Adopt good agronomic practices
- Monitor disease and resistance development
- Proper choice of application timing & fungicides

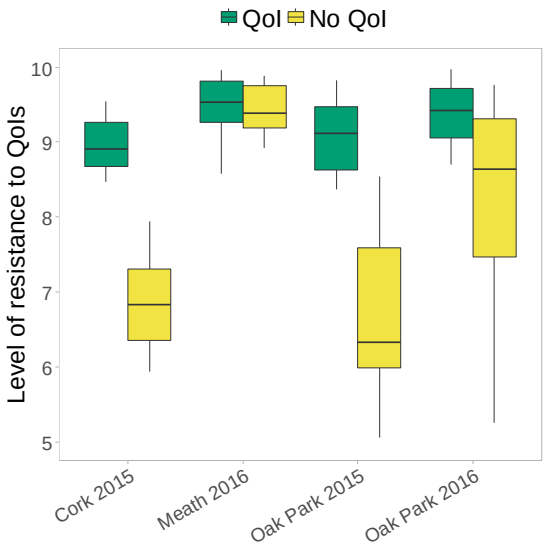


Notes:

Fungicide Resistance

What is fungicide resistance?

A fungal strain which adapts to survive and reproduce in the presence of a fungicide



Continued selection for resistance

Impacts of resistance

- Increased cost of production
- Poor disease control
- Loss of active ingredients

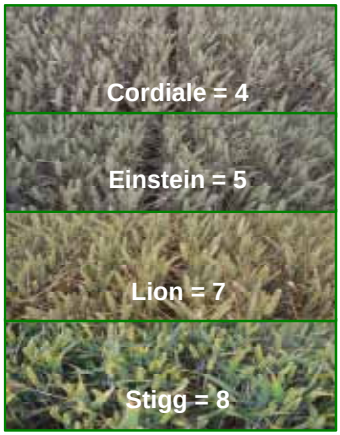
You don't need perfect disease control to maximise profit

Notes:

Host Adaptation in Septoria

What is Host Adaptation?

- Septoria has a very high *evolutionary potential*, and can adapt to break down resistance in important cultivars in < 5 years
- The reason for this is that Septoria is a highly sexual pathogen, capable of undergoing several sexual cycles per growing season



Implications

- Resistant cultivars are an effective and now essential strategy for control of septoria
- But resistance needs to be durable and risk of resistance breakdown minimized
- The more widely cultivated a resistant cultivar, the more rapidly its resistance is eroded

Notes:

Wheat Disease Control

What: Fungicide mixtures of different MoA including multisites

Know the target - Know the timing - Know the fungicide


Septoria tritici blotch


Eyespot


Yellow rust


Fusarium head blight


Powdery mildew

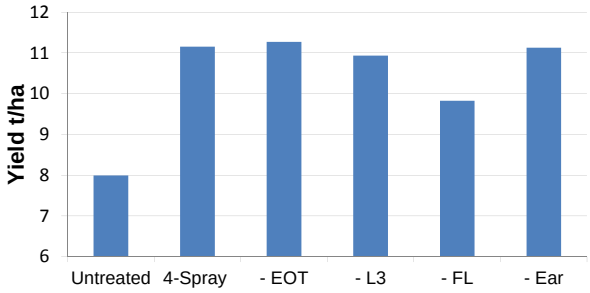
Put Together	End of Tillering	3rd Leaf Emerged	Flag Leaf Emerged	Start of Flowering
Low Disease Pressure	------	Azole (Mix) & Multi-site	SDHI / Azole & Multi-site	Azole (mix)
High Disease Pressure	Multisite & (Strob)	SDHI / Azole & Multisite	SDHI / Azole & Multisite	Azole (mix)

Notes:

Wheat Disease Control

The Why, When and What of winter wheat fungicide programmes

Why: Diseases can reduce potential yields



Impact of fungicide programmes on final yield

Root, stem, foliar and ear diseases reduced ability of wheat to realise yield potential

When: To protect the stem, upper leaves and ear from infection

Upper leaves essential to yield

Build programme to provide protection

Fungicide timing critical to effectiveness of programme

End of tillering	3rd leaf fully emerged	Flag leaf fully emerged	Start of flowering

Notes:

EPIC – IPM

Establishing a platform for IPM in Irish crops

Determining potential for IPM in Irish crops

- Detailed surveys of specialised arable, potato and horticultural systems
- Comparison of Irish practises to those used elsewhere in north-western Europe

Adapting IPM strategies to suit Irish needs

- Evaluating DSS optimised elsewhere in north-western Europe for Irish crops
- Model pest/pathosystems selected


Eyespot of wheat


Ramularia in barley


Potato late blight


Cereal aphids


Carrot root fly

Knowledge Transfer

- Utilising most effective means to communicate research findings

Notes: