ELVEDEN

AHDB

# SPot East Results Day
# 11 January 2018

POTATOES

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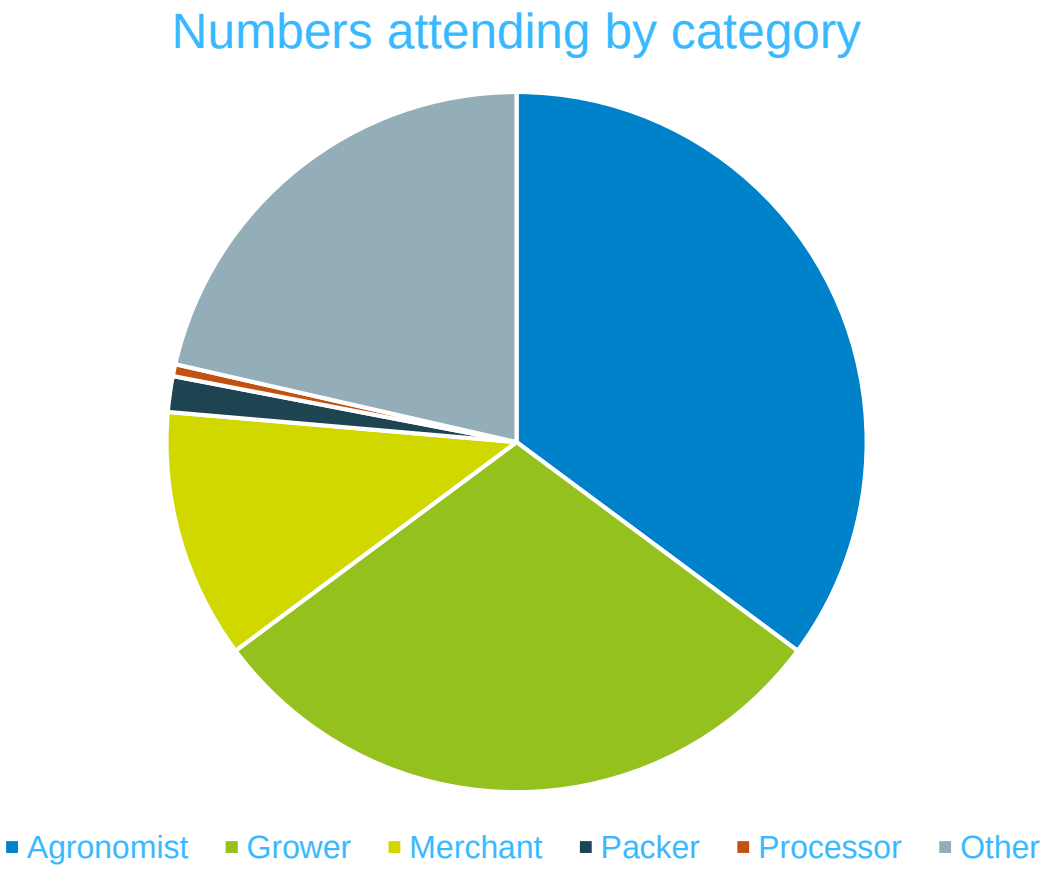
# Welcome

# Housekeeping


# Attendance at SPot East in 2017, Elveden Estate.



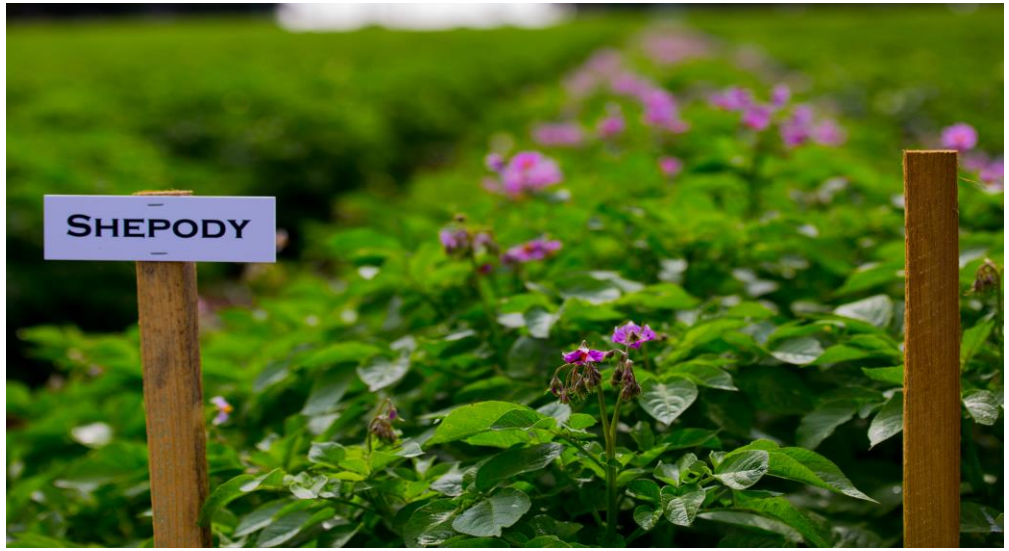

- **62%** of visitors to Spot East would make significant, some or minor changes to their working practices.
- **48%** of visitors would adopt new technologies.
- **75%** would attend another SPot Farm event.

Total numbers attending events through 2017 = 209

POTATOES

# Video

## SPot East Open Day -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# Audience participation

# Workshop


# Graham Tomalin, Herbicides

# AHDB SPot Farm East -Herbicide Demonstration

## Demonstration Objective 1- Residual

VCS Potatoes Ltd was commissioned to demonstrate the performance residual herbicide combinations in a medium sand soil site. The demonstration compared the performance of combinations and individual active substances to a standard application containing Linuron, pendimethalin and metribuzin.

VCS Potatoes Ltd

# AHDB SPot Farm East -Herbicide Demonstration

## Demonstration Objective 2- Post Emergence Contact Herbicide

The demonstration compared the performance of post emergence application of two rates of metribuzin and in combination with rimsulfuron on 23 varieties.


VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Background

Following changes to pesticide approval system to a new Regulation regime in 2009 – *'Regulation (EC) No. 1107/2009'* ' all new active substances or renewal of approvals of current active substances would need to comply with the new regulations

- **Hazard** not **risk** assessments
- Candidates for substitution list 77 active substances inc Linuron, Pendimethalin, Metribuzin and Flufenacet (7 year approvals)

## Linuron

- Linuron **Now Revoked End of use 3rd June 2018**

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Residual Demonstration Design

- Varieties

| Category | Varieties |
|---|---|
| Processing Varieties | R. Burbank, Royal, Daisy, Performer, Challenger, Shepody, Innovator, Forza |
| Prepack Varieties | Lanorma, Soraya, Jelly, Marfona, Nectar, Vales sovereign, Saxon, Melody |
| Crisping Varieties | Brooke |
| Salad Varieties | Maris Peer, Leontine |
| Ware Varieties | Maris Piper, Eurostar, Rooster, Markies |

- 13 non replicated plots with different residual herbicide applications
- All plots – Diaquat @ 3l/ha + NI Wetter at same timing to allow residual not contact comparison

| | Block A |
|---|---|
| Planting Date | 11th May |
| Application date | 5th June |
| Weed counts Assessment 1 | 16th June |
| Weed counts Assessment 2 | 3rd July |
| Weed counts Assessment 3 | 31st August |

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Demonstration Design

| Trt No. | Water Volume | Herbicide Application | Cost £/ha |
|---|---|---|---|
| 1 | | UNTREATED | £0 |
| 2 | 200 l/ha | **VCS 1717** *(aclonifen )* 2.5l/ha | TBC |
| 3 | 200 l/ha | **Stomp Aqua** (pendimethalin 455g/l) 2.8 l/ha | £22 |
| 4 | 200 l/ha | **Praxim** *(metobromuron 500g/l)* 4l/ha | £72 |
| 5 | 200 l/ha | **Gamit *36SC*** *(clomazone 360 g/l)* 200ml/ha | £15 |
| 6 | 200 l/ha | **No Product** *(flufenacet 500g/l)* 600g/ha (maximum rate within Artisit) | TBC |
| 7 | 200 l/ha | **Artist** *(metribuzin 17.5% + flufanacet 24%)* 1.2 kg/ha + **Stomp Aqua** *(pendimethalin 455g/l)* 2 l/ha | £45 |
| 8 | 200 l/ha | **Praxim** *(metabromuron 500g/l)* 2.5 l/ha + **Stomp Aqua** (pendimethalin 455g/l) 2 l/ha + **Shotput** (metribuzin 70%) 200 g/ha | £66 |
| 9 | 200 l/ha | **Praxim** *(metabromuron 500g/l)* 2.5 l/ha + **Defy** *(prosulfocarb800g/l)* 3l/ha + **Shotput** (metribuzin 70%) 200g/ha | £71 |
| 10 | 200 l/ha | **Stomp Aqua** (pendimethalin 455g/l) 2 l/ha + **Shotput** (metribuzin 70%) 400 g/ha | £26 |
| 11 | 300 l/ha | STANDARD **Afalon** *(linuron 500g/l)* 1.35l + **Stomp Aqua** *(pendimethalin 455g/l)* 2.2 l/ha + **Shotput** *(metribuzin 70%)* 200g/ha | £33 |
| 12 | 200 l/ha | **Shotput** *(metribuzin 70%)* 600g/ha | £14 |
| 13 | 200 l/ha | **Shotput** *(metribuzin 70%)* 600g/ha (irrigate 15mm 20 hours post application) | £14 |

Other Products are available with identical active substances!

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Phytotoxicity

Application of the residual active substances can lead to phytotoxic effects particularly

- Metribuzin – veinal yellowing/chlorosis – stunting – varietal variation *(label "do not use Shoput on sands")*
- Clomazone – chlorosis- whitening – varietal variation *(label " do not use Gamit 36EC on sands or very light soils")*
- Pendimethalin – slight yellowing of leaf margins, leaf distortions *(label Stomp Aqua "on stony or gravely soils there is a risk of crop damage especially if heavy rain falls soon after application")*
- Linuron – *(label Afalon " Use on all soil types except very light soils and sands")*

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

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Application of the residual active substances can lead to phytotoxic effects particularly

- Metribuzin – veinal yellowing/chlorosis – stunting – varietal variation *(label "do not use Shoput on sands")*

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

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VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

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VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Weeds Present on site

| | |
|---|---|
| Present- | Groundsel, S.nettle, Fat Hen, Runch, *Fools parsley, AMG, cranesbill* |
| Missing (expected)- | B.bindweed, Mayweed, Knotgrass |
| Missing (not expected) – | Redshank, Pale persicaria, W.oats, Blackgrass |

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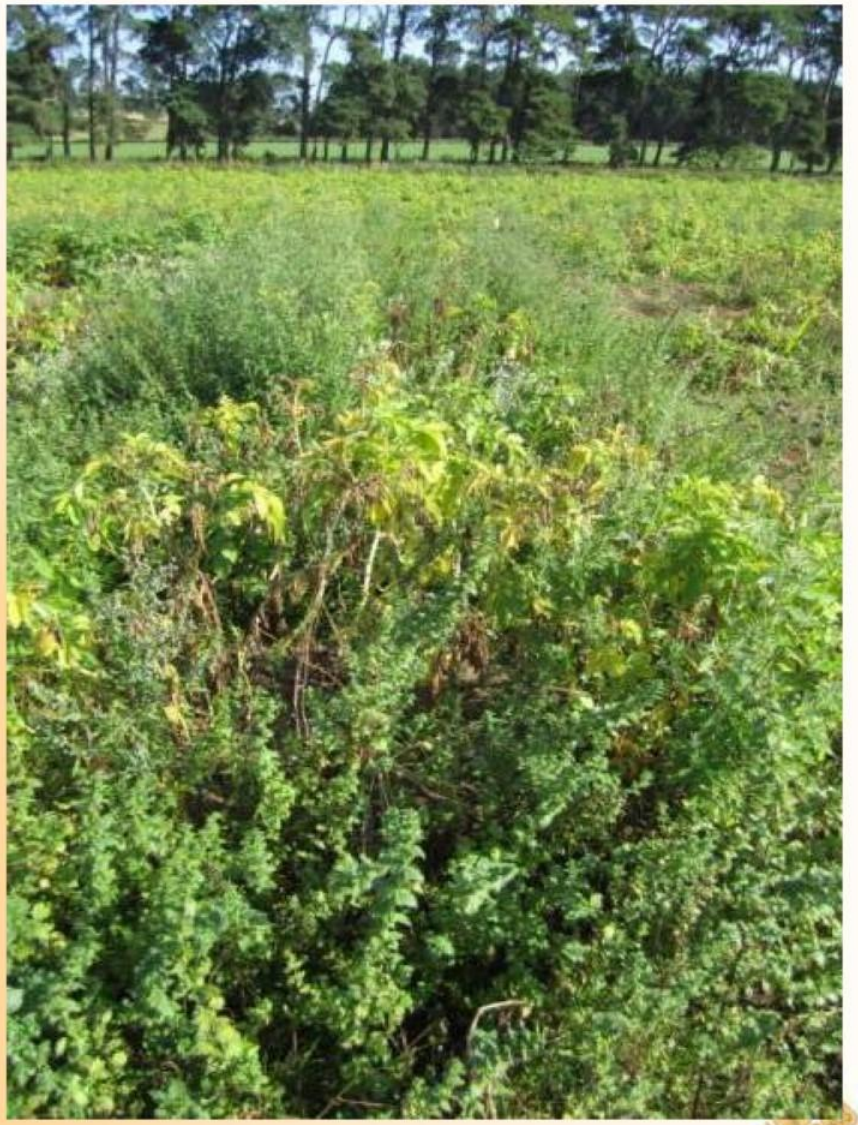
# AHDB SPot Farm East Residual Herbicide Demonstration

Weeds Present on site



VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

Weeds Present on site

VCS Potatoes Ltd

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# AHDB SPot Farm East Residual Herbicide Demonstration

Weeds Present on site

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Weeds Present on site

Present (High levels)- Groundsel & S.nettle

Moderate level - Fat Hen & Runch

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Groundsel – Observations/Weed Counts

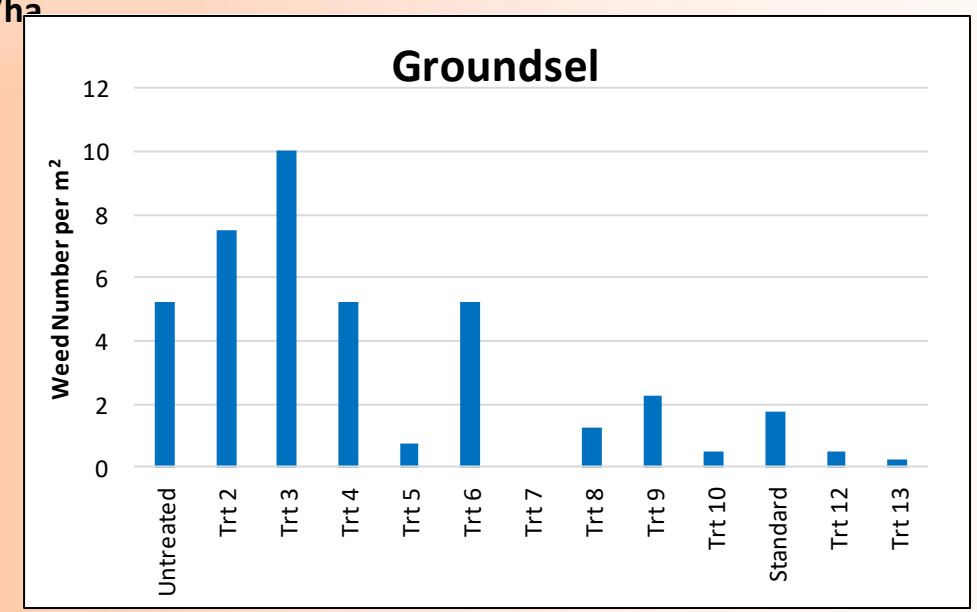
**High Control**

- Trt 7 **Artist** *(metribuzin175g/kg + flufenacet 240g/kg)* **1.2kg/ha** + **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha**
- Trt 13 **Shotput** *(metribuzin70%)* **600g/ha**
- Trt 12 **Shotput** *(metribuzin70%)* **600g/ha**

**Low Control**

- Trt 3 **Stomp Aqua** *(pendimethalin 455g/l)* **2.8 l/ha**
- Trt 2 **No Product VCS1717** *(aclonifen xxg/l)* **2.5 l/ha**
- Trt 6 **No Product** *(flufenacet 500g/l)* **600g/ha**

- Improved control with increasing rates of a.i. Metribuzin
- Good activity – linuron/clomazone
- Low - moderate activity metobromuron




VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Groundsel – Observations/Weed Counts

Trt 7 **Artist** *(metribuzin225g/kg + flufenacet xx)* **1.2kg/ha** + **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha**

Trt 3 **Stomp Aqua** *(pendimethalin 455g/l)* **2.8 l/ha**

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## S.Nettle – Observations/Weed Counts

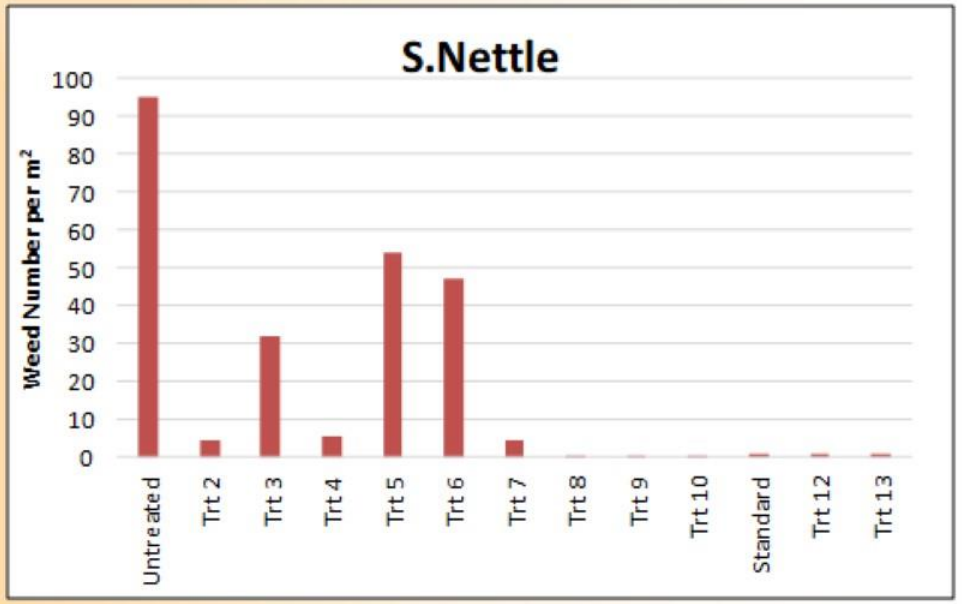
**High Control**

- Trt 8 **Praxim** *(metobromuron 500g/l)* **2.5l/ha + Stomp Aqua***(pendimethalin 455g/l)* **2.2 l/ha + Shotput** *(metribuzin70%)* **200g/ha**
- Trt 9 **Praxim** *(metobromuron 500g/l)* **2.5l/ha + Defy** *(prosulfocarb 800 g/l)* **3l/ha + Shotput** *(metribuzin70%)* **200g/ha**
- Trt 10 **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha + Shotput** *(metribuzin70%)* **400g/ha**

**Low Control**

- Trt 5 **Gamit 36CS** *(clomazone 360 g/l)* ***200ml/ha***
- Trt 6 **No Product** *(flufenacet 500g/l)* **600g/ha**
- Trt 10 **Stomp Aqua** *(pendimethalin 455g/l)* **2.8 l/ha**

- Good control within 3 way mixes
- Moderate activity metobromuron/metribuzin/pendimethalin/aclonifen
- Poor activity clomazone, flufenacet




VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## S.Nettle – Observations/Weed Counts

Trt 8 **Praxim** *(metobromuron 500g/l)* **2.5l/ha + Stomp Aqua***(pendimethalin 455g/l)* **2.2 l/ha + Shotput** *(metribuzin70%)* **200g/ha**

➢Trt 5 **Gamit 36CS** *(clomazone 360 g/l)* ***200ml*/ha**

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

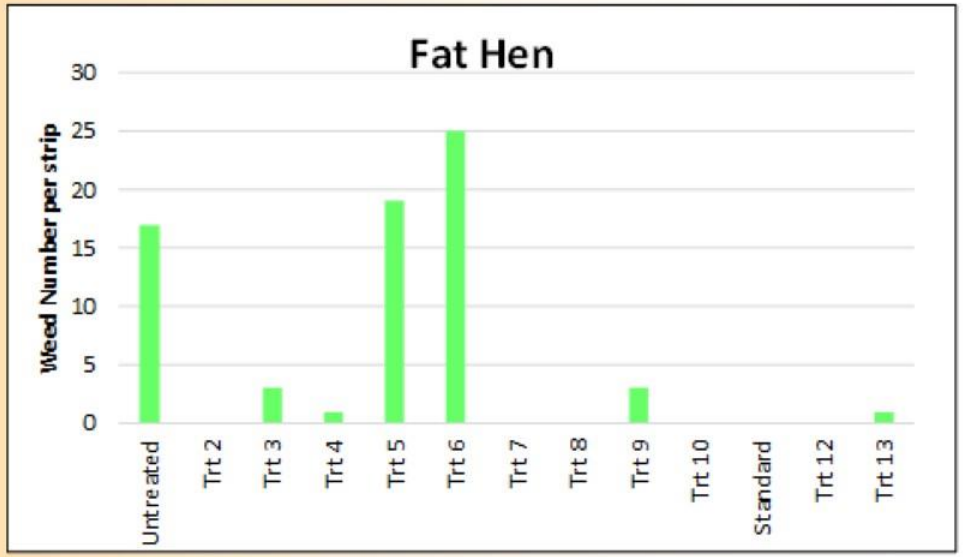
## Fat Hen – Observations/Weed Counts

**High Control**

- Trt 7 **Artist** *(metribuzin175g/kg + flufenacet 240 g/kg)* **1.2kg/ha** + **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha**
- Trt 2 **No Product VCS1717** *(aclonifen xxg/l)* **2.5 l/ha**
- Trt 8 **Praxim** *(metobromuron 500g/l)* **2.5l/ha + Defy** *(prosulfocarb 800 g/l)* **3l/ha + Shotput** *(metribuzin70%)* **200g/ha**

**Low Control**

- Trt 5 **Gamit 36CS** *(clomazone 360 g/l)* ***200ml*/ha**
- Trt 6 **No Product** *(flufenacet 500g/l)* **600g/ha**




- Good activity VCS 1717
- Moderate activity pendimethalin, linuron, metribuzin & metobromuron
- Poor activity clomazone & flufenacet

Note – weed counts full strip

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Fat Hen – Observations/Weed Counts

Trt 7 **Artist** *(metribuzin175g/kg + flufenacet 240 g/kg)* **1.2kg/ha** + **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha**

Trt 5 **Gamit 36CS** *(clomazone 360 g/l)* ***200ml*/ha**

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

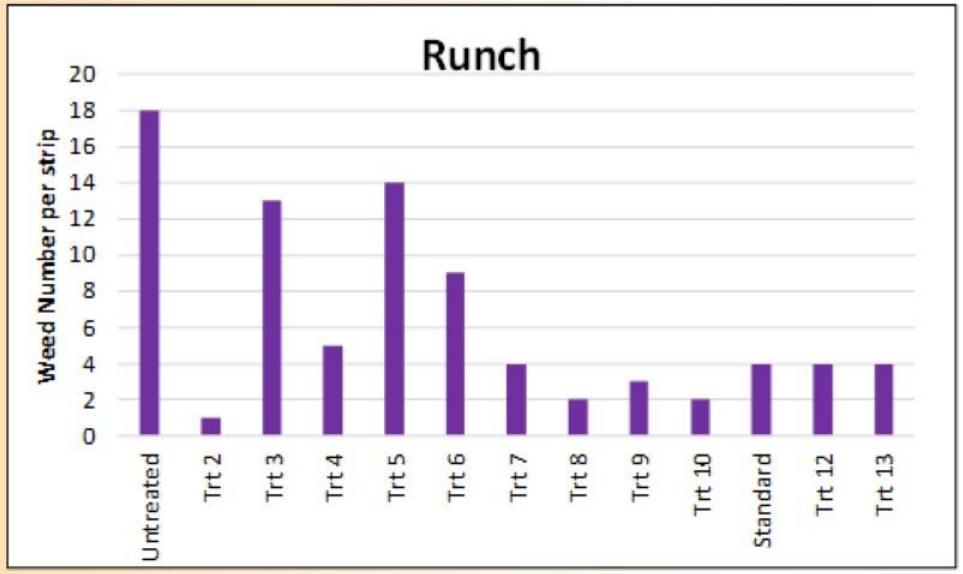
## Runch – Observations/Weed Counts

**High Control**

- Trt 2 **No Product VCS1717** *(aclonifen xxg/l)* **2.5 l/ha**
- Trt 8 **Praxim** *(metobromuron 500g/l)* **2.5l/ha + Defy** *(prosulfocarb 800 g/l)* **3l/ha + Shotput** *(metribuzin70%)* **200g/ha**
- Trt 10 **Stomp Aqua** *(pendimethalin 455g/l)* **2 l/ha + Shotput** *(metribuzin70%)* **400g/ha**

**Low Control**

- Trt 3 **Stomp Aqua** *(pendimethalin 455g/l)* **2.8 l/ha**
- Trt 5 **Gamit 36CS** *(clomazone 360 g/l)* ***200ml/ha***
- Trt 6 **No Product** *(flufenacet 500g/l)* **600g/ha**




- Good activity metribuzin, VCS 1717
- Moderate activity metobromuron
- Poor activity pendimethalin, clomazone, flufenacet

Note – weed counts full strip

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Runch – Observations/Weed Counts

Trt 2 **No Product VCS1717** *(aclonifen xxg/l)* **2.5 l/ha**

Trt 3 Stomp Aqua *(pendimethalin 455g/l)* 2.8 l/ha

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Overall– Observations - Residuals

Stomp Aqua *(pendimethalin 455g/l)*2l/ha +Shotput *(metribuzin 70%)* *400*g/ha – Trt 10 £26/ha

Praxim *(metobromuron 500g/l)* 2.5l/ha + Defy *(prosuflocarb 800g/l)* 3 l/ha +Shotput *(metribuzin 70%)* 200g/ha – Trt 8 £71/ha

- Commercially acceptable performance from Trt 7,8,9,10,11 STD,12,13
- The level of metribuzin within 7,10,12,13 high for some varieties on this soil type
- 3 active substance combinations provided broader(and better on this site) control
- VCS 1717 – aclonifen useful contribution Fat Hen, Runch and S.nettle
- Post Linuron the cost of residual herbicide applications will increase – sand/sandy loams
- Maximising the control using safe levels of remaining active substances targeting the components for the expected weed spectrum.

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Post emergence Herbicide

| Trt No. | Water Volume | Herbicide Application | Cost £/ha |
|---|---|---|---|
| 14 | 200l/ha | **Shotput** *(metribuzin 70%)* 200g/ha | **£4.70** |
| 15 | 200 l/ha | **Shotput** *(metribuzin 70%)* 500g/ha | **£11.70** |
| 16 | 200 l/ha | **Shotput** *(metribuzin 70%)* 200g/ha +**Titus** *(rimsulfuron)* 30g/ha + NI Wetter 200ml/ha | **£20** |

- Application @ 15-20cm crop height – 20th June
- Significantly reduced level of scorch than anticipated, all treatments

Other Products are available with identical active substances!

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Post emergence Herbicide

Trt 15 - Shotput 500g/ha

Severe Scorch – Innovator

Moderate Scorch - Eurostar

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Post emergence Herbicide

Trt 15 - Shotput 500g/ha

Slight Scorch – Lanorma

No Scorch - Challenger

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Post emergence Herbicide

Trt 15 - Shotput 500g/ha

| Variety | Phytotoxicity Score (0 none – 9 severe) – post emergence treatments assessed 30th June | | |
|---|---|---|---|
| | Treatment 14 200g/ha Shotput | Treatment 15 500g/ha shotput | Treatment 16 200g/ha Shotput + 30g/ha Titus+ 200ml NI Wetter |
| Maris Piper | 2 | 6 | 4 |
| Performer | 1 | 4 | 3 |
| Eurostar | 2 | 5 | 2 |
| Lanorma | 1 | 2 | 2 |
| Challenger | 0 | 0 | 0 |
| Shepody | 2 | 4 | 3 |
| Maris Peer | 2 | 5 | 4 |
| Leontine | 0 | 3 | 1 |
| Royal | 0 | 2 | 1 |
| Soraya | 0 | 1 | 2 |
| Rooster | 0 | 1 | 2 |
| Jelly | 1 | 2 | 1 |
| Markies | 0 | 1 | 1 |
| Melody | 2 | 4 | 4 |
| Innovator | 4 | 7 | 5 |
| Russet Burbank | 1 | 2 | 2 |
| Daisy | 1 | 3 | 2 |
| Forza | 4 | 8 | 6 |
| Marfona | 0 | 0 | 0 |
| Nectar | 1 | 4 | 3 |
| Brooke | 0 | 0 | 1 |
| Vales sovereign | 0 | 0 | 1 |
| Saxon | 0 | 0 | 0 |

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

## Post emergence Herbicide

Trt 15 - Shotput 500g/ha

| Tollerant | Low Sensitivity | Moderate Sensitivity | High Sensivity |
|---|---|---|---|
| V.Sovereign | Royal | M.piper | Forza |
| Brooke | Daisy | Leontine | Innovator |
| Marfona | Lanorma | Eurostar | M.Peer |
| Saxon | R.Burbank | Melody | |
| Rooster | Jelly | Nectar | |
| Challenger | | Performer | |
| Soraya | | Shepody | |
| Markies | | | |

2017 Demonstration Results – Caution not Recommendation!

VCS Potatoes Ltd

# AHDB SPot Farm East Residual Herbicide Demonstration

2018

- Continue to Assess Residual herbicides – VCS 1717
- Continue weed spectrum comparisons target site Praxim – B.Bindweed Knotgrass & Mayweed (earlier application)
- Further investigations – metribuzin/clomazone, application rates sands, variety interactions

VCS Potatoes Ltd would like to thank Elveden Estates and AHDB potatoes for their assistance with this demonstration

VCS Potatoes Ltd

# Coffee and networking opportunity

# Dr. Mark Stalham, Common Scab Irrigation

# Key questions under investigation:

- What is the best irrigation regime to control common scab on different soil types for varieties differing in susceptibility to scab?
- How does a grower identify the ideal scab control period for maincrop and salad varieties?
- When is the scab control period over?

# Maximum SMD (mm) for common scab control in different varietal scheduling groups (AHDB R448)

Notes:
SMD for top 25 cm of ridge and stone-free ridge profile. This can be calculated by water balance ('model'), directly measured or converted from soil water tension.

†Marabel and Safari: tentative.

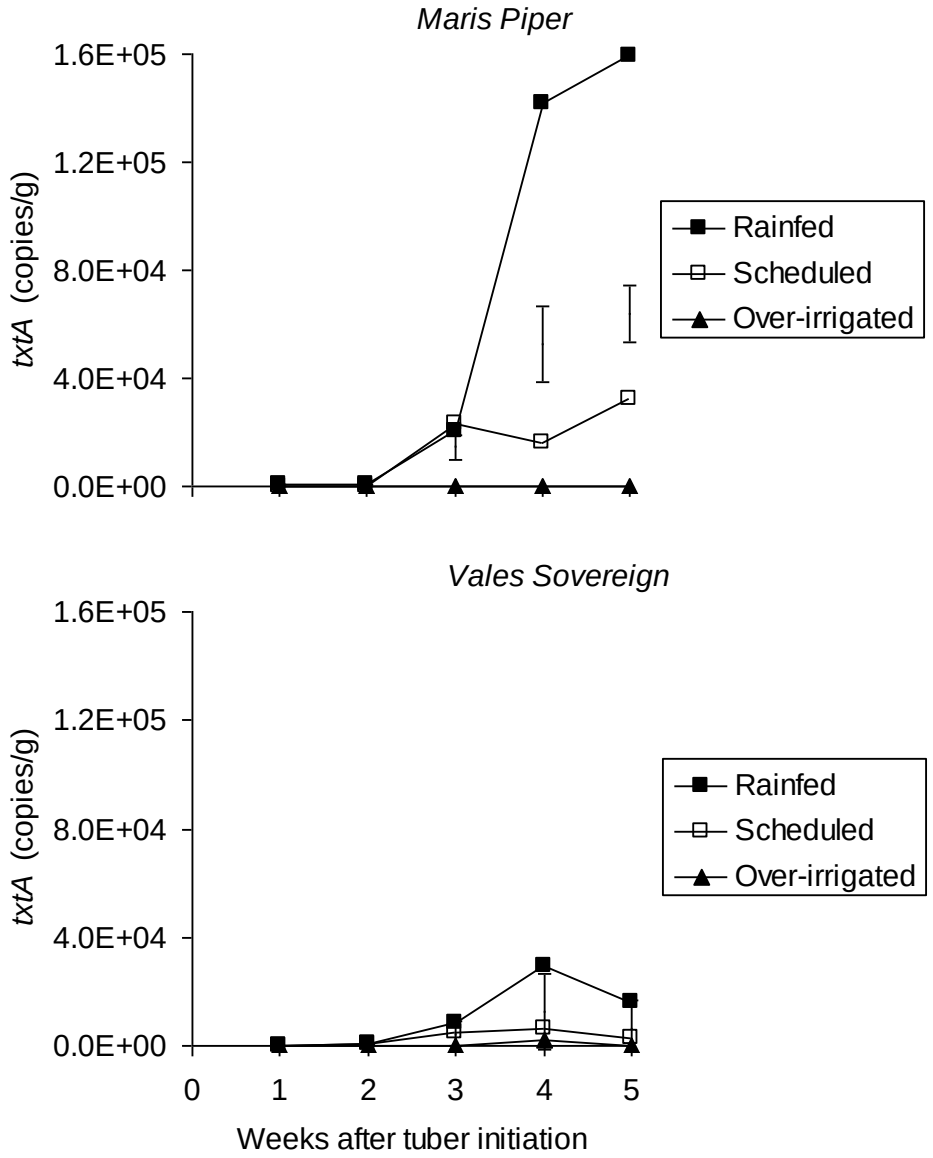
‡Excessively cloddy soils may need to be maintained at a smaller SMD.

Values in () are the rankings for common scab resistance in Potato Council Variety Database. 1 = most susceptible, 9 =fully resistant.

| | Group | 1. Susceptible | 2. Intermediate | 3. Resistant |
|---|---|---|---|---|
| | | Maris Piper(1)<br>Maris Peer (5) | Charlotte (4)<br>Desiree (4)<br>Estima (6)<br>Exquisa<br>Flair<br>King Edward (7)<br>Marabel†<br>Melody (7)<br>Nectar (6)<br>Rooster (6)<br>Sylvana (7)<br>Safari† (4)<br>Venezia<br>Vivaldi (5) | Bute (4)<br>Electra (8)<br>Elfe<br>Jelly (6)<br>Lanorma (7)<br>Orchestra (8)<br>Perline<br>Regina<br>Vales Sovereign (7)<br>Volare (5) |
| Sand | | 9.8 | 14.6 | 18.8 |
| Loamy Sand | | 12.0 | 17.9 | 23.1 |
| Sandy Loam | | 13.4 | 20.0 | 25.8 |
| Sandy Silt Loam | | 14.4 | 21.5 | 27.7 |
| Silt Loam | | 16.3 | 24.3 | 31.4 |
| | | 14.4 | 21.5 | 27.7 |

# Tuber initiation (TI)

# Pathogenic *Streptomyces* populations: the key to timing?



# Recommendations

- Ensure that the soil is moist to wet throughout the ridge from 1 to 3 weeks after TI
- Pathogenic *Streptomyces* multiply rapidly as the soil dries out
- Don’t stop after 2 weeks!
- Irrigation outside this period is mainly for:
  - Wetting up ridges following dry periods (a single irrigation is often inadequate)
  - Very susceptible varieties (e.g. Maris Piper for pre-pack)
  - Maintaining wet conditions where tubers develop/expand more slowly (e.g. salads)

# Background

- Scab control for packing crops (15 varieties)
- Sand (91 % S, 5 % Z, 4 % C, 2.2 % OM)
- Irrigation regimes
- Standard: 10 mm SMD in bed from TI for 4 weeks, 18 mm application
- Half-frequency 20 mm SMD in bed, 27 mm application
- Irrigation scheduled by Elveden
- Surrounding crop: Red Fantasy
- Planting date (hand): 18 April

# 2017: emergence / TI

| **Planted** | **Emergence date** | | | **Emergence (days after planting)** | | | **TI** | **TI (days after emergence)** | ***2016*** |
|---|---|---|---|---|---|---|---|---|---|
| 18-Apr | First | 50% | 90% | 50% | First-50 % | First-90% | 50% | 50% | *50%* |
| Bute | 18-May | 22-May | 24-May | 34 | 4 | 6 | 10-Jun | 19 | *n/a* |
| Estima | 22-May | 24-May | 26-May | 36 | 2 | 4 | 11-Jun | 18 | *15* |
| Jelly | 20-May | 23-May | 25-May | 35 | 3 | 5 | 12-Jun | 20 | *19* |
| Juliette | 19-May | 23-May | 25-May | 35 | 4 | 6 | 11-Jun | 19 | *19* |
| Lanorma | 19-May | 22-May | 25-May | 34 | 3 | 6 | 06-Jun | 15 | *15* |
| Leontine | 18-May | 21-May | 27-May | 33 | 3 | 9 | 04-Jun | 14 | *12* |
| Maris Peer | 14-May | 17-May | 21-May | 29 | 3 | 7 | 05-Jun | 19 | *16* |
| Maris Piper | 18-May | 22-May | 25-May | 34 | 4 | 7 | 11-Jun | 20 | *17* |
| Melody | 19-May | 21-May | 23-May | 33 | 2 | 4 | 09-Jun | 19 | *18* |
| Nectar | 18-May | 21-May | 23-May | 33 | 3 | 5 | 09-Jun | 19 | *19* |
| Red Fantasy | 20-May | 23-May | 25-May | 35 | 3 | 5 | 11-Jun | 19 | *22* |
| Rooster | 20-May | 23-May | 25-May | 35 | 3 | 5 | 10-Jun | 18 | *18* |
| Saxon | 20-May | 23-May | 25-May | 35 | 3 | 5 | 09-Jun | 17 | *15* |
| Soraya | 20-May | 23-May | 25-May | 35 | 3 | 5 | 08-Jun | 16 | *18* |
| Vales Sovereign | 21-May | 24-May | 26-May | 36 | 3 | 5 | 10-Jun | 17 | *18* |
| **Mean** | **19-May** | **22-May** | **24-May** | **34** | **3** | **6** | **09-Jun** | **18** | ***17*** |

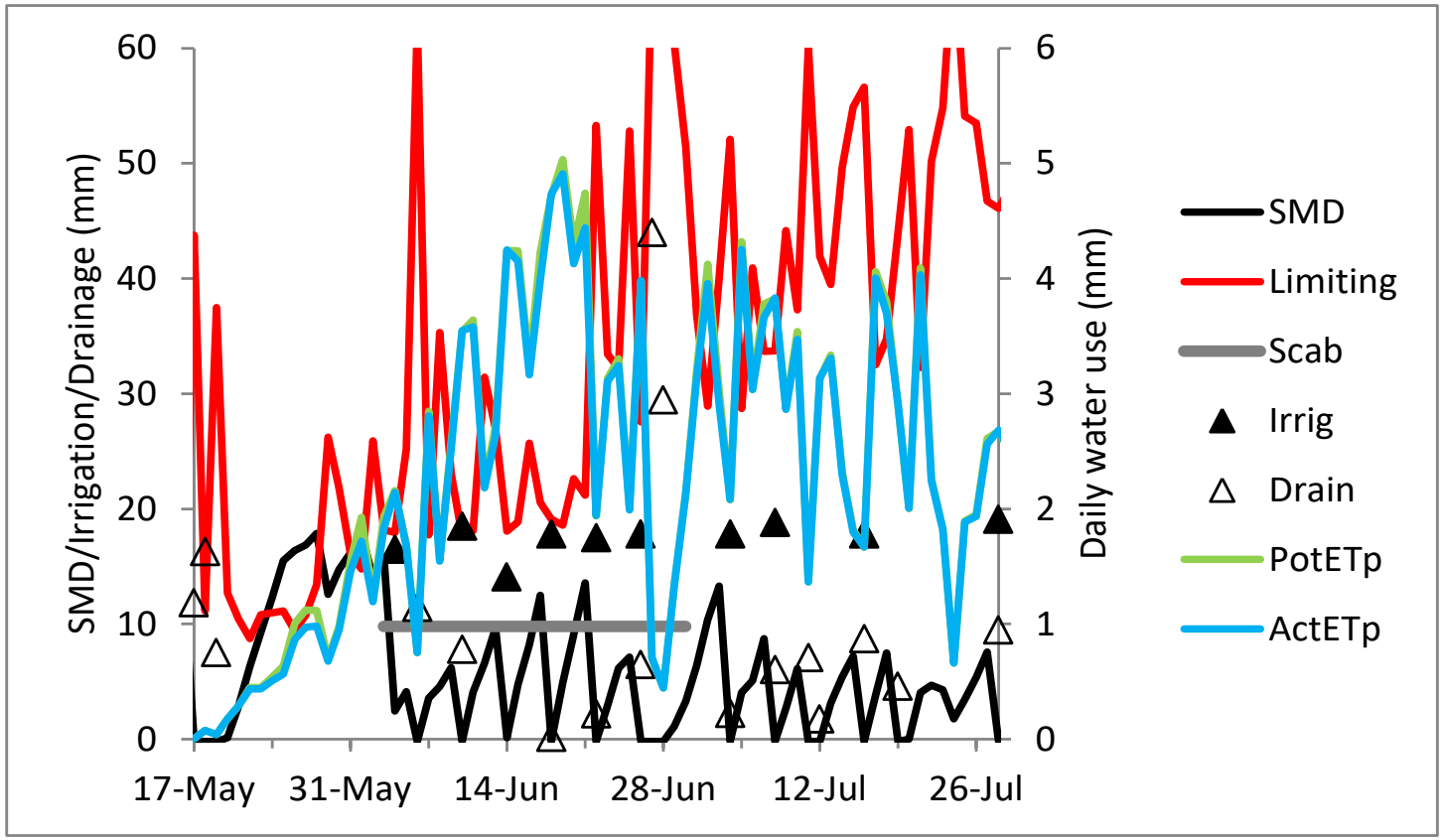
- Emergence occurred over short period (c. 6 days from first to 90 % emergence)
- Emergence to TI = 18 days (1 day longer than in 2016)
- Red Fantasy and Leontine not as extreme as in 2016, but still an 8-day variation in date of TI across varieties

# Timings 2016/2017

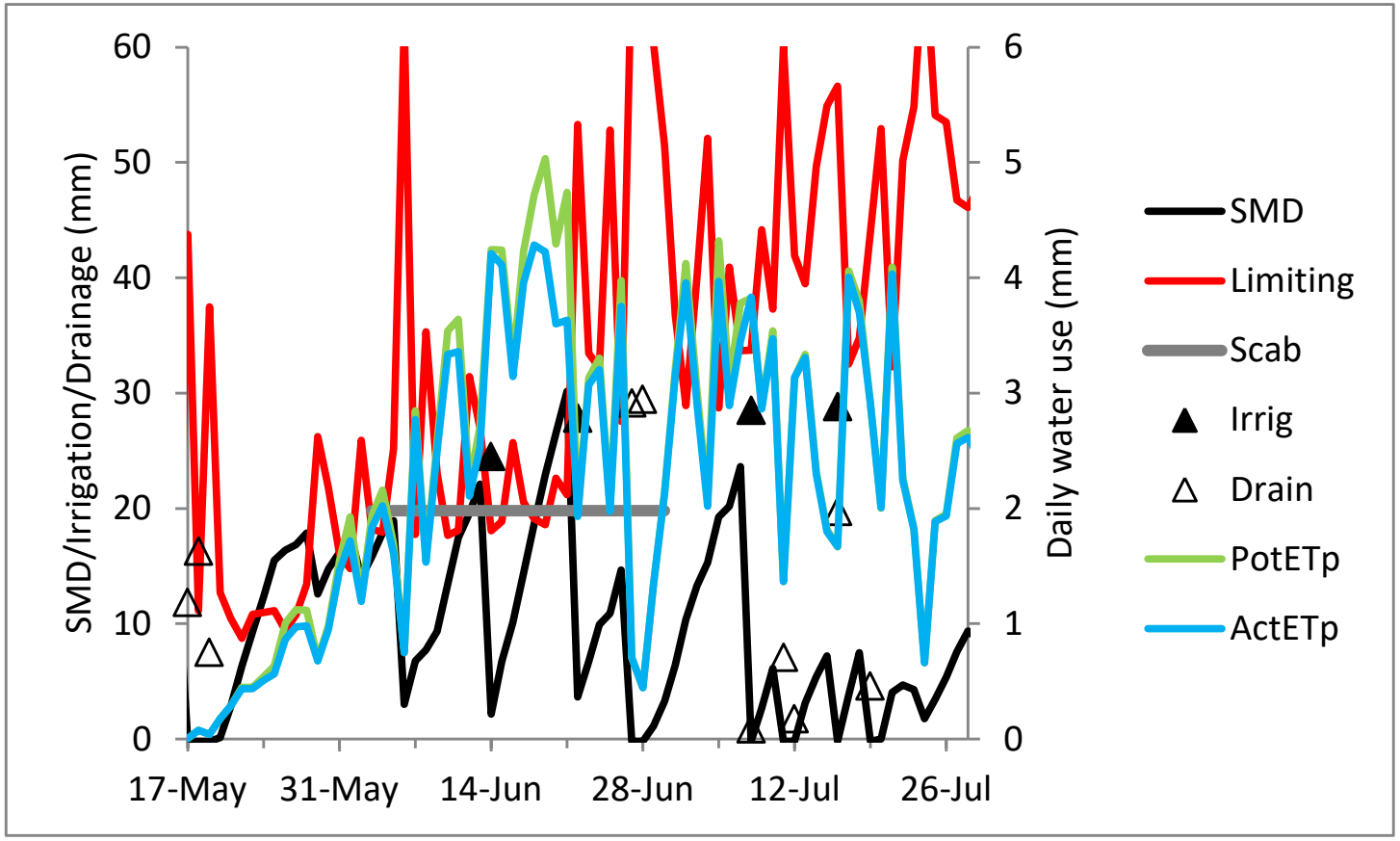
| | Emer First-50 % | Emer First-90% | Emer-TI 50% |
|---|---|---|---|
| Bute | 4 | 6 | 19 |
| Estima | 3 | 5 | 17 |
| Jelly | 3 | 5 | 20 |
| Juliette | 4 | 7 | 19 |
| Lanorma | 4 | 7 | 15 |
| Leontine | 4 | 8 | 13 |
| Maris Peer | 4 | 7 | 18 |
| Maris Piper | 4 | 7 | 19 |
| Melody | 2 | 5 | 19 |
| Nectar | 3 | 5 | 19 |
| Red Fantasy | 4 | 7 | 21 |
| Rooster | 3 | 6 | 18 |
| Saxon | 4 | 6 | 16 |
| Soraya | 3 | 5 | 17 |
| Vales Sovereign | 5 | 16 | 18 |
| **Mean** | **3** | **7** | **18** |

- Key is to know what time lapse is between emergence and TI: 18 ± 2 days
- Varieties with a short period are at a greater risk from delayed start and failure to wet up ridge

# Scab 2017: soil moisture deficits
# a) Standard 18 mm
# Earliest TI: 4 June. First irrigations: 4, 10 & 14 June



# Scab 2017: soil moisture deficits
# b) Infrequent 27 mm
# Earliest TI: 4 June. First irrigation: 14 June



# Common scab data

| Treatment | Variety | Proportion packable (%) | Severity (% SA) | Cracking (%) | Powdery scab (%) |
|---|---|---|---|---|---|
| Standard | Bute (7) | 71 | 4.4 | 10 | 0 |
| Infrequent | Bute | 94 | 2.0 | 0 | 0 |
| Standard | Estima (3) | 97 | 1.8 | 9 | 58 |
| Infrequent | Estima | 97 | 1.6 | 8 | 47 |
| Standard | Jelly (5) | 93 | 1.3 | 1 | 63 |
| Infrequent | Jelly | 100 | 0.8 | 0 | 54 |
| Standard | Juliette (6) | 88 | 3.0 | 2 | 0 |
| Infrequent | Juliette | 99 | 1.2 | 2 | 0 |
| Standard | Lanorma (4) | 96 | 1.2 | 0 | 17 |
| Infrequent | Lanorma | 99 | 1.1 | 1 | 4 |
| Standard | Leontine (8) | 93 | 2.4 | 0 | 29 |
| Infrequent | Leontine | 74 | 4.1 | 0 | 22 |
| Standard | M Peer (6) | 82 | 2.9 | 0 | 7 |
| Infrequent | M Peer | 78 | 4.1 | 0 | 8 |
| Standard | M Piper (3) | 80 | 4.9 | 0 | 0 |
| Infrequent | M Piper | 21 | 18.1 | 0 | 0 |
| Standard | Melody (5) | 97 | 1.7 | 0 | 0 |
| Infrequent | Melody | 96 | 1.5 | 3 | 0 |
| Standard | Nectar (4) | 87 | 2.6 | 0 | 75 |
| Infrequent | Nectar | 70 | 4.7 | 1 | 45 |
| Standard | R Fantasy (6) | 99 | 1.0 | 0 | 2 |
| Infrequent | R Fantasy | 80 | 3.6 | 1 | 2 |
| Standard | Rooster (6) | 90 | 2.4 | 1 | 2 |
| Infrequent | Rooster | 87 | 2.9 | 1 | 2 |
| Standard | Saxon (6) | 95 | 1.7 | 0 | 1 |
| Infrequent | Saxon | 55 | 7.7 | 1 | 0 |
| Standard | Soraya (7) | 90 | 2.7 | 0 | 0 |
| Infrequent | Soraya | 96 | 1.7 | 2 | 0 |
| Standard | V Sovereign (3) | 100 | 0.9 | 0 | 4 |
| Infrequent | V Sovereign | 94 | 2.0 | 0 | 1 |
| **Standard** | | **91** | **2.3** | **1** | **17** |
| **Infrequent** | | **83** | **3.8** | **1** | **12** |

# Maris Piper

## 10 mm SMD

## 20 mm SMD

# Jelly

## 10 mm SMD

## 20 mm SMD

# Juliette

## 10 mm SMD

## 20 mm SMD

# Leontine

## 10 mm SMD

## 20 mm SMD

# Maris Peer

## 10 mm SMD

## 20 mm SMD

# Red Fantasy

## 10 mm SMD

## 20 mm SMD


# Soraya

## 10 mm SMD

## 20 mm SMD


# Summary

- Incidence of common scab much worse than 2016
- Maris Piper bad common scab with infrequent irrigation
- Why was scab bad if initial irrigation timing correct?
- Infrequent regime: worse scab in Leontine, Maris Peer, Nectar, Red Fantasy and Saxon
- Powdery scab increased with Standard (frequent) irrigation, but confined to certain varieties

# Common scab control in different varietal scheduling groups (revised table)

Notes:
Soil moisture deficit (SMD) for top 25 cm of stone-free ridge profile. This can be calculated by water balance ('model'), directly measured or converted from soil water tension.

†Excessively cloddy soils may need to be maintained at a smaller SMD.

Values in () are the rankings for common scab resistance in AHDB Potato Variety Database. 1 = most susceptible, 9 = fully resistant.

| | Varietal scheduling group | | | |
|---|---|---|---|---|
| | 1. V. Susceptible | 2. Susceptible | 3. Intermediate | 4. Resistant |
| | Maris Piper(1) | Charlotte (4) | Bute (4) | Electra (8) |
| | Maris Peer (5) | Desiree (4) | Estima (6) | Elfe |
| | | Leontine | Exquisa | Jelly (6) |
| | | Marabel | Flair | Lanorma (7) |
| | | Nectar (4) | Juliette (7) | Orchestra (8) |
| | | Red Fantasy | King Edward (7) | Perline |
| | | Rooster (6) | Melody (7) | Regina |
| | | Safari (4) | Soraya | Vales Sovereign (7) |
| | | Saxon (5) | Sylvana (7) | Volare (5) |
| | | Venezia (3) | | |
| | | Vivaldi (5) | | |
| Sand | 9.8 | 12.7 | 15.6 | 18.8 |
| Loamy Sand | 12.0 | 15.9 | 19.3 | 23.1 |
| Sandy Loam | 13.4 | 17.8 | 21.5 | 25.8 |
| Sandy Silt Loam | 14.4 | 19.0 | 23.0 | 27.7 |
| Silt Loam | 16.3 | 21.5 | 26.2 | 31.4 |
| Clay Loam/Clay† | 14.4 | 19.0 | 23.1 | 27.7 |


# Thank you

# Reducing Runoff


Ed Bramham-Jones
CamEO Farm Advisor
Norfolk Rivers Trust

Joanna Niziolomski
Cranfield University

# Background

- Elveden Estate sits within the Cam and Ely Ouse Catchment (CamEO), with land across two river catchments of the Lark and Little Ouse.
- Water and environmental Stewardship is key to the Farm as a part of it's land management commitments.
- Runoff from Potatoes and other crops have previously occurred on gently sloping fields.

**Key question under investigation: How effective are various mitigation techniques at helping prevent Diffuse Pollution.**

**Aims:**

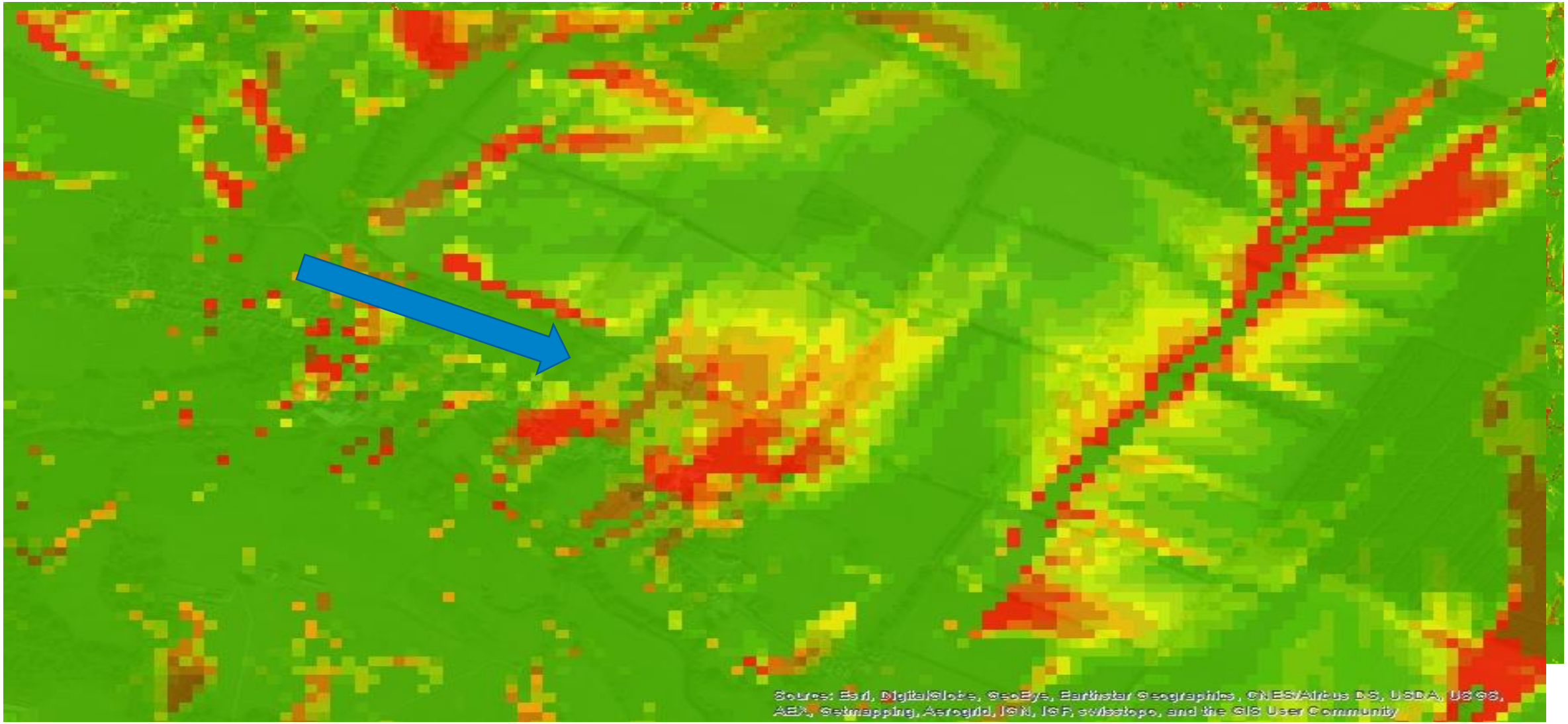
Practical in-field solutions to:

- Reduce runoff of sediments, nutrients and pesticides
- More efficient use of water within beds and wheelings
- Reduction in standing water in wheelings to improve trafficking

# SCIMAP Opportunity runoff mapping

Dando Field – 4% slope

Length of Field – 250m



# Field Layout

- 36 Plots
- 6 Treatments
- Each Treatment with 1 replicate of Boom and Rain gun irrigation @ 15mm

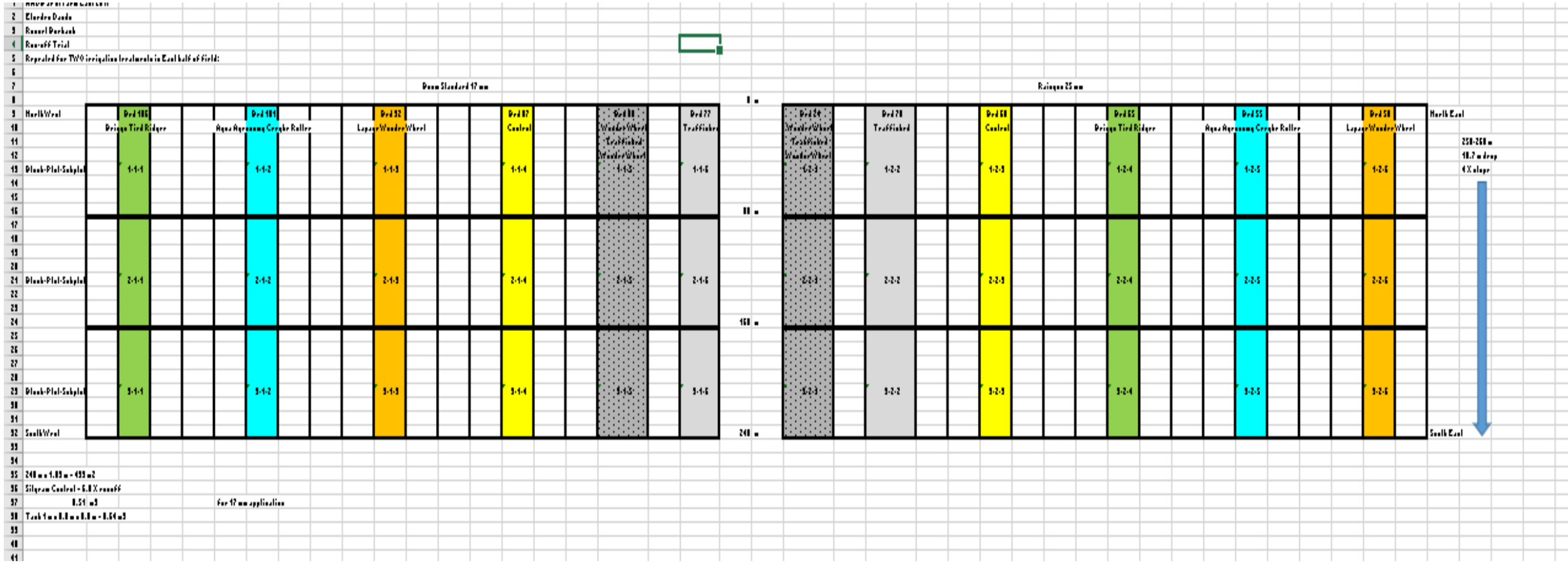
Treatments

- Creyke Aqua Agronomy Wheeltrack Roller
- Briggs Tied Ridger
- Bye Engineering Wonderwheel
- Control

} Implemented 13th April

- Trafficked - Implemented 23rd May
- Trafficked (4 passes with 14 tonne sprayer) with Bye Engineering Wonderwheel – Implemented 24th May

# Field Layout

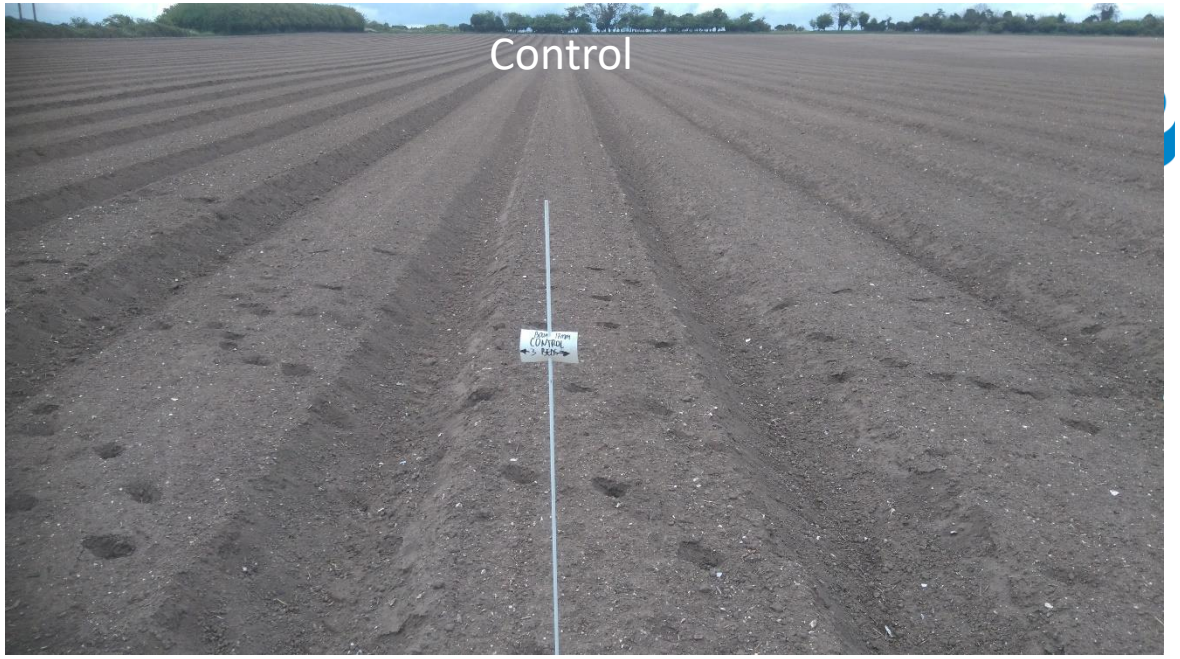


# Creyke
# Wheeltrack Roller

# Briggs Tied Ridger

# Bye Engineering Wonderwheel

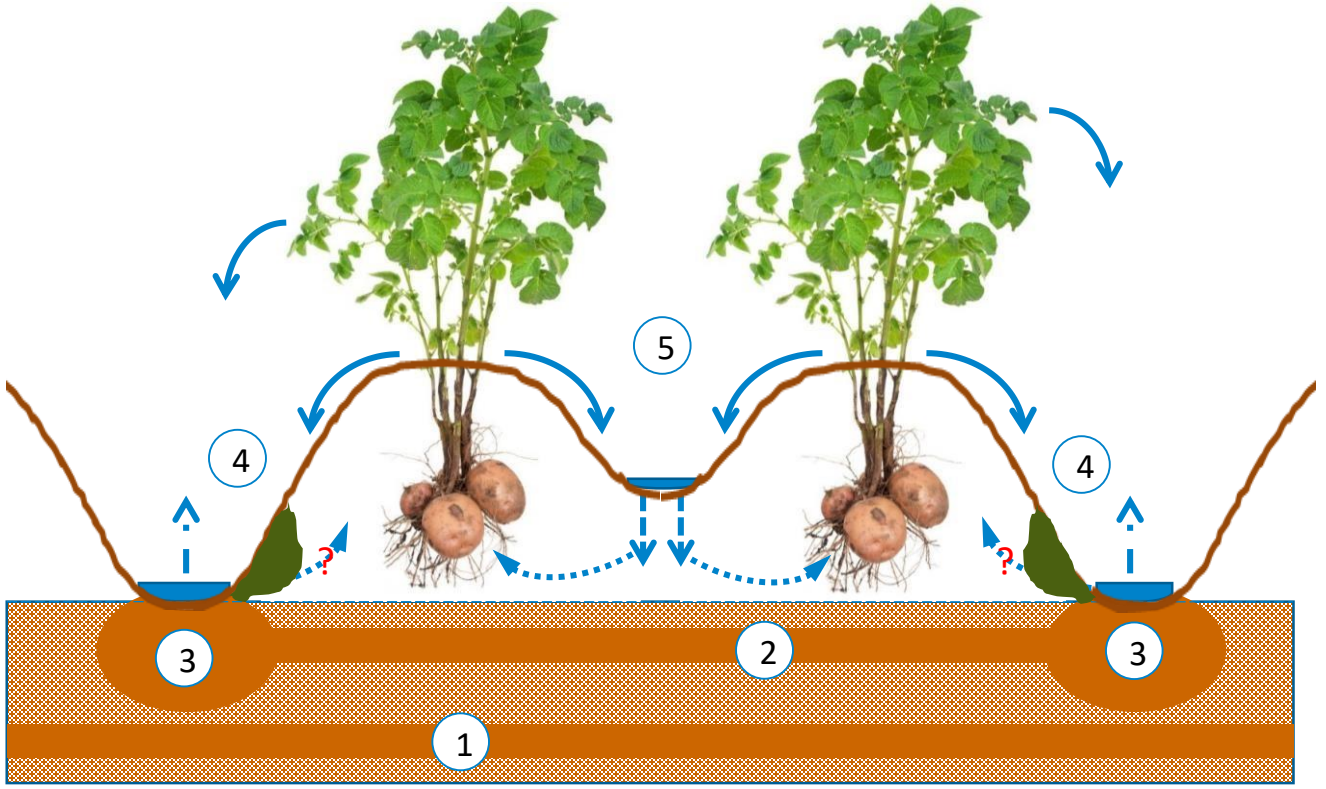

Briggs Tied Ridger


Control


Bye Wonderwheel


Creyke Wheeltrack Roller

# Soil and water management challenges in potatoes




1: Plough plan: Tillage operation under wet soil conditions
2: Compaction caused by bed-tiller
3: Wheeling compaction
4: Compaction/smearing at base of ridge
5: Capping at the soil surface

# Data collection plots

Russet Burbank
Sandy Loam
3.18 % organic matter

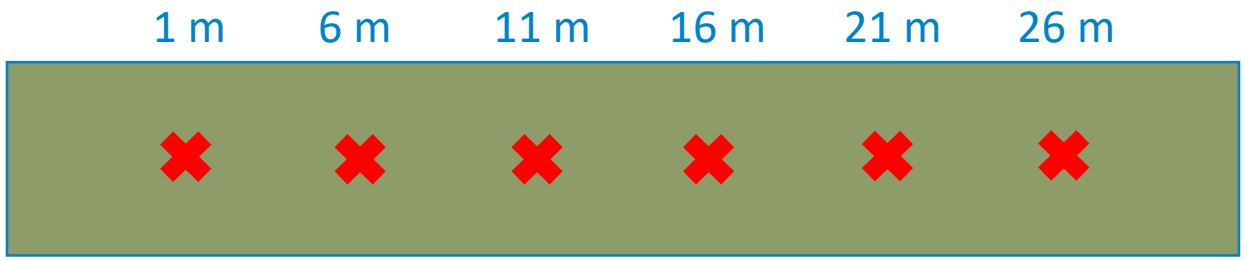
# Treatment soil characteristics

| Treatment | Bulk density (BD) 0-5 cm ($g\ cm^{-3}$) | Moisture content 0-5cm (%) |
|---|---|---|
| **Tied ridger** | 1.30a | 15.38a |
| **Wheel track roller** | 1.33ab | 15.25a |
| **Wonder wheel** | 1.30a | 14.32c |
| **Control** | 1.28a | 15.06a |
| **Wonder wheel trafficked** | 1.37bc | 16.66b |
| **Trafficked** | 1.40c | 16.62b |

- Control, tied ridger and wonder wheel treatments had significantly higher BD values as compared to the wonder wheel trafficked and trafficked treatments.
- Wonder wheel lowest moisture content as compared to all other treatments.
- Control, Tied ridger and Wheel track roller had significantly lower moisture content (0-5 cm) as compared to the wonder wheel trafficked and trafficked treatments.

# Penetrative resistance (MPa)

Plot wheeling (30m)




- Measurements recorded at 1 cm intervals
- Average depths reached: 24 – 45 cm due to stone layer.

| Treatment | Penetrative resistance (MPa)* | | |
|---|---|---|---|
| | Median | Maximum | Minimum |
| **Tied ridger** | 2.21 | 2.88 | 1.44 |
| **WTR** | 2.38 | 2.93 | 1.34 |
| **Wonder wheel** | 2.41 | 3.05 | 1.66 |
| **Control** | 2.35 | 3.05 | 1.48 |
| **Wonder wheel trafficked** | 2.58 | 2.93 | 1.87 |
| **Trafficked** | 2.72 | 3.24 | 1.96 |

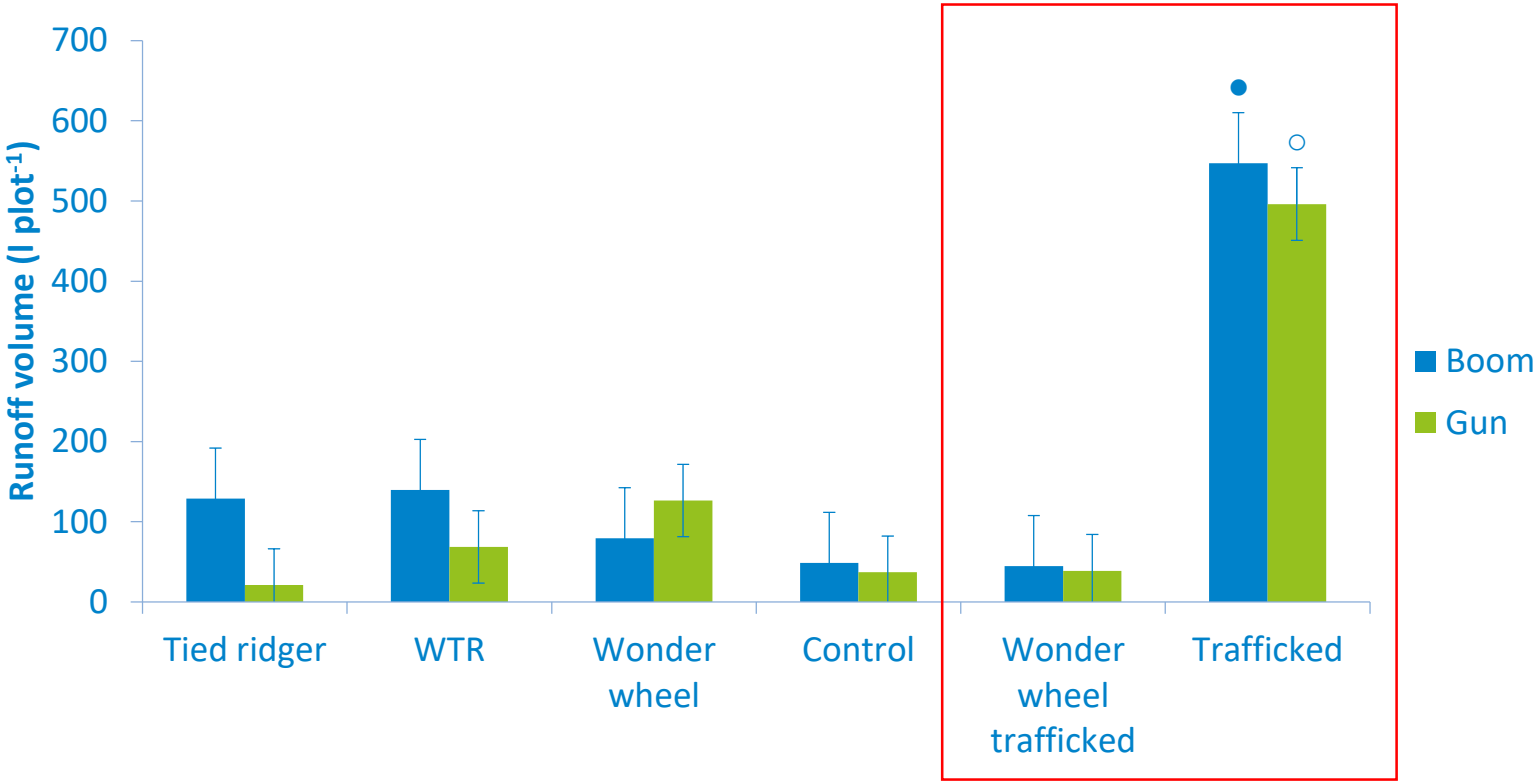
# Sample events

| Sample Event | Collection Period | Rainfall received (mm) | Irrigation applied (mm) | Ground cover |
|---|---|---|---|---|
| **1** | 26th – 30th Jun | 50.8 | 15 | 100 |
| **2** | 1st – 13th Jul | 27.2 | 30 | 100 |
| **3** | 14th – 26th Jul | 27 | 0 | 100 |
| **4** | 27th Jul – 30th Aug | 69.4 | 30 | 100 |
| **5** | 31st Aug – 25th Sep | 48.8 | 15 | <100 |
| **6** | 26th Sep – 9th Oct | 13.6 | 0 | Minimal |

# Treatment effectiveness tested for…

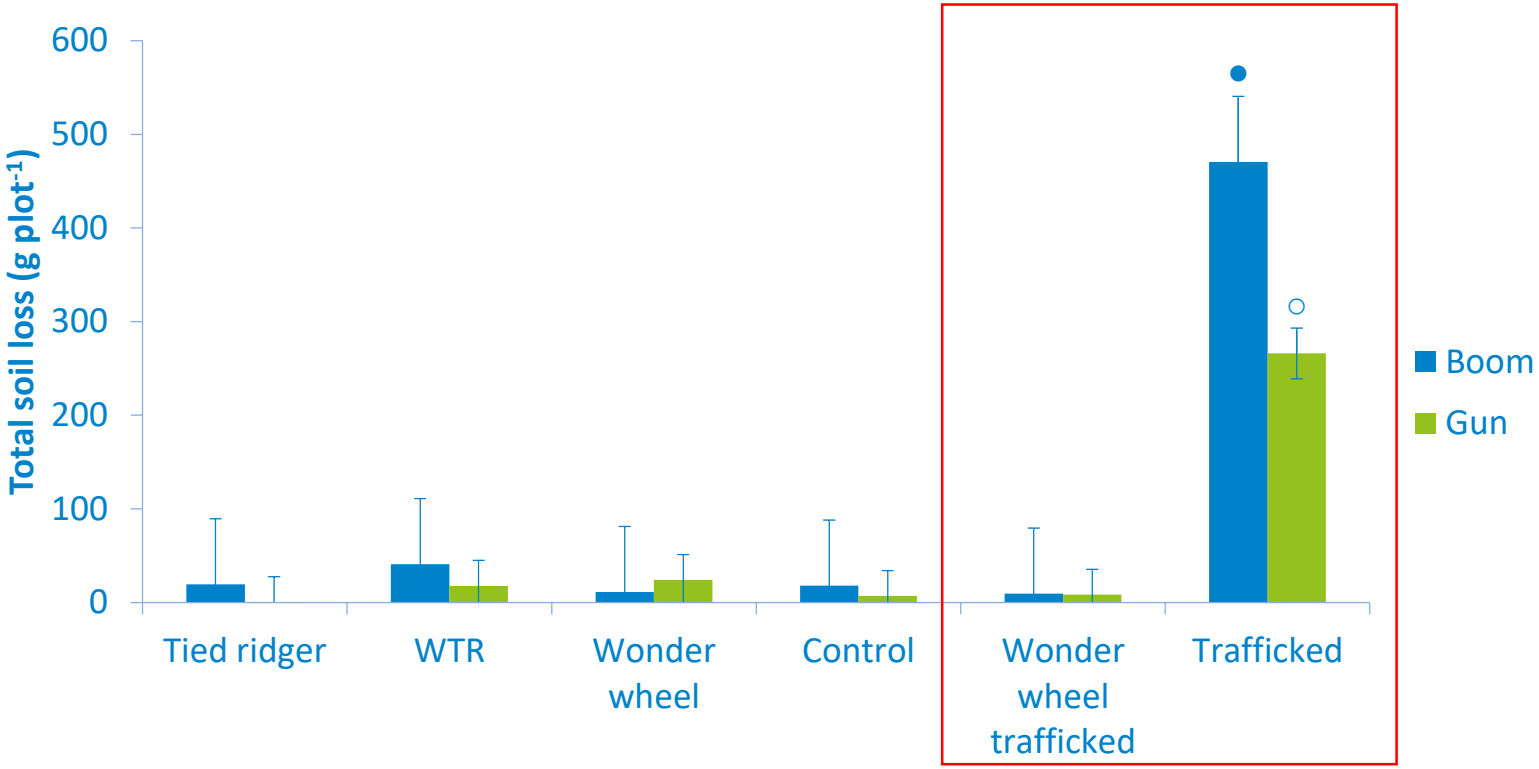
- Runoff volume
- Total soil loss
- Sediment concentration
- Total oxidised Nitrogen
- Orthophosphate

# Mean (n=6) Runoff volume across all sampling events



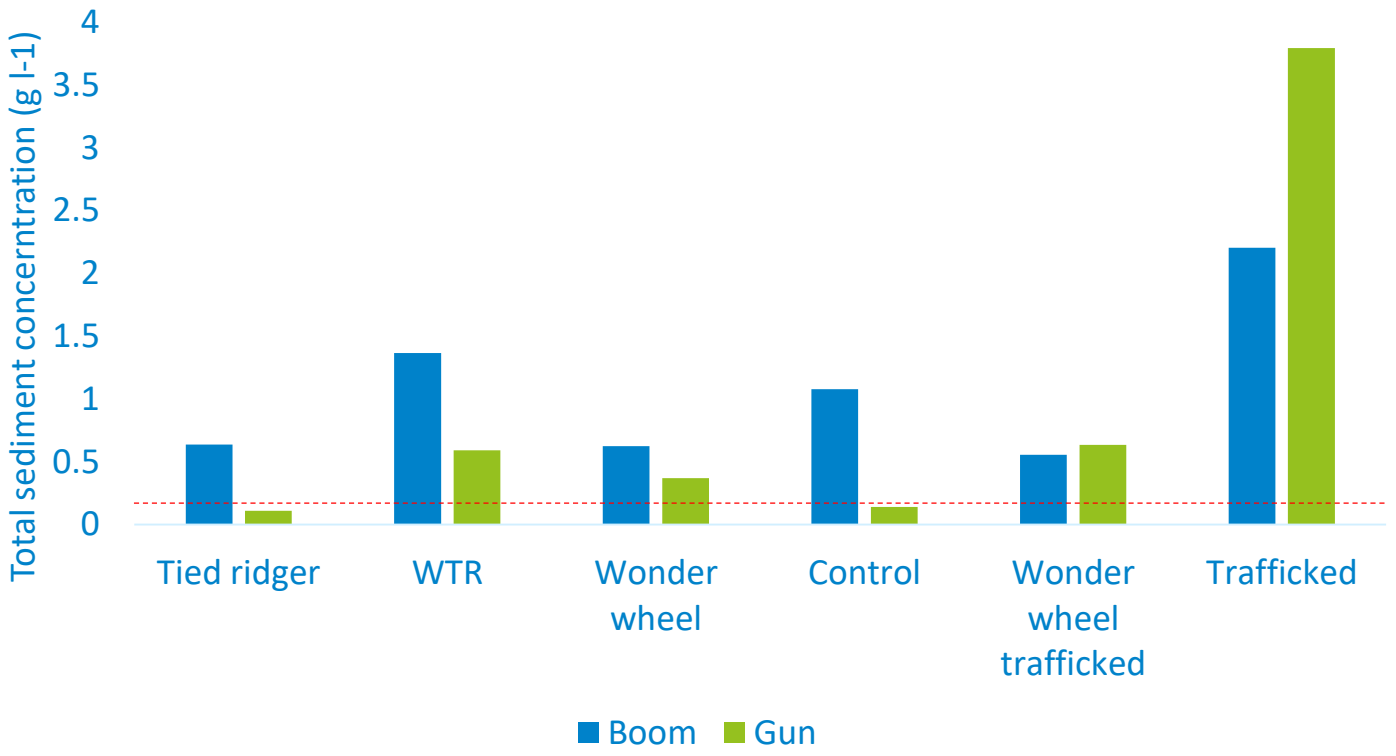

- Trafficked treatments generated significantly higher runoff as compared to all other treatments.

# Mean (n=5) Total soil loss across all sampling events

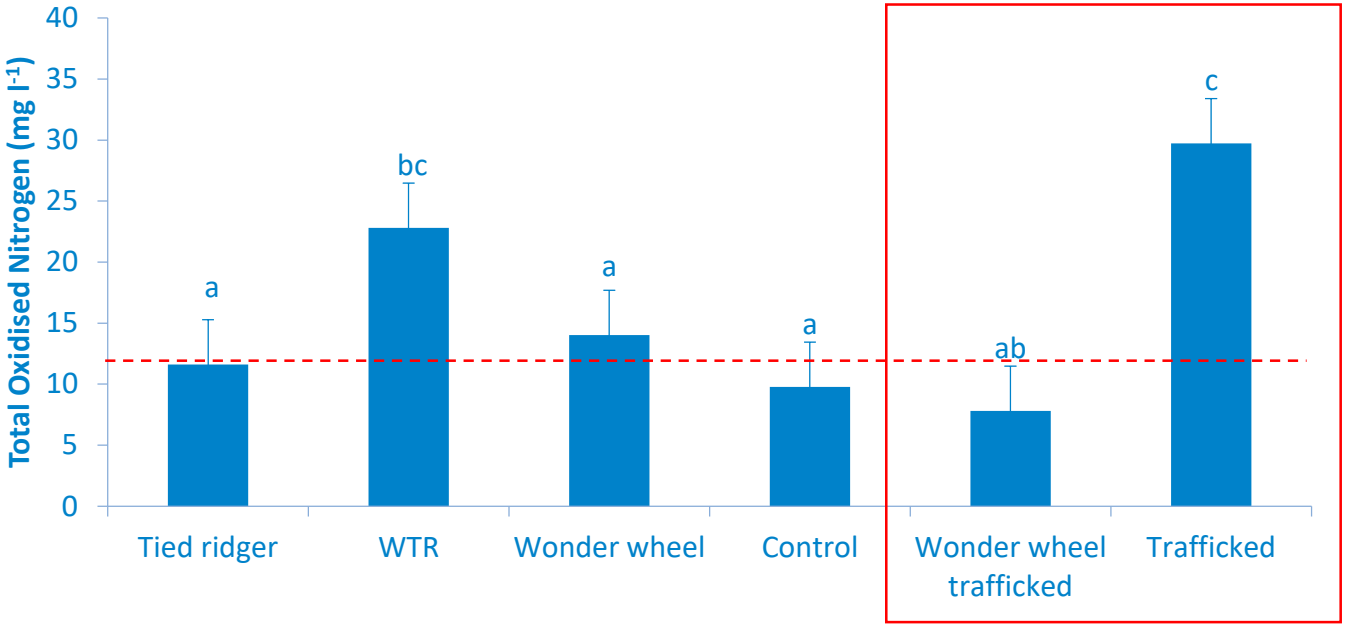



- Trafficked treatments generated significantly higher total soil loss as compared to all other treatments.
- Wonder wheel trafficked total soil loss was not significant from all non-trafficked treatments.

# Mean (n=5) sediment concentration in runoff across all sampling events

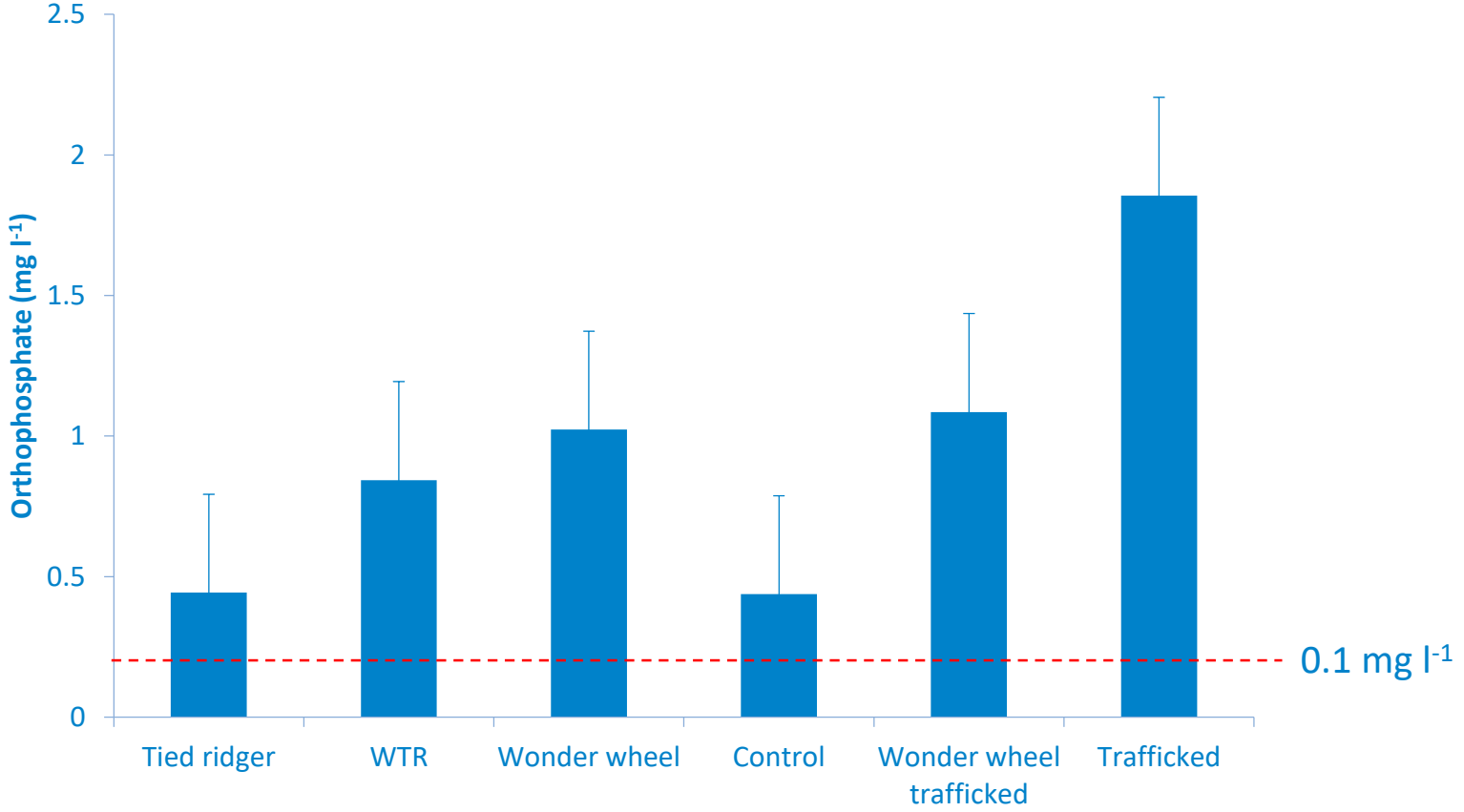


# Mean (n=5) TON concentration in runoff across all sampling events




- The Trafficked treatment irrespective of irrigation generated significantly higher TON than the Control, Wonder wheel, Wonder wheel trafficked and tied-ridger.
- The tied-ridger, wonder wheel and control generated the least TON but was not significantly different from the wonder wheel trafficked.

# Mean (n=5) Orthophosphate concentration in runoff across all sampling events




- No significant difference between treatments irrespective of irrigation type.

# Irrigation effects irrespective of treatments

| | Full | SE1 | SE2 | SE3 | SE4 | SE5 | SE6 |
|---|---|---|---|---|---|---|---|
| Runoff volume | | | | | | | |
| Total soil loss | Boom ▲ 43 % | | Boom ▲ 68 % | | | | |
| Sediment concentration | | | | | | Boom ▲ 69 % | |
| TON | Boom ▲ 47 % | | | | Boom ▲ 49 % | | |
| Orthophosphate | | | | | | | |

| Sample Event | Collection Period | Rainfall received (mm) | Irrigation (mm) | Ground cover |
|---|---|---|---|---|
| 1 | 26th – 30th Jun | 50.8 | 15 | 100 |
| 2 | 1st – 13th Jul | 27.2 | 30 | 100 |
| 3 | 14th – 26th Jul | 27 | 0 | 100 |
| 4 | 27th Jul – 30th Aug | 69.4 | 30 | 100 |
| 5 | 31st Aug – 25th Sep | 48.8 | 15 | 100 |
| 6 | 26th Sep – 9th Oct | 13.6 | 0 | Minimal |

# Yield: Means per tramline treatment

| Tramline management | Plants (000/ha) | Stems (000/ha) | Total no. tubers (000/ha) | Tubers >40 mm (000/ha) | Total yield (t/ha) | Yield >40 mm (t/ha) | DM (%) | DM yield (t/ha) | Tubers >90 mm length (%) |
|---|---|---|---|---|---|---|---|---|---|
| Control | 33 | 78 | 420 | 304 | 74.4 | 71.5 | 20.9 | 15.5 | 87 |
| Briggs | 33 | 83 | 397 | 293 | 73.1 | 70.3 | 21.4 | 15.7 | 80 |
| Creyke | 33 | 91 | 426 | 322 | 74.2 | 71.4 | 21.6 | 16.0 | 82 |
| Wonder Wheel | 34 | 83 | 458 | 358 | 80.3 | 77.9 | 21.3 | 17.1 | 84 |
| Trafficked | 33 | 73 | 387 | 290 | 70.5 | 68.0 | 21.1 | 14.8 | 86 |
| Trafficked Wonder Wheel | 33 | 87 | 440 | 335 | 77.5 | 74.9 | 21.3 | 16.5 | 82 |
| S.E. (20 D.F.) | 0.57 | 5.1 | 30.5 | 18.1 | 3.03 | 2.87 | 0.40 | 0.80 | 3.1 |

- No significant effect

# Yield: Means per irrigation type

| Irrigation | Plants (000/ha) | Stems (000/ha) | Total no. tubers (000/ha) | Tubers >40 mm (000/ha) | Total yield (t/ha) | Yield >40 mm (t/ha) | DM (%) | DM yield (t/ha) | Tubers >90 mm length (%) |
|---|---|---|---|---|---|---|---|---|---|
| Boom | 33 | 78 | 414 | 307 | 72.8 | 70.1 | 21.3 | 15.5 | 84 |
| Gun | 33 | 86 | 429 | 327 | 77.2 | 74.6 | 21.2 | 16.4 | 84 |
| S.E. (2 D.F.) | 0.29 | 2.7 | 7.0 | 4.8 | 1.70 | 1.52 | 0.15 | 0.46 | 1.2 |

- No significant effect

# Quality: Means per tramline treatment

| Tramline management | Greening (%) | Brown centre (%) | Hollow heart (%) | Secondary growth (%) | Fry colour (-1 = USDA 00) |
|---|---|---|---|---|---|
| Control | 4.2 | 2.5 | 4.2 | 5.8 | -0.22 |
| Briggs | 3.3 | 12.5 | 8.3 | 9.2 | -0.11 |
| Creyke | 4.2 | 5.8 | 0.8 | 8.3 | -0.14 |
| Wonder Wheel | 2.5 | 6.7 | 6.7 | 6.7 | -0.17 |
| Trafficked | 3.3 | 6.7 | 11.7 | 10.0 | -0.21 |
| Trafficked Wonder Wheel | 5.8 | 5.0 | 7.5 | 4.2 | -0.18 |
| S.E. (20 D.F.) | 1.23 | 2.60 | 3.26 | 2.17 | 0.031 |

- No significant effect

# Quality: Means per irrigation type

| Tramline management | Greening (%) | Brown centre (%) | Hollow heart (%) | Secondary growth (%) | Fry colour (-1 = USDA 00) |
|---|---|---|---|---|---|
| Boom | 4.4 | 7.2 | 7.8 | 8.3 | -0.16 |
| Gun | 3.3 | 5.8 | 5.3 | 6.4 | -0.18 |
| S.E. (2 D.F.) | 1.11 | 1.75 | 0.68 | 2.55 | 0.028 |

- No significant effect

# Conclusions

- Tramline disruption (Wonder wheel trafficked) significantly decreased runoff volume, total soil loss, sediment concentration and TON.
- Trafficked treatments significantly increased runoff volume, total soil loss, sediment concentration and TON.
- Boom irrigation showed some significant increases in total soil loss, sediment concentration and TON.
- No significant difference in yield or quality between treatments at 95 % confidence.

- Results only relevant to tested conditions – full canopy, gentle slope, soil type, variety.

# Laura Tippin, Leaf

## Potato Trial Opportunities

SolACE

Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use

# Potato Trial Opportunities

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# The problem…

**Increased rainfall variability and reduced availability of nitrogen (N) and phosphorus (P) in soils)**

**Increasing combined water and N or P stresses**

## Water

Higher variability in rainfall

Increased risk of water shortage during summers

## Nutrients

The European Commission has pledged to reduce the use of P fertilizers significantly in the future.

Socio-economic projections suggest a steady increase and volatility of fertilizers' prices .

Current N and P flows are negatively contributing to environmental change

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# SolACE

**Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use**

**Four year European project funded by the European Commission covering 14 countries and 25 partners**

**Focussing on three major European Crops:**

***Potato***

Bread Wheat

Durum wheat

**SolACE is looking to create solutions to combined water and nutrient stress in crops by combing crop genotypes and management innovations to improve efficiency.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# Trials

Bread wheat:
Conventional production- Sweden
Organic, warm summer continental climate- Switzerland
Onventional production, Mediterranean climate- spain

Durum wheat:
Conventional production, Mediterranean climate, france
Organic production, Mediterranean climate Italy.

**Potato**
***Conventional production, oceanic climate UK***
Organic production, warm summer continental climate, Hungary.

# UK Potato Trials

**Workshop**

- Workshop hosted at Elveden Estates on the 8th February:
- Chance to talk through the innovation that you want to test out and how the project can help to facilitate this
- The traits you look for in potato crops, influencing the genotypes chosen for trial
- The challenges you face currently in potato production and how the project can help to address these.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# UK Potato Trials

**The Network:**

- Looking for *4 commercial potato farms* to trial innovations and crop mixes, starting late 2018 for 2-3 years
- Trial farms chosen by October 2018
- We are also looking for a group of farms to take part in the 'baseline' data collection (typical inputs, yields, soil type, climate etc.)

**The trial:**

- The trial plot can be as big or as small as the farmer would like
- Data will be collected by the University of Newcastle
- ***Small nuisance fee of up to £1,000***

**Why be involved?**

- Opportunity to contribute to solutions to new upcoming challenges
- Be part of a European project looking for solutions across a range of countries in Europe
- Trial innovative approaches on farm and discuss with other like-minded farmers

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# Workshop 8th Feb

**LEAF is hosting a workshop at** Elveden Farms, **on the 8th February to discuss the solACE project, investigating water and nutrient stress in potatoes.**

At the workshop we will be gathering your opinions and experiences as well as explaining the project and the opportunities available. We'll also be hearing from Andrew Francis about the strategies in place at Elveden.

**The workshop will begin at 10am and conclude at 2.30pm following a tour of Elveden estates**

**If you are interested in the workshop or the trials please email:**
**Events@leafuk.org**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727247 (SolACE)

# Lunch

# Benchmarking: Giving you a competitive edge

Mark Topliff

AHDB Farm Economics

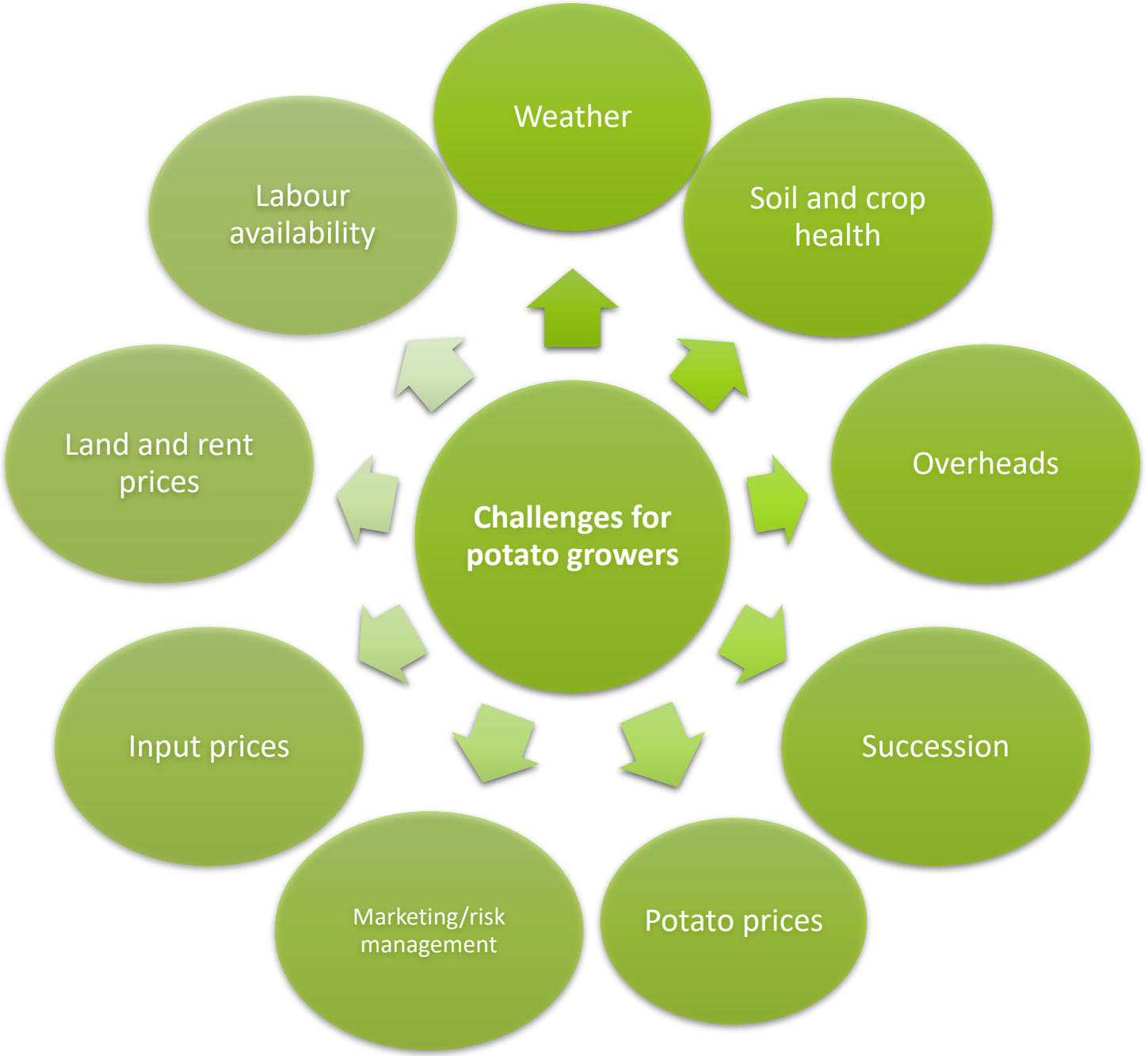
# Content


Why benchmark?

What can you do?


How?

# Why benchmark?


Challenges for potato growers
Weather
Soil and crop health
Overheads
Succession
Potato prices
Marketing/risk management
Input prices
Land and rent prices
Labour availability


"You can't stop the waves,
but you can learn to surf."
Jon Kabat-Zinn

# The issue

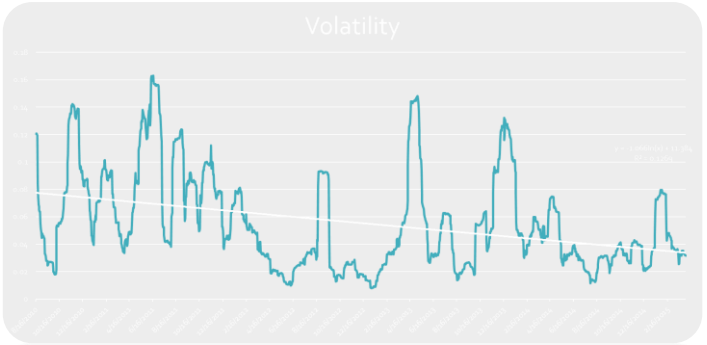
| £/tonne | Grower 1 |
|---|---|
| Net margin | 8 |

Knowing COP can help with marketing decisions

Help with business decisions such as land rental

Identify the strengths and weaknesses


Helping to survive volatility



# What can you do?

# Working out your costs of production

enables you to…

- Make informed business decisions
- Compare performance year-on-year
- Compare with other data
- Compare with industry targets

**Important to make sure that the comparison is like for like**

# Grower meeting option

Help to

- share experiences & best practice
- have peer review
- accept possible need to change

# How?

# Farmbench.ahdb.org.uk

# Motivation for Farmbench

**Measure**

- Measure & record performance
- Compare performance

# Multi-enterprise benchmarking

Suckler cows and beef cattle

Sheep

Combinable crops

Potatoes

Forage enterprises

Dairy – in 2018

# Estimated Arable Output

| Enterprise | Ha | Budgeted yield t/ha | Budgeted tonnes produced | Budgeted £/T | Total budgeted crop sales | By-products total £ (e.g. straw) | Total budgeted output |
|---|---|---|---|---|---|---|---|
| Wheat (Milling Wheat) | 25 | 9 | 225.00 | £ 150 | £33,750.00 | £ 5000 | £38,750.00 |
| Wheat (Feed) | 25 | 8 | 200.00 | £ 110 | £22,000.00 | £ | £22,000.00 |
| Oilseed Rape (Oilseed Rape) | 50 | 4 | 200.00 | £ 220 | £44,000.00 | £ | £44,000.00 |
| Potatoes (packing) | 30 | 45 | 4,500.00 | £ 130 | £585,000.00 | £ | £585,000.00 |
| Potatoes (salad) | 30 | 40 | 1,200.00 | £ | £0.00 | £ | £0.00 |
| Potatoes (ware) | 40 | 45 | 1,800.00 | £ | £0.00 | £ | £0.00 |

Previous | Save and Next

## Notes

Add Note

# Crop Protection

| | Ha | | Herbicides | Fungicides | Insecticides | Nematicides | Molluscicides | PGRs | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Total | 272 | | | | | | | | | |
| Wheat (Wheat) | 56 | Total £ | 1364.72 | 6567.12 | | | 103.6 | 1188.88 | 632.8 | 9857.12 |
| | | £ / Ha | 24.37 | 117.27 | | | 1.85 | 21.23 | 11.3 | 176.02 |
| Barley (spring barley ) | 95 | Total £ | 2261 | 4899.15 | | | | | | 7160.15 |
| | | £ / Ha | 23.8 | 51.57 | | | | | | 75.37 |
| Barley (winter barley ) | 18 | Total £ | 471.06 | 1304.28 | 36 | | | 280.98 | | 2092.32 |
| | | £ / Ha | 26.17 | 72.46 | 2 | | | 15.61 | | 116.24 |
| Oats (Oats) | 28 | Total £ | 803.32 | 1398.32 | 55.44 | | | 197.96 | | 2455.04 |
| | | £ / Ha | 28.69 | 49.94 | 1.98 | | | 7.07 | | 87.68 |
| Oilseed Rape (Oilseed Rape) | 13 | Total £ | 372.06 | 1391.13 | 201.24 | | 216.71 | | 312 | 2493.14 |
| | | £ / Ha | 28.62 | 107.01 | 15.48 | | 16.67 | | 24 | 191.78 |
| Potatoes (Potatoes) | 62 | Total £ | 4387.12 | 16820.6 | 11878.58 | | 2790 | 172.36 | | 36048.66 |
| | | £ / Ha | 70.76 | 271.3 | 191.59 | | 45 | 2.78 | | 581.43 |

# Potato Specific Variable Costs

| | | | Seed certification and inspection | Seed treatment | Fleece | Sprout suppression | Store cleaning | Potato levy |
|---|---|---|---|---|---|---|---|---|
| | **Ha** | **Total Cost (£)** | | | | | | |
| Potatoes (packing) | 30 | Total Cost (£) | | | | | | |
| | | £/ha | | | | | | |
| Potatoes (salad) | 30 | Total Cost (£) | | | | | | |
| | | £/ha | | | | | | |
| Potatoes (ware) | 40 | Total Cost (£) | | | | | | |
| | | £/ha | | | | | | |
| | | Non-benchmarked enterprises(£) | | | | | | |

Previous | Save and Next

# Overheads

## Overhead Allocation

| | Office, telephone and subscriptions | Miscellaneous business costs | Professional fees | Insurance |
|---|---|---|---|---|
| Total cost (£) | 3000.00 | 1503.00 | 1150.00 | 2400.00 |
| Benchmarked Combinable Enterprises(%) | 45.00 | 45.00 | 45.00 | 55.00 |
| Benchmarked Potatoes Enterprises(%) | 55.00 | 55.00 | 55.00 | 45.00 |
| Non-benchmarked enterprises(%) | 0.00 | 0.00 | 0.00 | 0.00 |

Previous Save and Next

# Equipment Depreciation

## Equipment valuation

| Equipment type | No. of items | Name | Total second hand value at start of year (£) | Purchases this year (£) | Sales this year (£) | Net Value of Equipment |
|---|---|---|---|---|---|---|
| Telehandler | 1 | andler | 50000 | 55000 | 20000 | 85000 |
| Other self-propelle | 1 | forklift | 15000 | 0 | 0 | 15000 |
| Tractor | 1 | T6 175 Tracl | 40000 | 0 | 0 | 40000 |
| Tractor | 1 | T6 175 | 50000 | 0 | 0 | 50000 |
| Tractor | 1 | T6 165 | 30000 | 0 | 0 | 30000 |
| Tractor | 1 | T7 185 | 40000 | 0 | 0 | 40000 |
| Ridger/Bed former | 1 | ridger | 3000 | 0 | 0 | 3000 |
| Ridger/Bed former | 1 | bed tiller | 2700 | 0 | 0 | 2700 |
| Planting equipmen | 1 | planter | 5000 | 0 | 0 | 5000 |
| Other specialist pol | 1 | destoner | 20000 | 0 | 0 | 20000 |
| Potato harvester | 1 | Potato harve | 80000 | 0 | 0 | 80000 |
| Other specialist pol | 1 | topper | 2500 | 0 | 0 | 2500 |

Add Equipment

## Equipment allocation

# Benefits of Farmbench

- Free to use
- Web-based
  - Always using latest version online
  - Can use on any internet enabled device
  - Data always kept confidential, secure and backed up

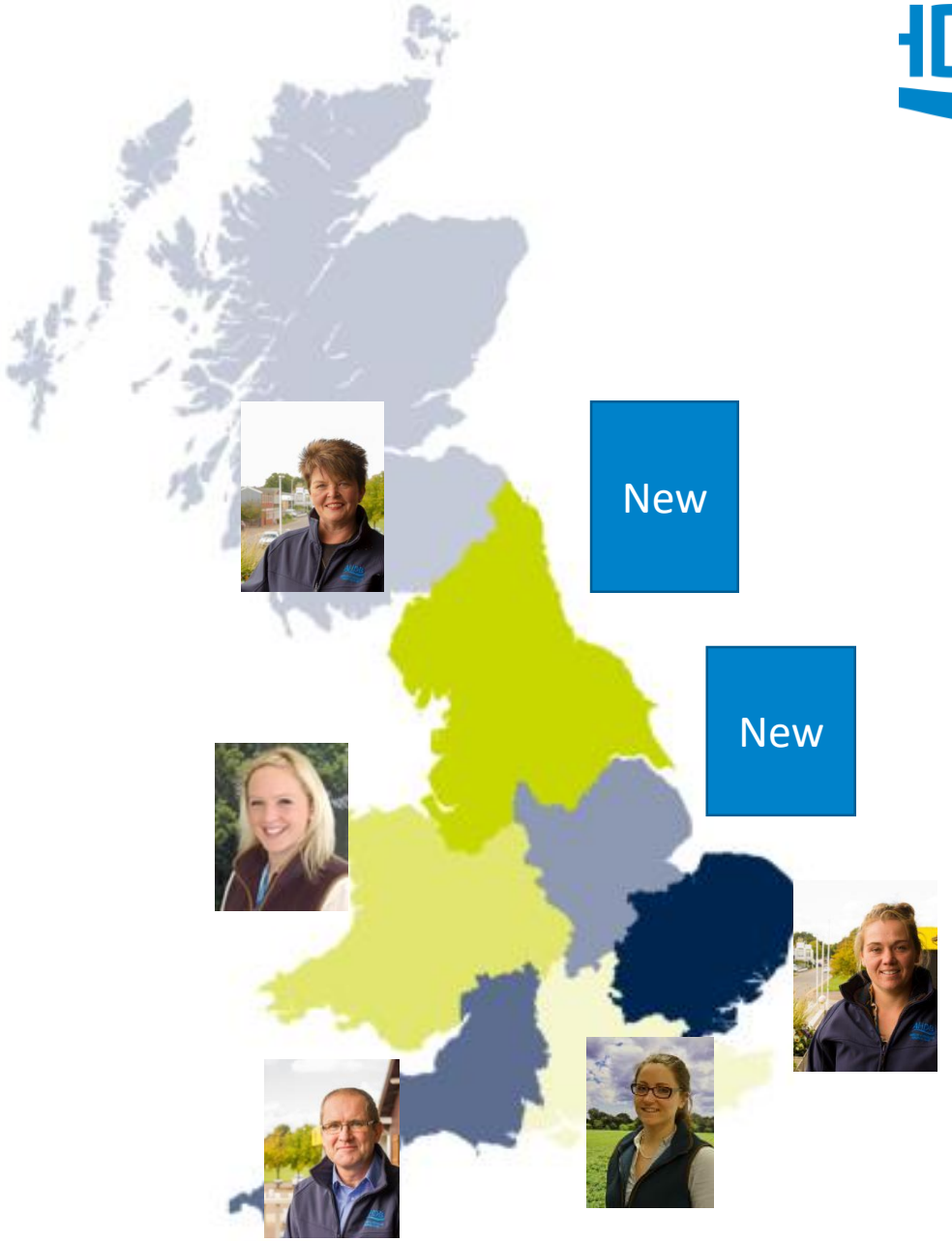
- Standardised methodology allowing you to compare consistently with others
- Only view the relevant data input pages
- Easier allocation of costs
- A variety of reports and comparisons available to help decision making

# AHDB expertise, the energy and the passion

**A Regional Benchmarking Officer team**

- 7 RBOs located around GB
- Available to help you start benchmarking
- Point of Farmbench contact for growers
- Work across sectors
- Work with grower and farmer groups

**Also, a dedicated telephone helpline will be available**




FARMBENCH


If you don't know where you are going, you might wind up someplace else.
Yogi Berra

# SPot Farm East Results
# Nitrogen and Irrigation

Marc Allison and Mark Stalham

# N x irrigation experiment conducted by NIAB CUF

- Variety: Brooke (crisping)
- Nitrogen
  - Standard Split N
  - All N applied to top of bed pre-planting
  - All N placed on-planter
- Irrigation
  - Standard (18 mm @ 18 mm SMD)
  - Over-water (27 mm @ 18 mm SMD)
- Sand (91 % S, 5 % Z, 4 % C, 1.9 % OM)
- Destoned: 3 April  Planted: 24 April  Emerged: 24 May

Do you think the following statement about splitting N applications is still true?

“splitting the dressing was inferior to applying it all to the seedbed in practically all experiments on medium and heavy soils…..there were (very small) advantages from splitting the dressing on half the experiments on light soils”

Cooke *et al.* (1957)

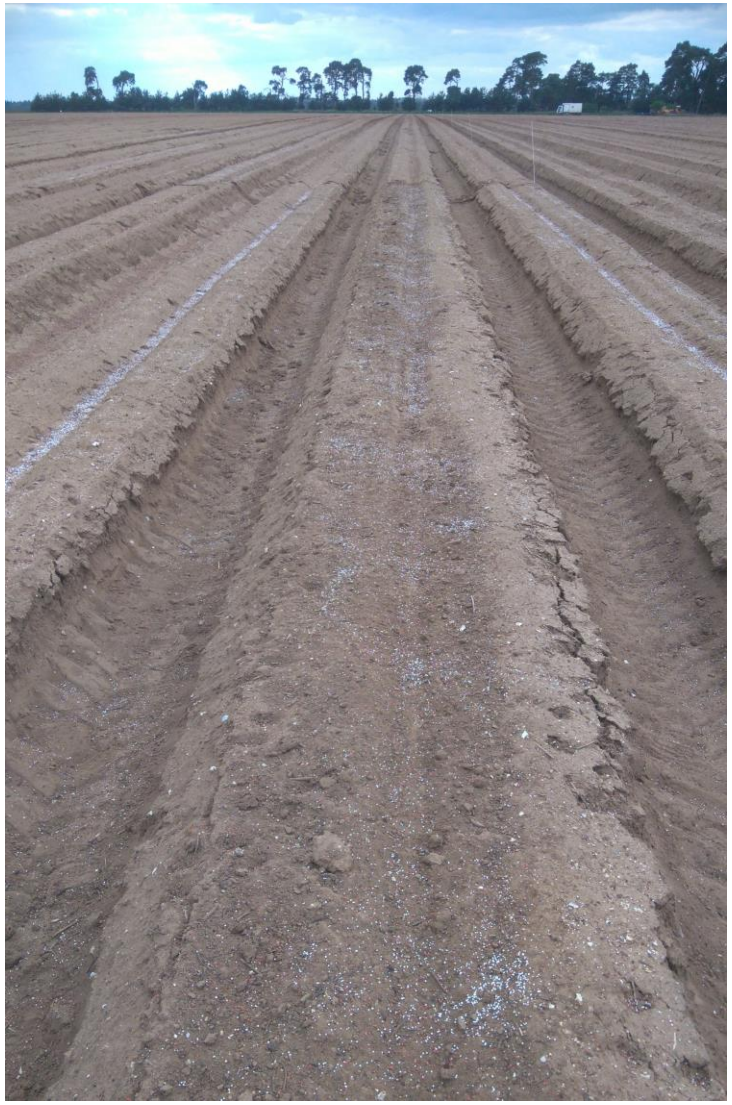
# N applications

All treatments received 20 kg N as DAP on 10 April

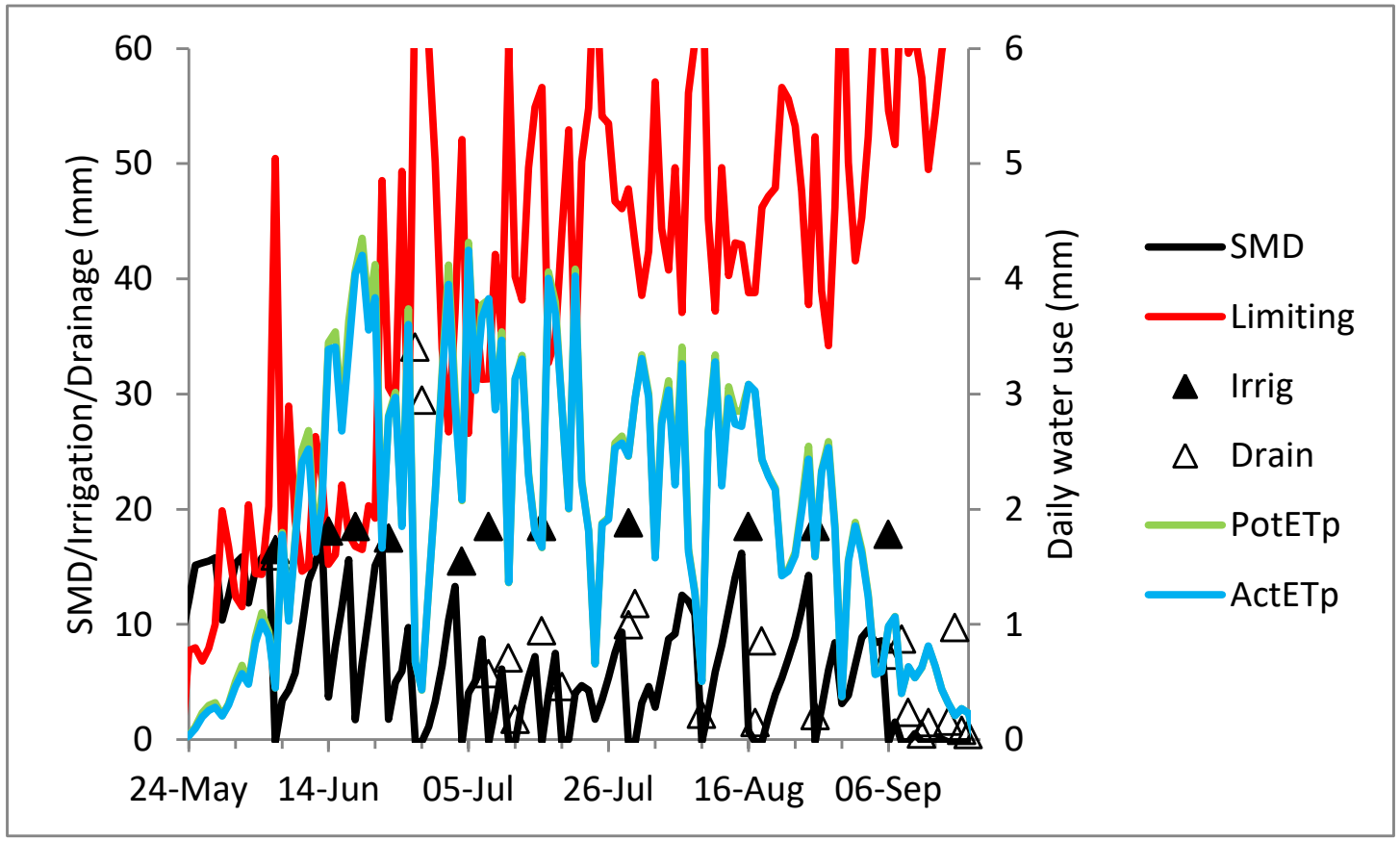
- Standard split N
- 60 kg N as N30S10 on 18 April
- 100 kg N as N30S10 on 25 May (emergence)
- 40 kg N as N37 (diluted 1:4) on 21 June (10 mm tuber stage). N.B. 80 kg N applied to rest of field not 40 kg.
- Seedbed N
- 60 kg N as $NH_4NO_3$ by hand on 13 April
- 140 kg N as N30S10 on 18 April
- Placed N
- 200 kg N on-planter as tank-mix 75 % N30S10 + 25 % N37 on 24 April

# Fertilizer spreading/spraying

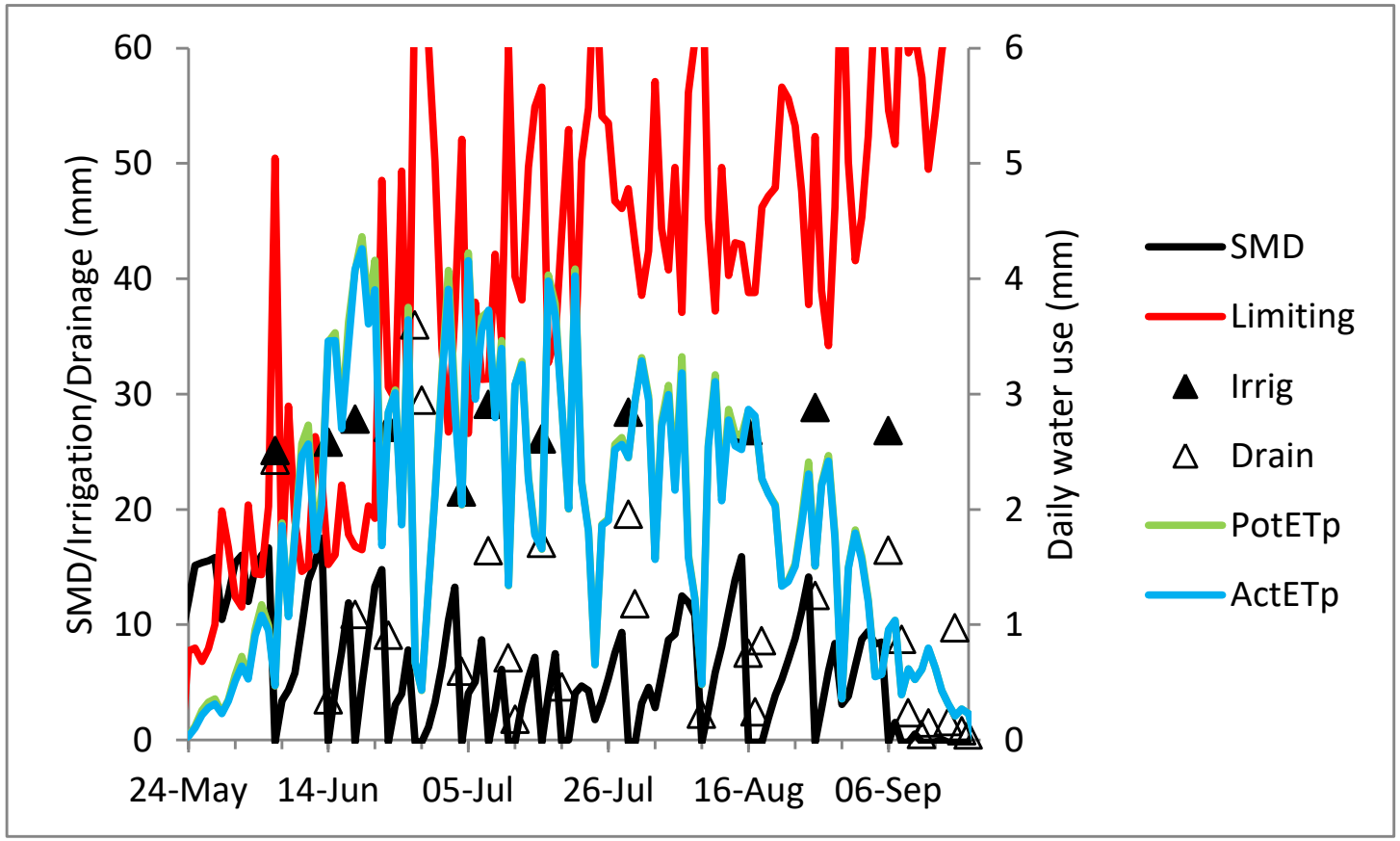




# N * Irrig: soil moisture deficits
# a) Standard irrigation



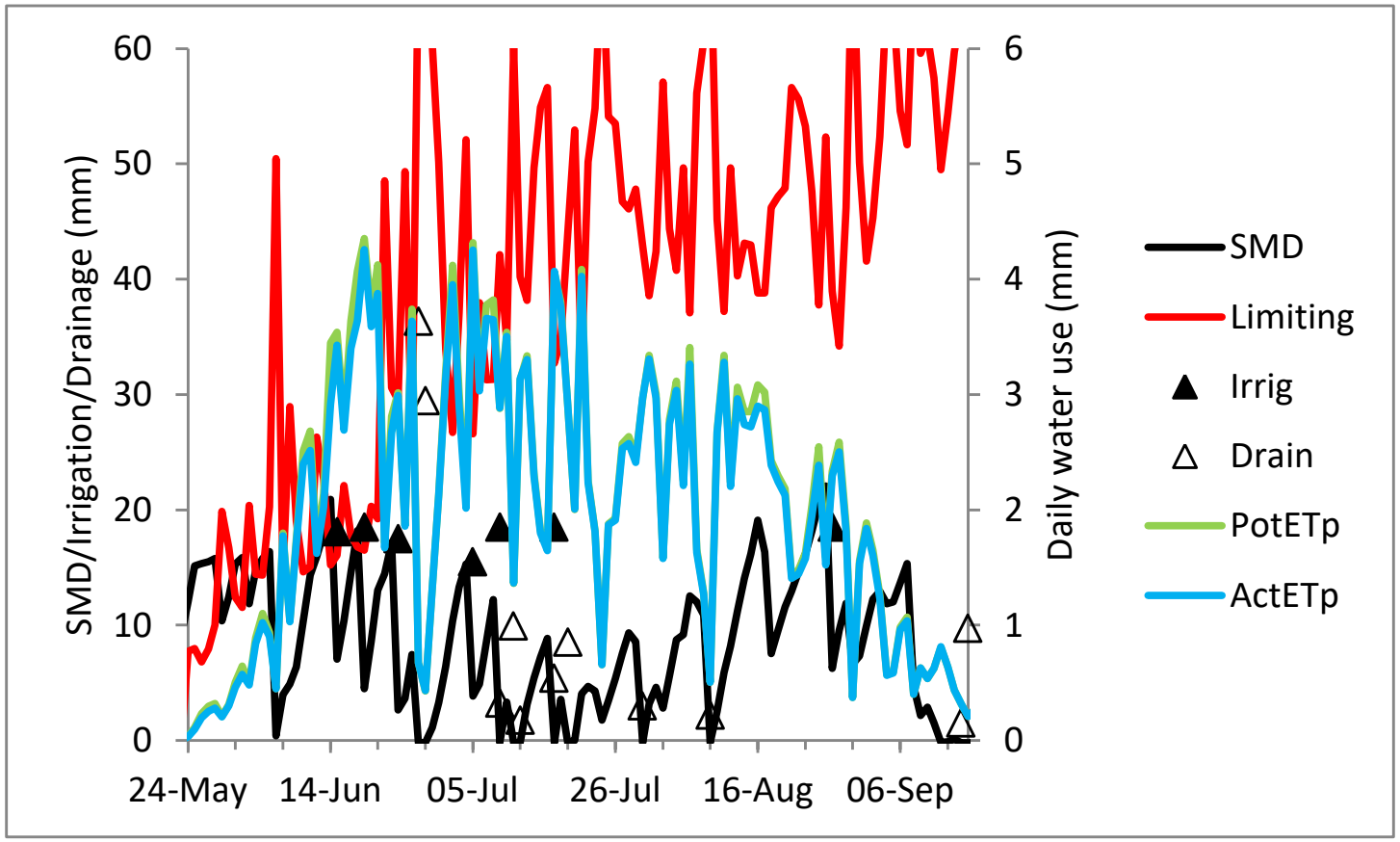
# N * Irrig: soil moisture deficits
# a) Standard irrigation



# Best practice schedule:

Rules: 1. If >50 % chance of rain the following day, delay irrigation

2. Have knowledge of long-term ET



# Comparisons:
## Standard, Over-water, Best Practice

| | Irrigation (mm) | Drainage (mm) | Water use (mm) | Efficiency† (%) | Modelled yield (t/ha) |
|---|---|---|---|---|---|
| Standard | 199 | 182 | 232 | 98.0 | 61.2 |
| Over-water | 296 | 278 | 229 | 98.2 | 60.4 |
| Best Practice | 127 | 115 | 230 | 97.2 | 60.7 |

Best Practice: yield reduced but drainage and irrigation reduced by *c.* 70 mm

†Efficiency in meeting water requirement of canopy and ET demand

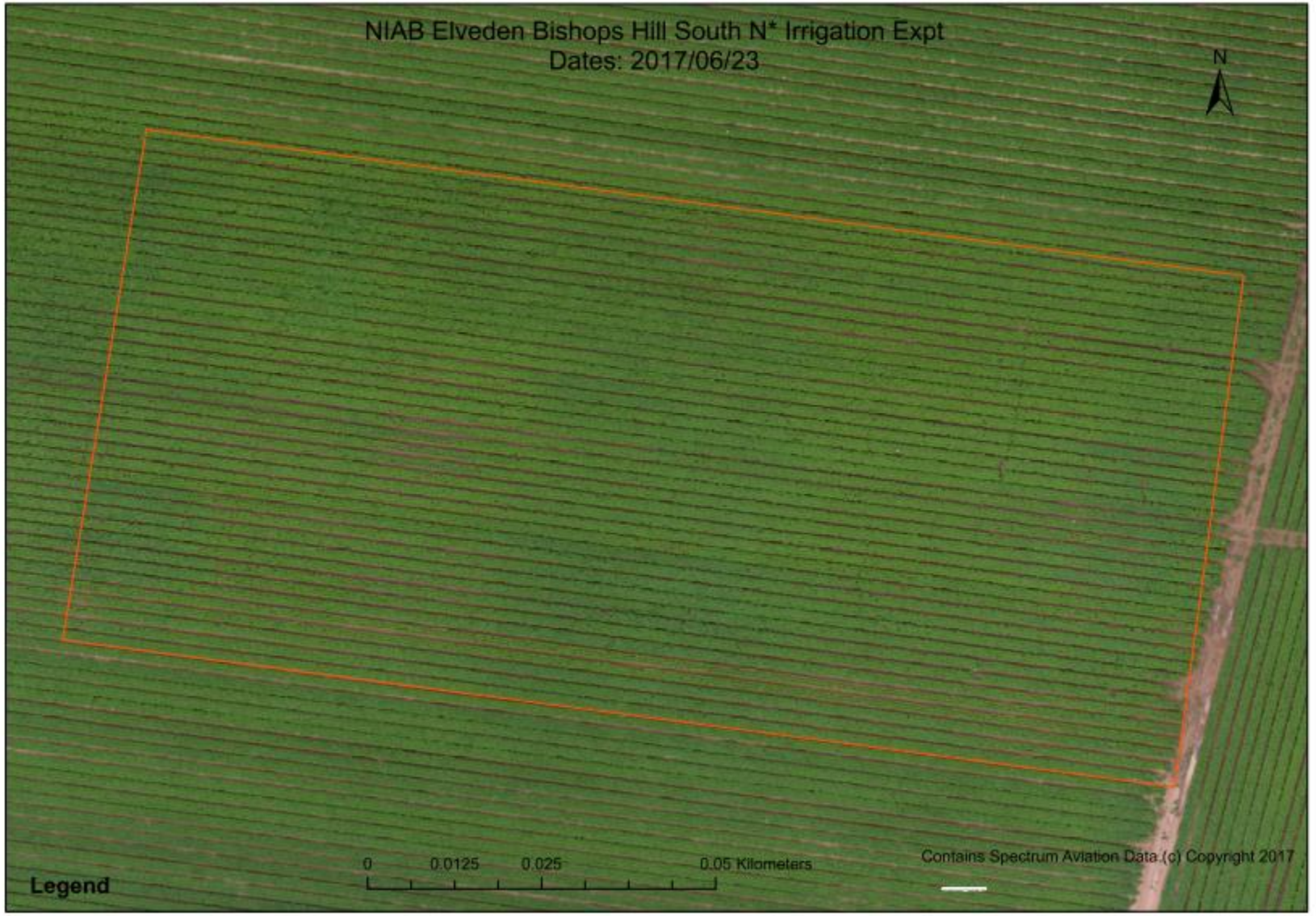
niab digital
Powered by KisanHub

# Potato Crop Management

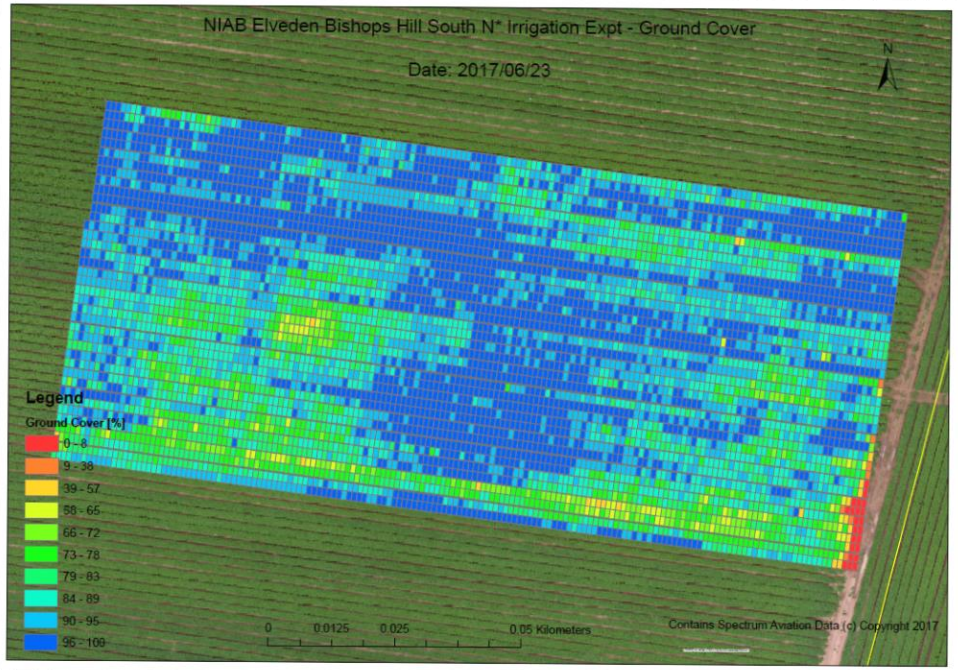


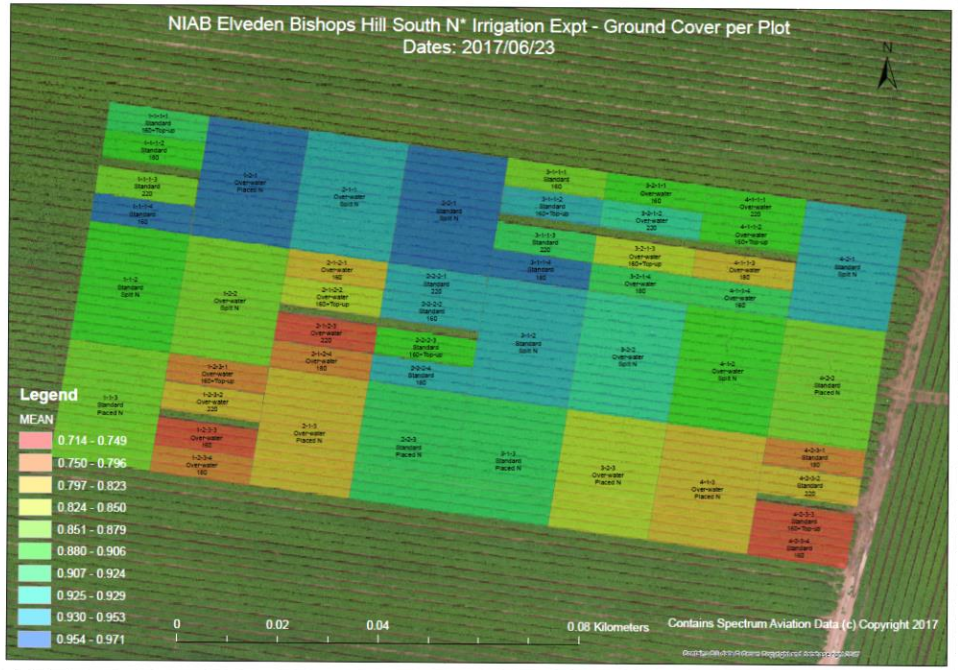
AHDB

# Ground cover 23 June 2017: any obvious differences?

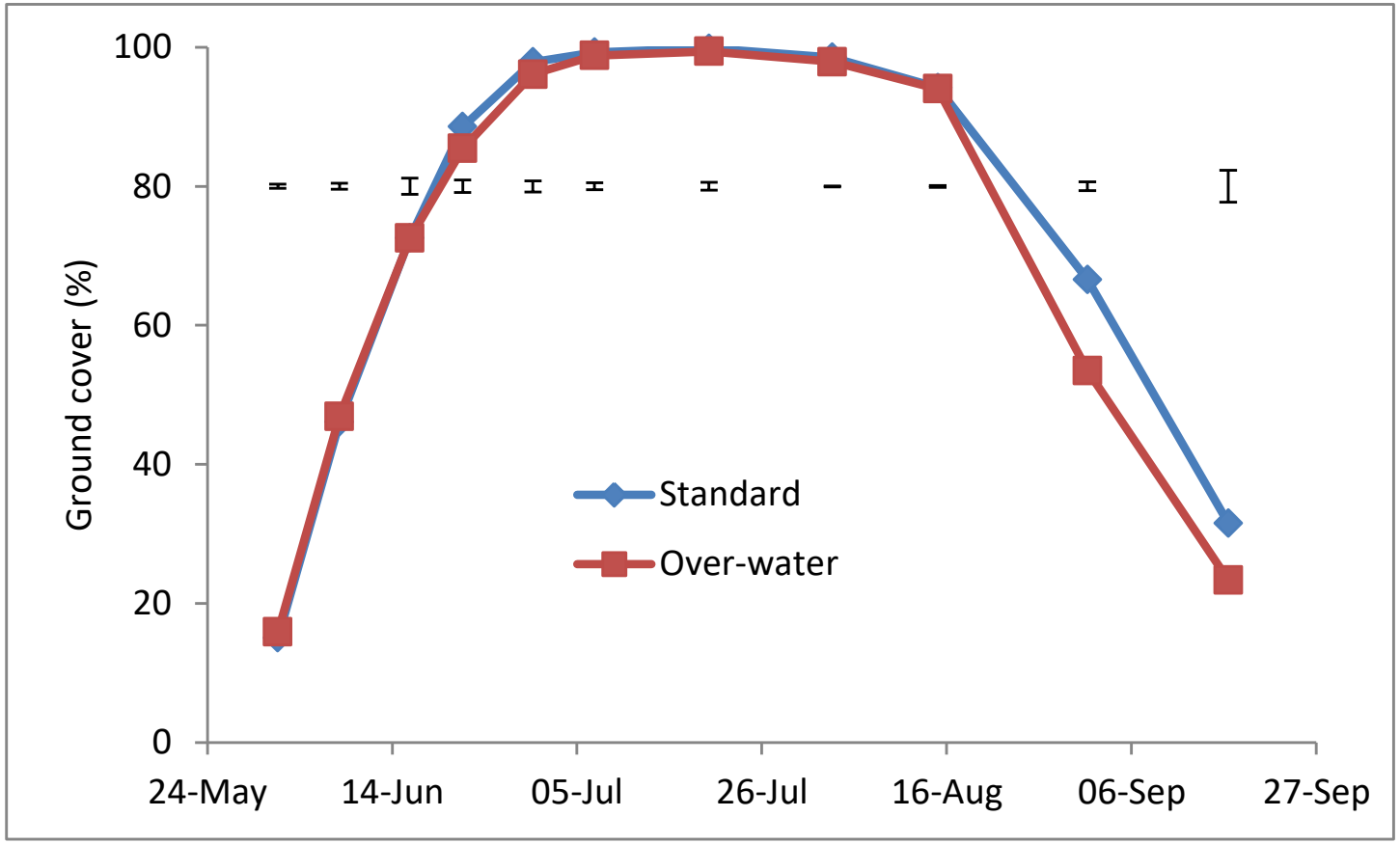


# GC converted from NDVI from fixed-wing aircraft

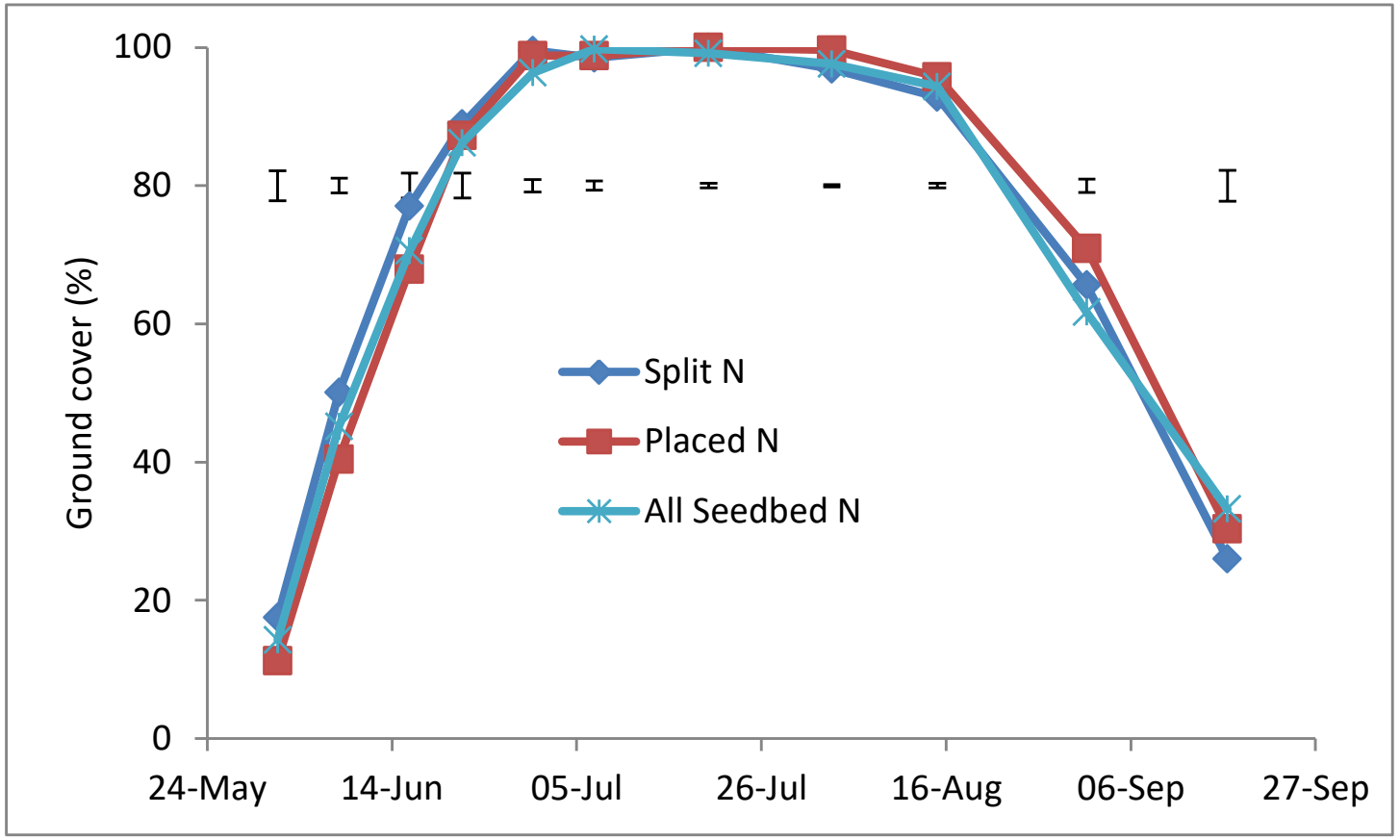


# Nitrogen x Irrigation: ground covers
# a) Irrigation



# Nitrogen x Irrigation: ground covers
# b) Nitrogen



# Ground cover duration (main effects)

| Irrigation | Nitrogen | GC duration (% days) |
|---|---|---|
| Standard | | 8914 |
| Over water | | 8464 |
| S.E. (3 D.F.) | | 99.2 |
| | | |
| | Split | 8717 |
| | Seedbed | 8618 |
| | Placed | 8733 |
| | S.E. (12 D.F.) | 103.7 |

# Nitrogen x Irrigation: yield

| Irrigation | Nitrogen | Stems (000/ha) | Tubers >10 mm (000/ha) | Total yield (t/ha) | Yield >40 mm (t/ha) | Tuber DM (%) | DM yield (t/ha) |
|---|---|---|---|---|---|---|---|
| Standard | Split | 91 | 442 | 65.0 | 63.5 | 24.4 | 15.9 |
| | Seedbed | 84 | 395 | 63.1 | 61.9 | 24.3 | 15.3 |
| | Placed | 77 | 334 | 59.8 | 58.7 | 25.0 | 15.0 |
| Over water | Split | 86 | 399 | 60.0 | 58.5 | 24.5 | 14.7 |
| | Seedbed | 77 | 376 | 61.3 | 60.2 | 25.2 | 15.4 |
| | Placed | 67 | 357 | 53.9 | 52.7 | 24.9 | 13.4 |
| S.E. (12 D.F.) | | 6.8 | 35.4 | 4.13 | 4.04 | 0.29 | 1.00 |
| S.E. (12 D.F.; same Irrig) | | 7.3 | 31.7 | 3.58 | 3.46 | 0.35 | 0.84 |

# Was 220 kg N sufficient? Comparison vs farm 260 kg N

| Irrigation | Nitrogen | Stems (000/ha) | Tubers >10 mm (000/ha) | Total yield (t/ha) | Yield >40 mm (t/ha) | Tuber DM (%) | DM yield (t/ha) |
|---|---|---|---|---|---|---|---|
| Standard | Split 220 | 91 | 442 | 65.0 | 63.5 | 24.4 | 15.9 |
| S.E. (12 D.F.) | | 7.3 | 31.7 | 3.58 | 3.46 | 0.35 | 0.84 |
| Standard | Split 260 | 57 | 349 | 64.8 | 63.0 | 23.6 | 15.2 |
| S.E. (3 D.F.) | | 7.6 | 69.5 | 2.08 | 3.20 | 0.95 | 0.57 |

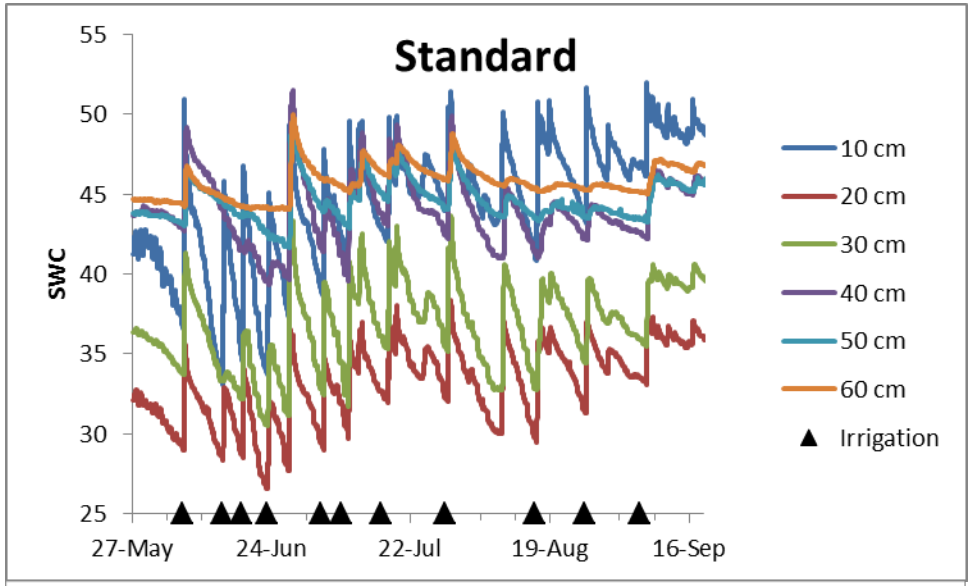
# Fry colour
# No effect of N or irrigation on fry quality

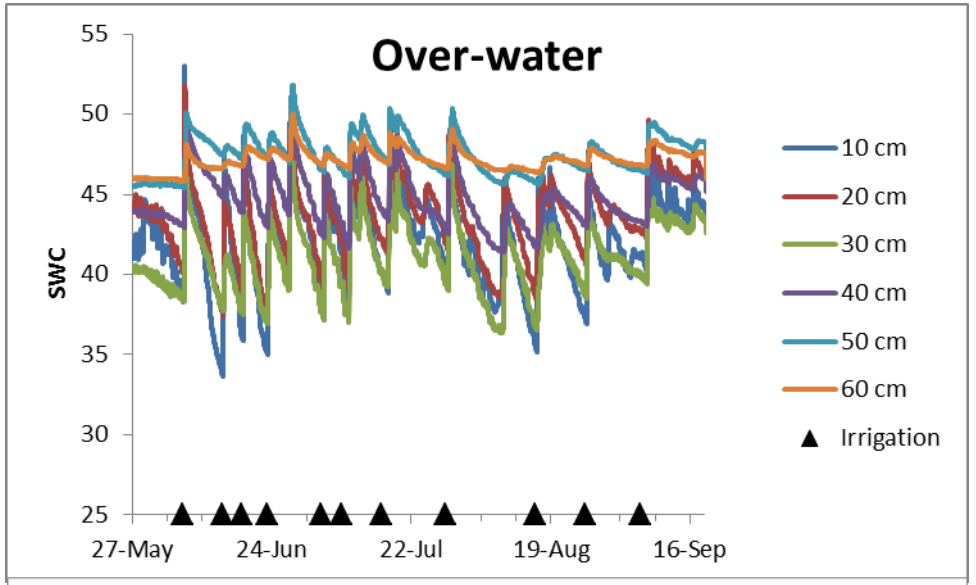
| | | | Defects (% w/w) | | | |
|---|---|---|---|---|---|---|
| Irrigation | Nitrogen | Hunter Lab L value | Bruise | Internal sugar | External sugar | Total |
| Standard | Split | 75.0 | 1.3 | 0.7 | 2.0 | 5.3 |
| | Seedbed | 73.3 | 0.0 | 0.0 | 0.9 | 2.1 |
| | Placed | 72.6 | 0.0 | 0.0 | 4.0 | 4.0 |
| Over water | Split | 73.4 | 0.0 | 0.3 | 2.7 | 3.1 |
| | Seedbed | 72.7 | 0.8 | 0.0 | 1.2 | 4.2 |
| | Placed | 73.8 | 0.0 | 0.7 | 0.5 | 0.5 |
| S.E. (12 D.F.) | | 0.99 | 0.53 | 0.46 | 1.05 | 1.91 |
| S.E. (12 D.F.; same Irrig) | | 0.93 | 0.63 | 0.45 | 1.14 | 1.96 |

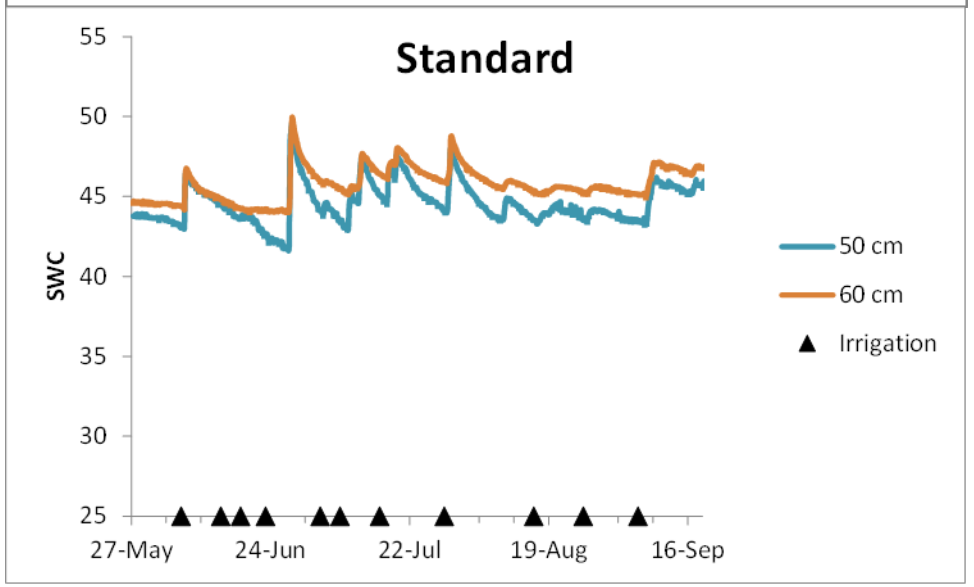
# Summary: yield and quality

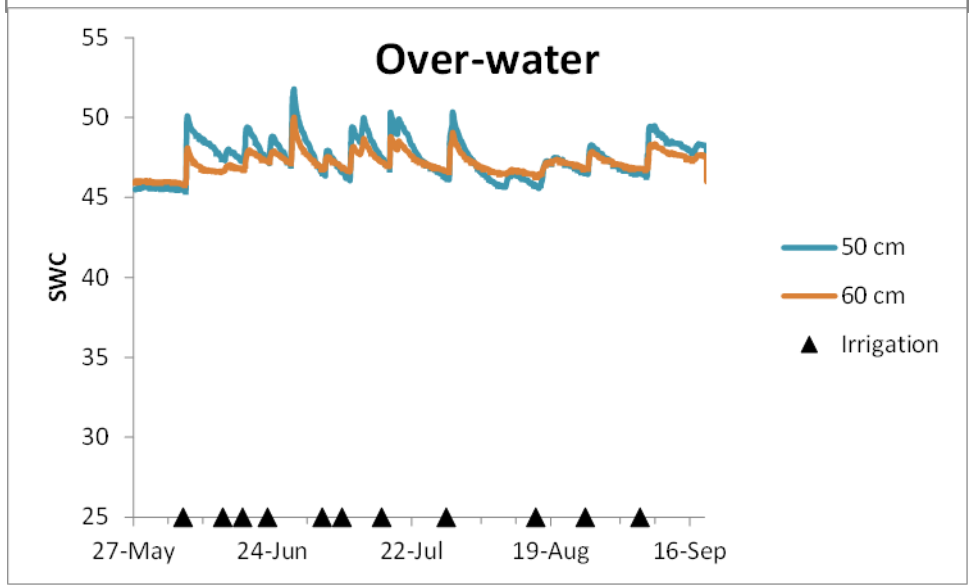
- No effect of irrigation regime on early ground cover development, but overwatering caused earlier senescence and reduced GC duration (but only by 3.5 days at 100 % GC)
- Placed N slightly later in developing GC than Split or Seedbed (but did emerge slightly later and maintain higher GC until desiccation, with no overall effect on GC duration)
- No effect of irrigation regime on yield or grading but overwatering increased tuber [DM]
- No effect of N method on yield but Placed numerically lower than Split or Seedbed
- No effect of irrigation or N method on fry quality

# Agrii Soil Water Sensor Data
# Showing drainage events at 50-60 cm



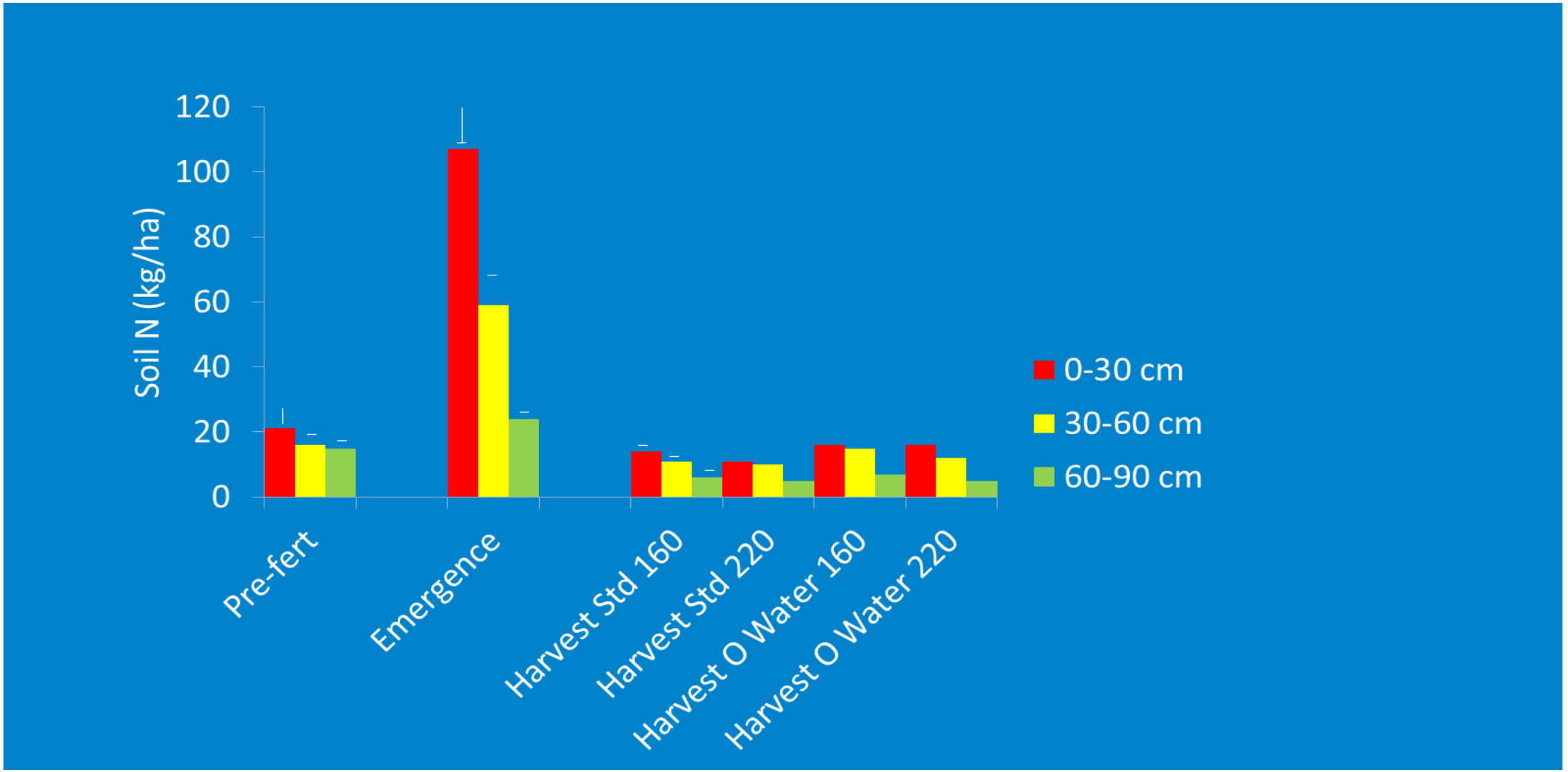



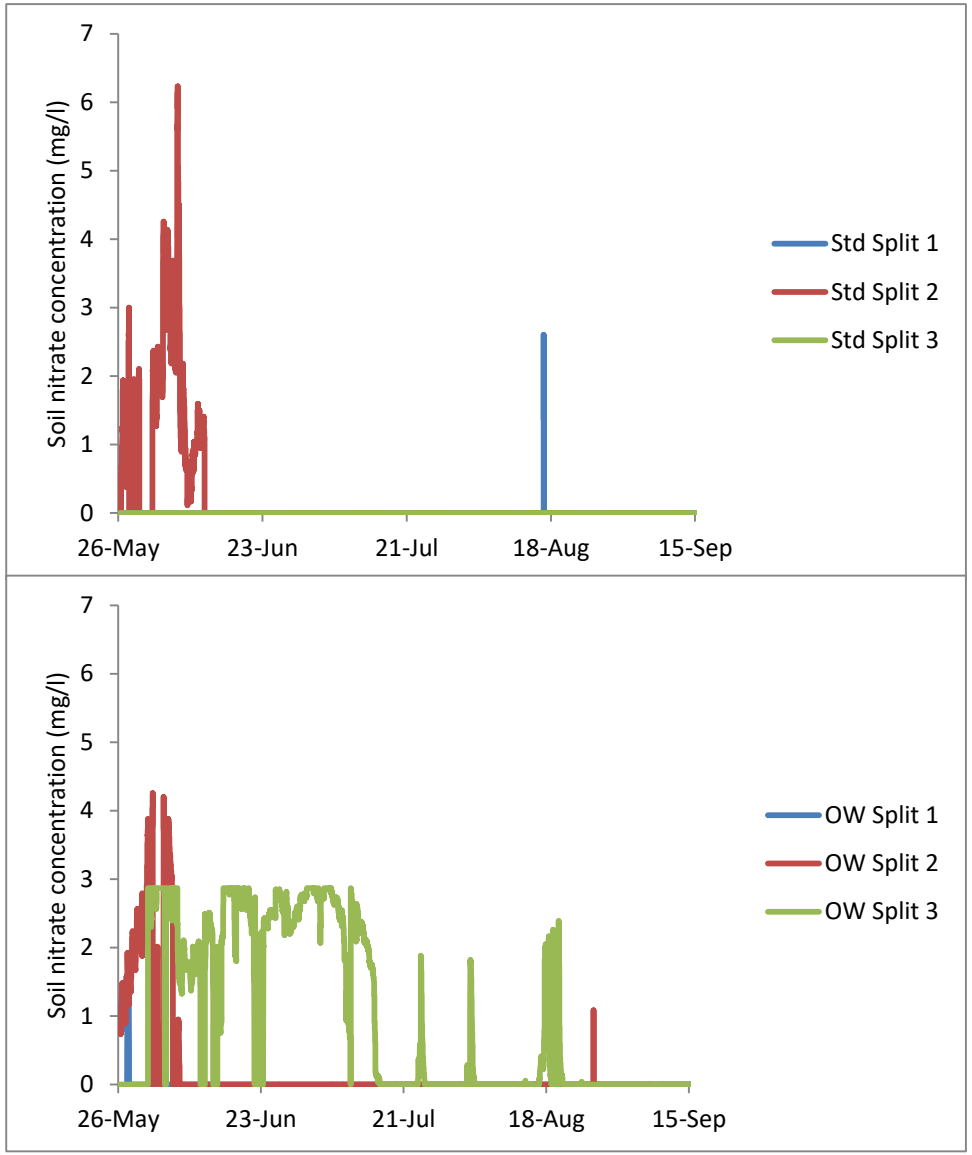
# Drainage

- All Over-water irrigation events recorded drainage at 50 and 60 cm
- Some Standard irrigation events recorded drainage at 50 and 60 cm

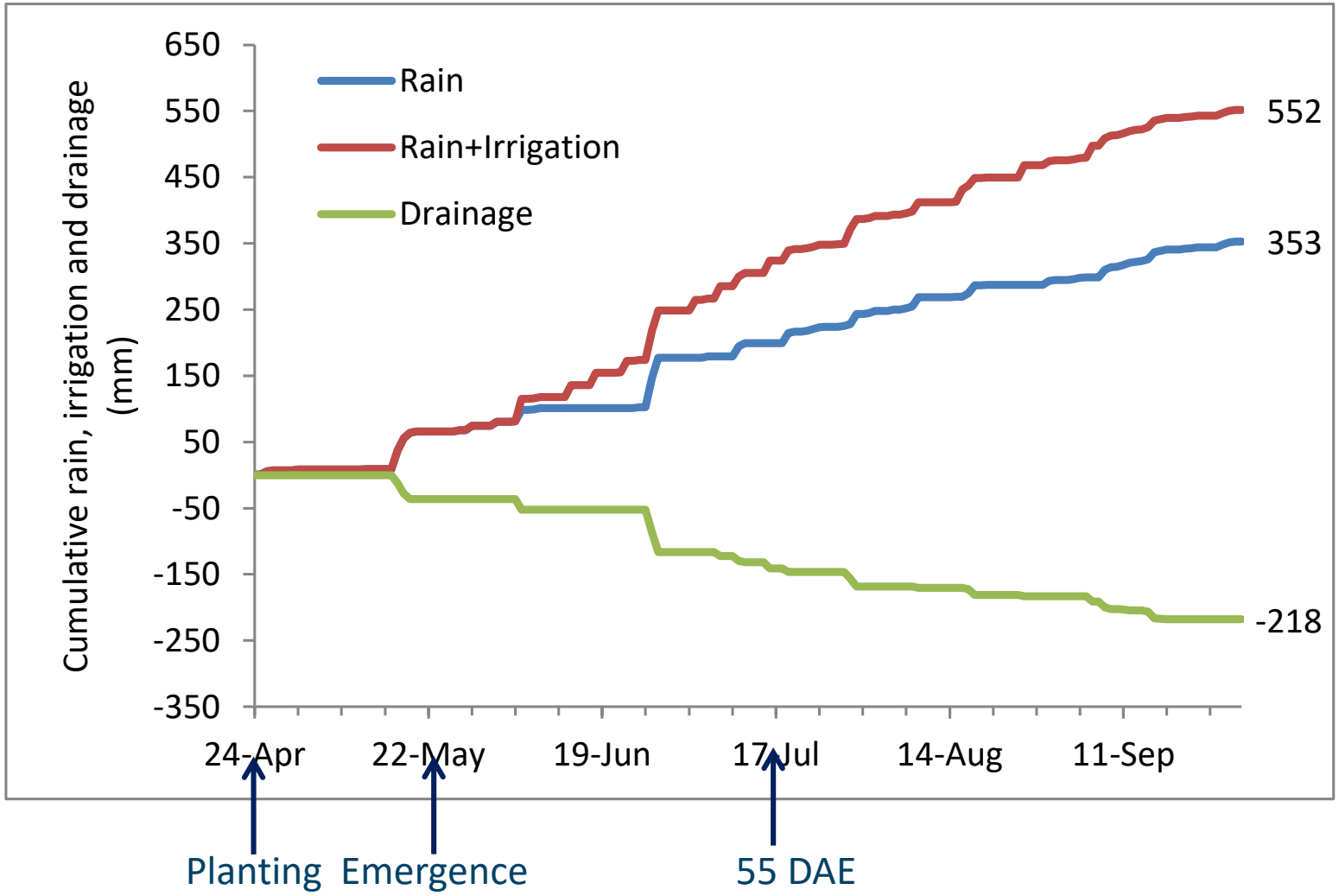
# Soil mineral N from soil cores
# 7 kg/ha MORE N in Over water at end of season



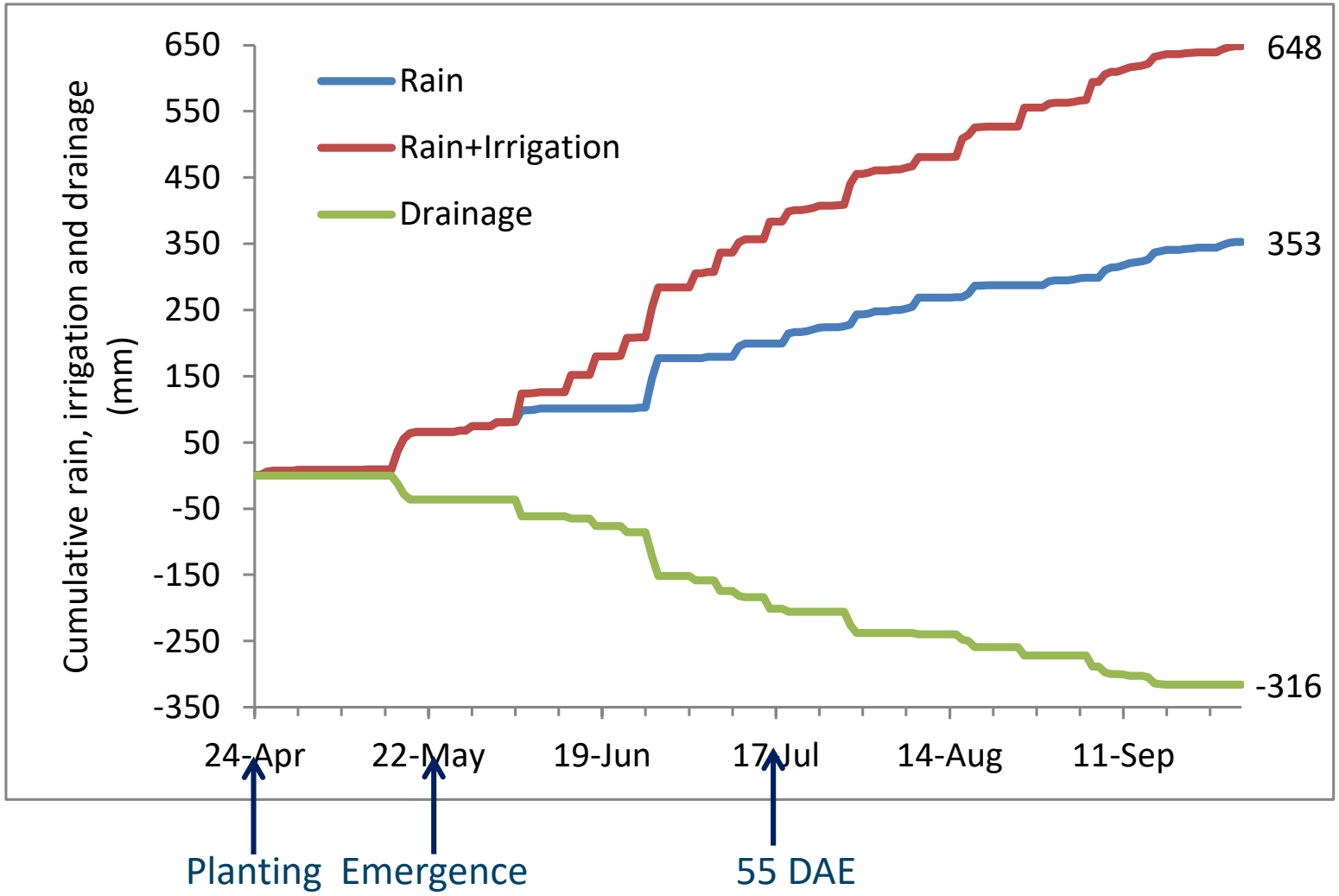
# Soil $NO_3$ sensors (Agrii/PBL Technology)




# Water input and drainage
# Standard irrigation and Split N

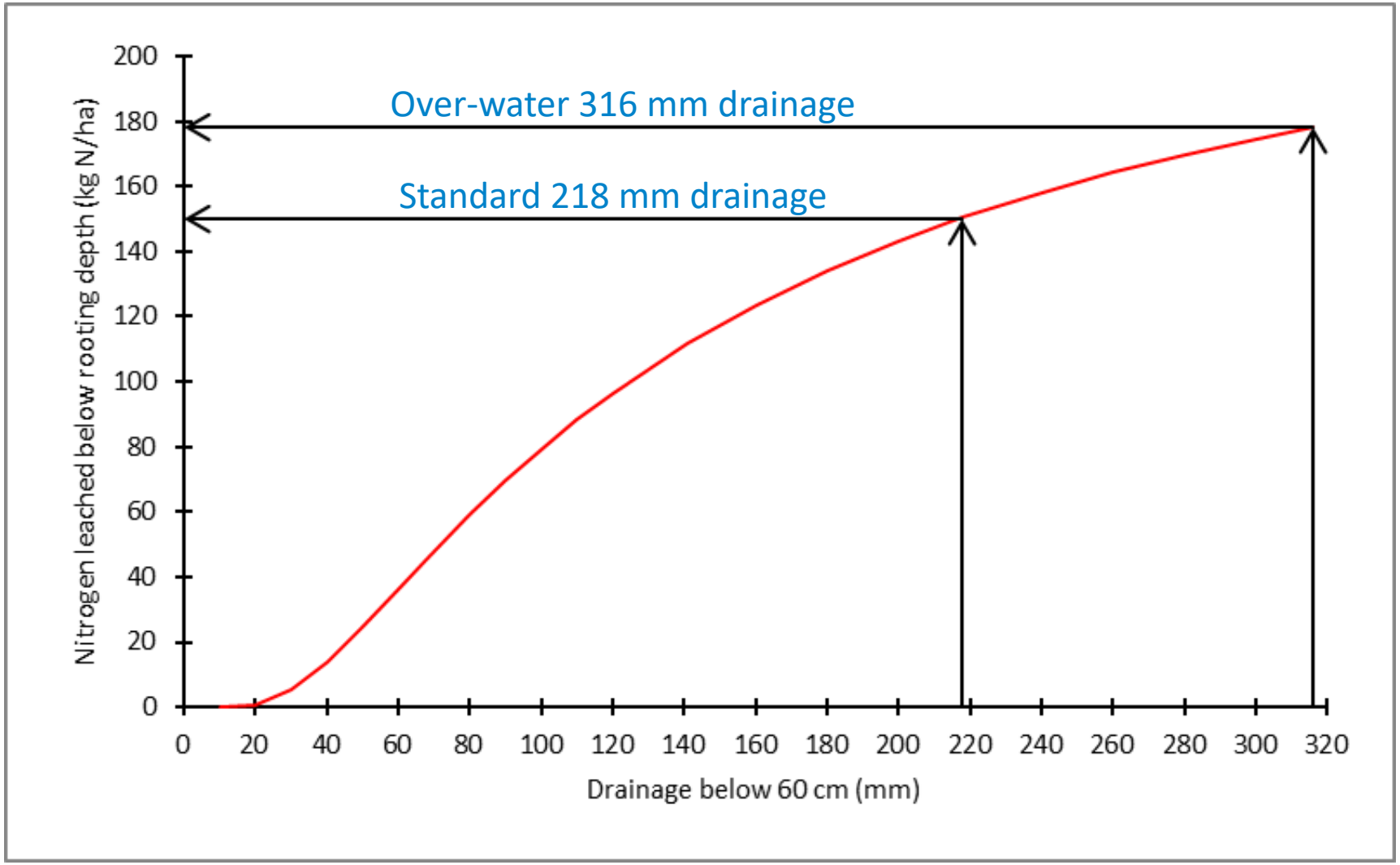


# Water input and drainage
# Over water irrigation and Seedbed N



# Leaching of N fertilizer below 60 cm using Burns' (1975) model

Loamy Sand textured soil with 260 kg N/ha applied at planting



# Summary: drainage and soil N

- Drainage greater than in 2016
- Some drainage following Standard irrigation in 2017
- Only 32 kg/ha N left in soil at end of season (started with 52 kg)
- Little useful data from soil $NO_3$ sensors in 2017
- Burns model indicates potential loss of 150-180 kg N/ha during season IF NO CROP UPTAKE but in reality uptake would be close to 200 kg N/ha

# AHDB SPot Farm East 2017– Manipulating Tuber Numbers

## VCS (UK) Ltd

Commissioned to complete a tuber number demonstration

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

Why are Tuber numbers important?

- Maximise yield of a specific size requirement
  - Under 42mm size
  - 65 – 85mm Baker fraction
  - Tuber count specification
  - Processing length tolerance e.g. Russet Burbank spec 1 %>90mm

- To achieve an intended harvest date e.g. Earlier Harvest – lower tuber numbers per seed/seed piece

- Reduce Seed requirement

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

Which growing aspects influence tuber numbers?

- Genetics (Variety)- within growers control

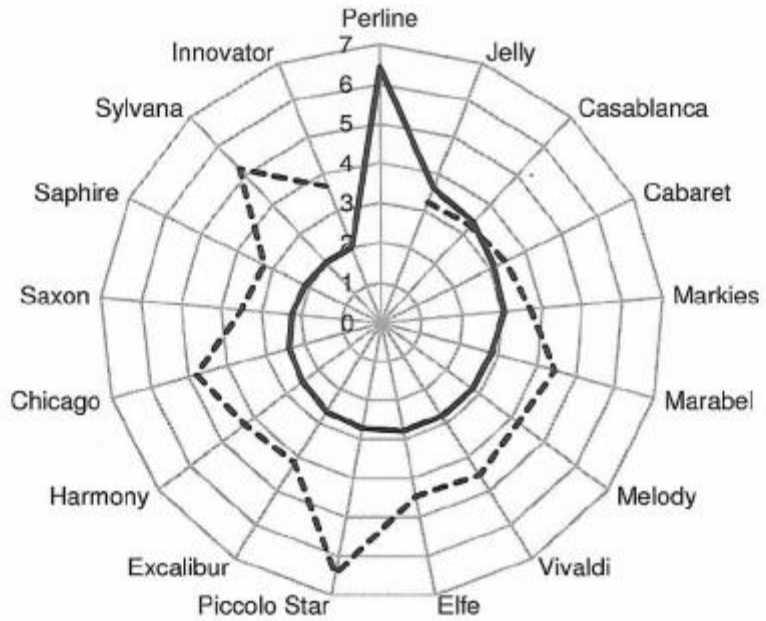
VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

Which growing aspects influence tuber numbers?

- Genetics (Variety)- within growers control

**Figure 25** Radar plot for varieties showing the number of stems per seed tuber (for seed weighing 50 g not accounting for seed age), solid line and number of tubers per stem at a stem density of 100 000/ha, broken line.




D.Firman CUPGRA Annual Report 2012

- Genetics - Variety effects stem numbers per seed and tubers per stem

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Which growing aspects influence tuber numbers?

- Genetics (Variety)- within growers control
  - Growing Environment of Seed Crop – partially within growers control
    - Chronological age of Seed Crop
    - Disease status of seed crop e.g. *Rhizoctonia,* Virus *PVY*
  - Growing Environment of Daughter crop – partially within growers control
    - Seed size
    - Seed population (rate)
    - Seed spatial arrangement
    - Soil conditions
    - Fertiliser P & N
    - Growing Environment – Weather
    - Planting Date
    - Treatments – Ethylene, Amistar (azoxystrobin- in furrow), Monceren DS (pencycuron)
    - Physiological age of seed

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Which growing aspects influence tuber numbers?

- Genetics (Variety)- within growers control
  - Growing Environment of Seed Crop – partially within growers control
    - Chronological age of Seed Crop
    - Disease status of seed crop e.g. *Rhizoctonia,* Virus *PVY*
  - Growing Environment of Daughter crop – partially within growers control
    - Seed size
    - Seed population (rate)
    - Seed spatial arrangement
    - Soil conditions
    - Fertiliser P & N
    - Growing Environment – Weather
    - Planting Date
    - Treatments – Ethylene, Amistar (azoxystrobin- in furrow), Monceren DS (pencycuron)
    - Physiological age of seed

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies & Shepody

- Markies – Chronological age, Physiological Age
  - Stock 1 1st Emergence - 8th June 'Old'
  - Stock 2 1st Emergence - 22nd June 'Young'
  - Both Physiologically aged 'chitted' to 245 day degrees

- Shepody – Chronological age
  - Stock 1 1st Emergence - 27th May 'Old'
  - Stock 2 1st Emergence - 21st June 'Young'

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

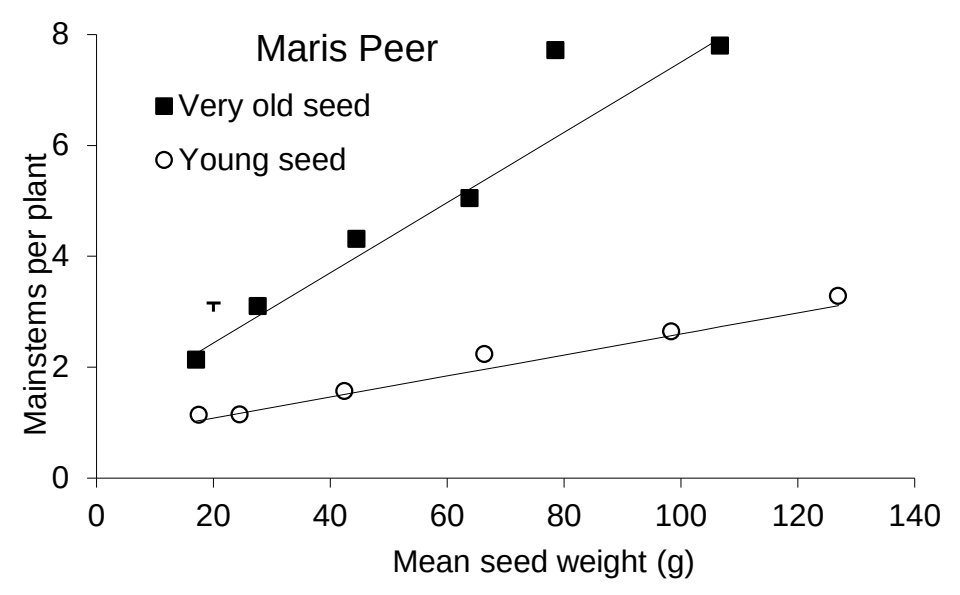
## Physiological Seed ageing - Chitting

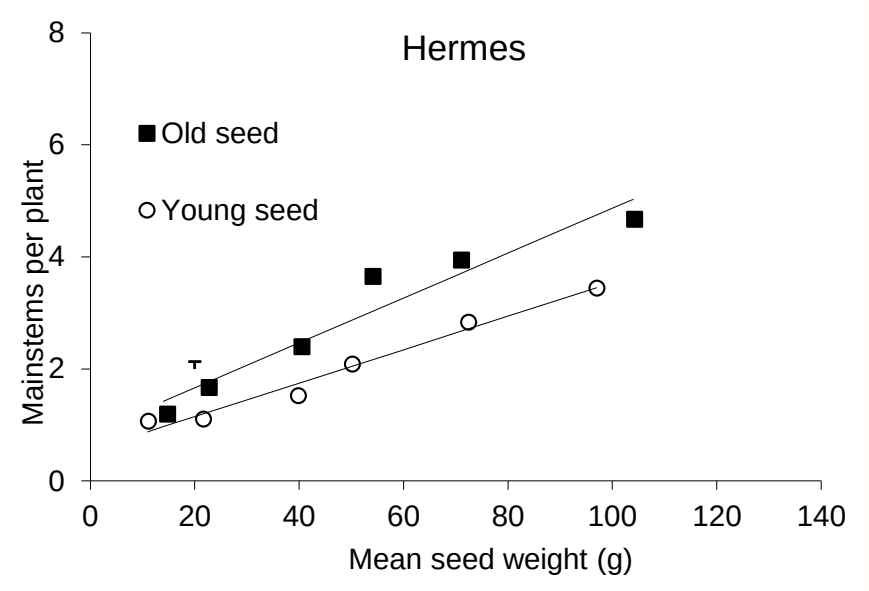
- Temperature and light at dormancy break affect sprout number (apical dominance) when pre-sprouting seed
- Bakers – Higher temperatures at dormancy break- initial chitting period 14-16 Deg C will induce apical dominance followed by storage at 5-6 deg C to avoid over 'ageing' of seed (darker conditions will also induce increased apical dominance)
- 'New/salads' – Ideally chit at a much cooler temperature 6-8 deg C at dormancy break promoting many sprouts to develop at a much slower rate, reduce temperature following the observation of sprouting to 4-5 deg C
- Generally Chitting will reduce the potential tuber numbers of a particular seed lot

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Chronological age of Seed Crop




- Chronological age – Date from Tuber Initiation of seed crop to planting date of daughter tubers
- Obtain TI information from Seed suppliers to optimise planting order
- Procure seed from early seed growers (to increase tuber numbers
- Grow 'Home saved Seed' – Suffolk target planting date Mid March

NIAB CUF

Source: Firman

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies & Shepody

- Field - Bishop Hill's Middle
  - Soil Type – Loamy Sand
  - Planting date 19th April
  - Shepody – Seed Size 30x45 whole, Population 41,300/ha
  - Markies – Seed Size 45x55, Population 34,200/ha

Single plot demonstration – harvest 6th July, 1st August and 6th September

- 10m 3 Row planted Bed, guard row on adjacent bed
- Assessment Stem numbers/tuber numbers all 3 dates
- Assessment yield 6th September

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies & Shepody

Markies ‘Old’ Chitted

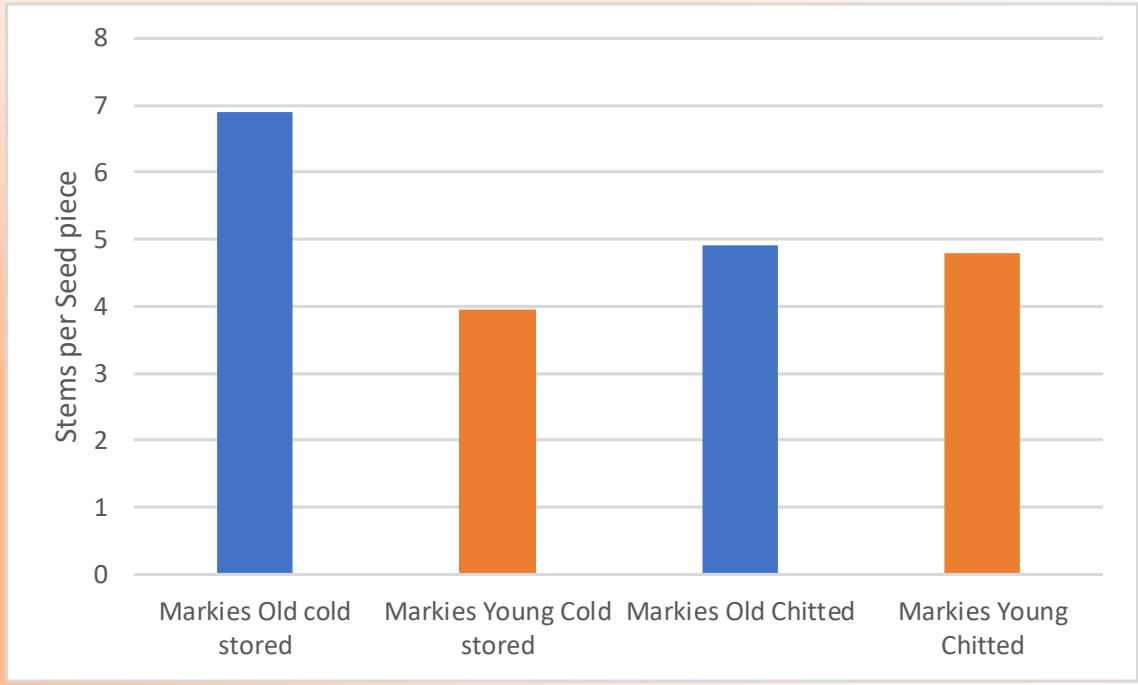
Markies ‘Old’ Cold store

VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies

- Stem numbers per seed piece

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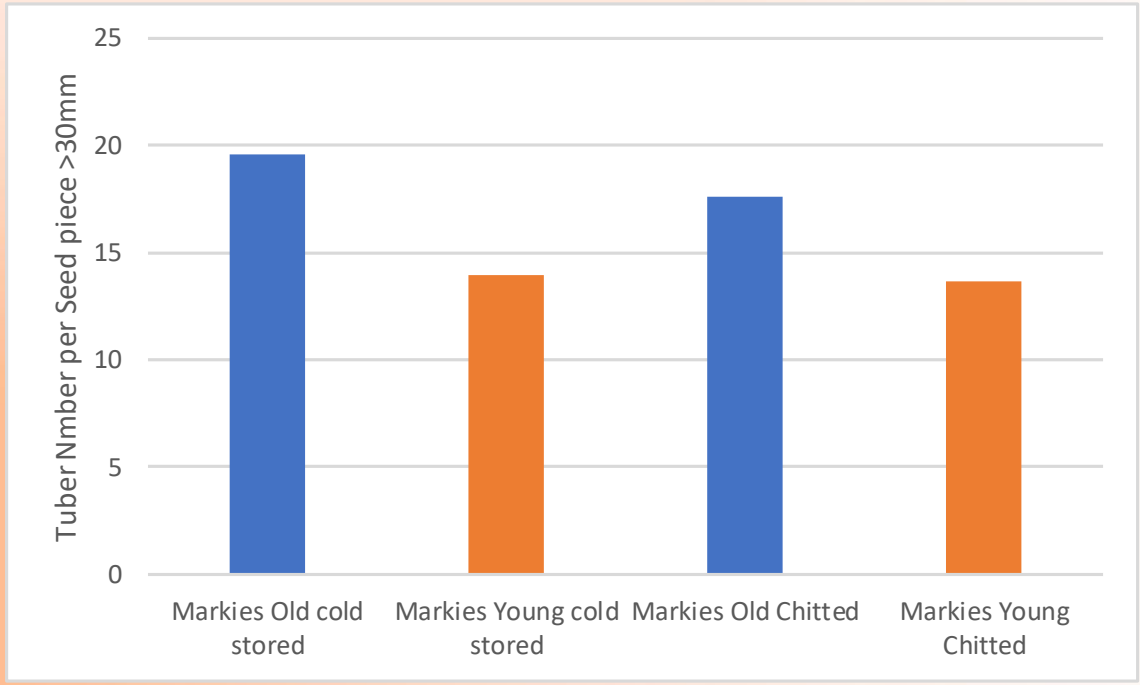
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies

- Tuber Numbers per seed piece

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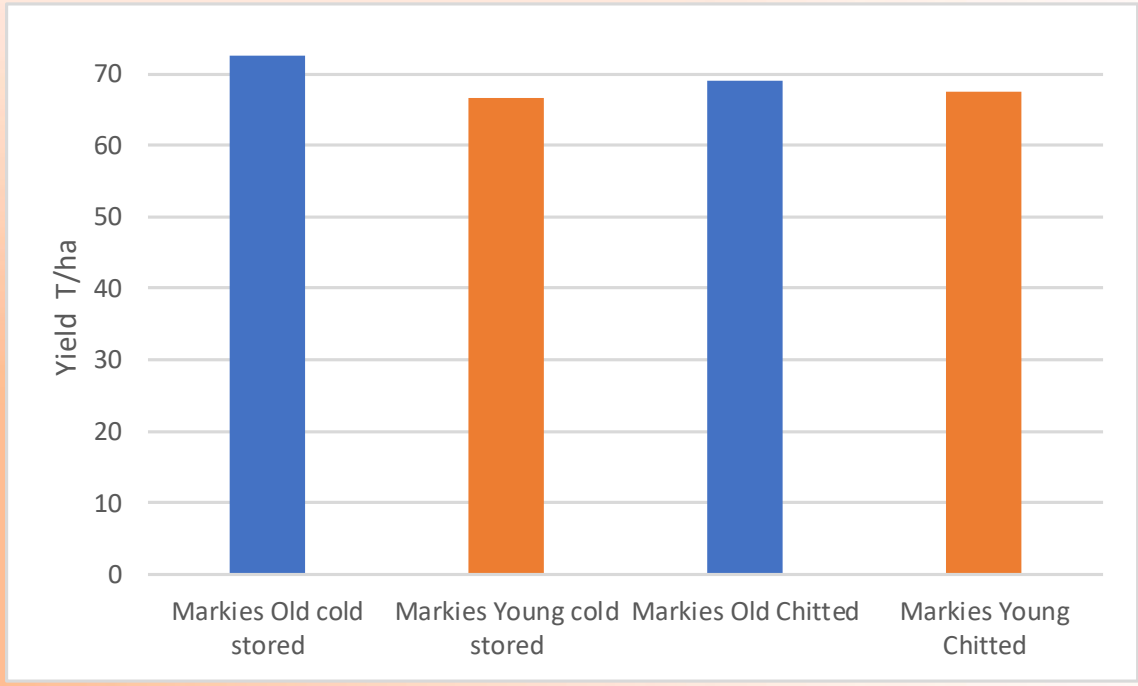
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Markies

- Yield T/ha small differences




VCS Potatoes Ltd

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Shepody

- Similar Ground cover development

Shepody ‘Old’

Shepody ‘Young’

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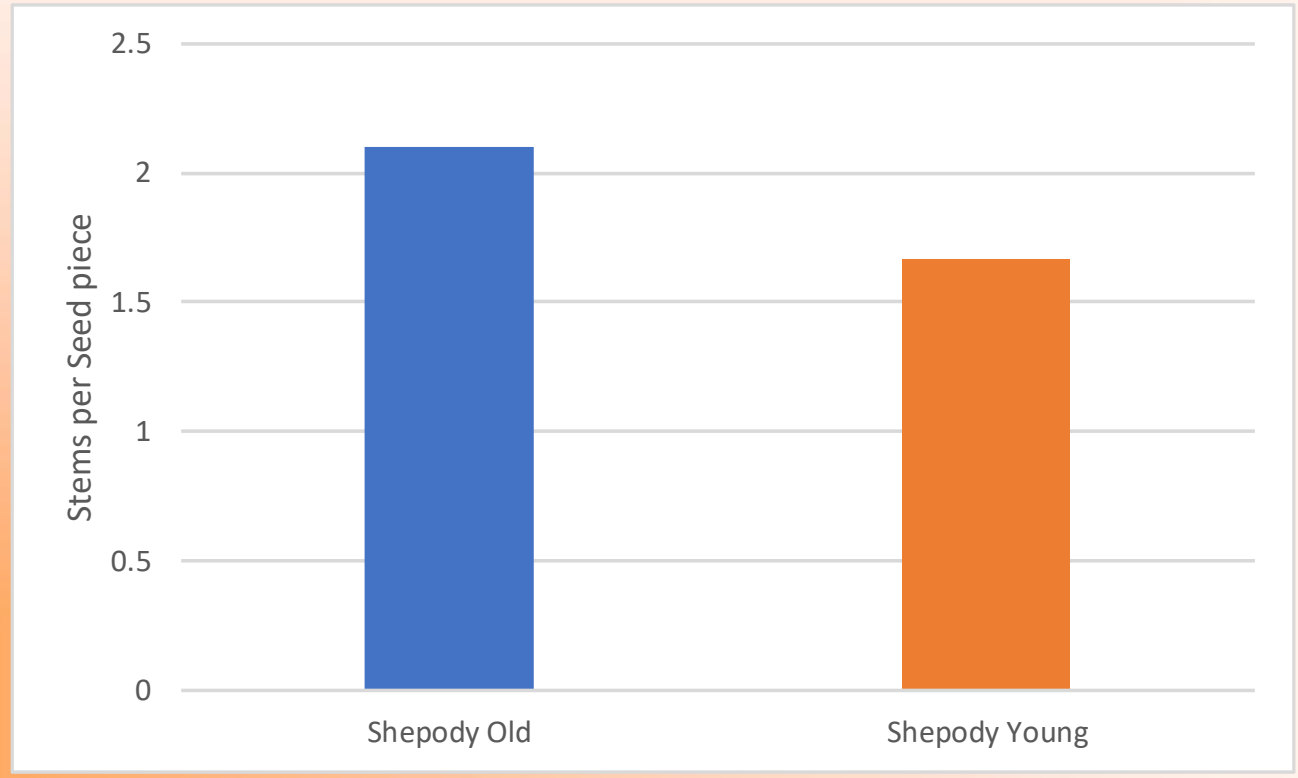
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Shepody

- Stem numbers per seed piece

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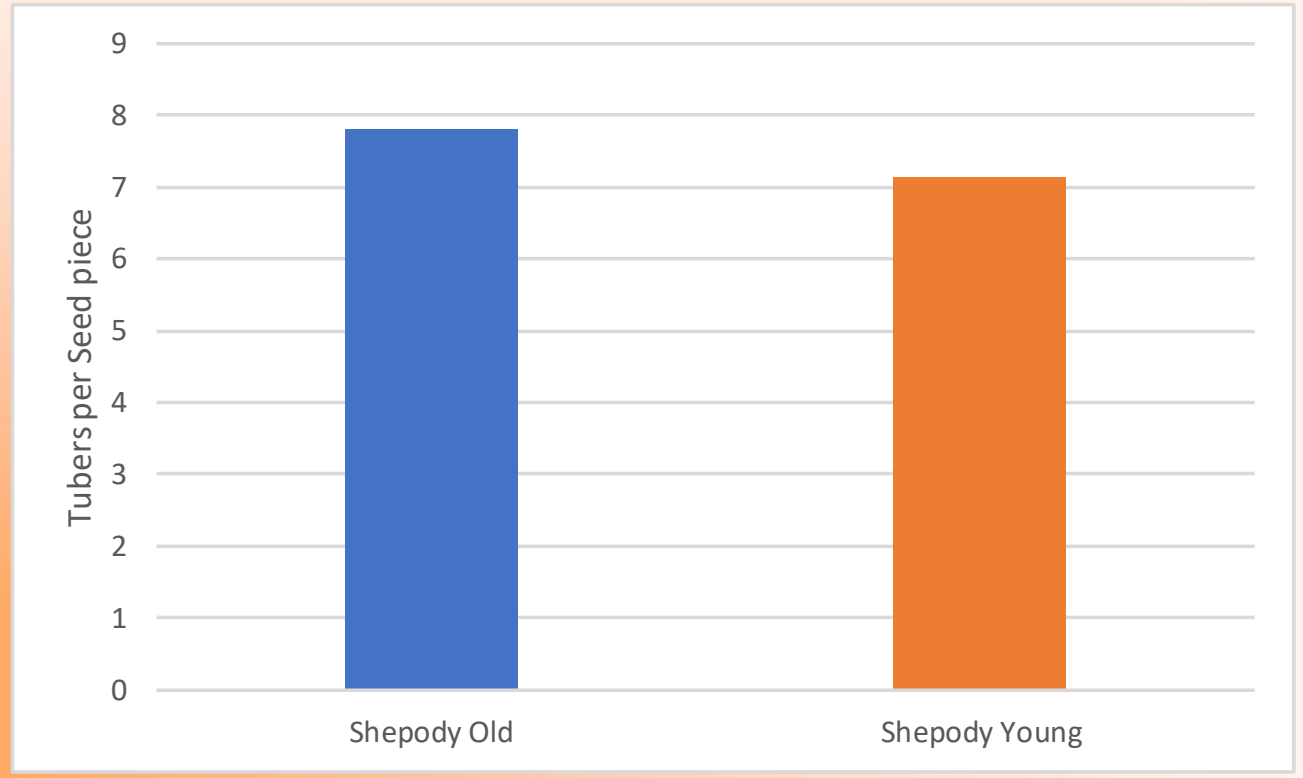
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Shepody

- Tuber Numbers per seed piece

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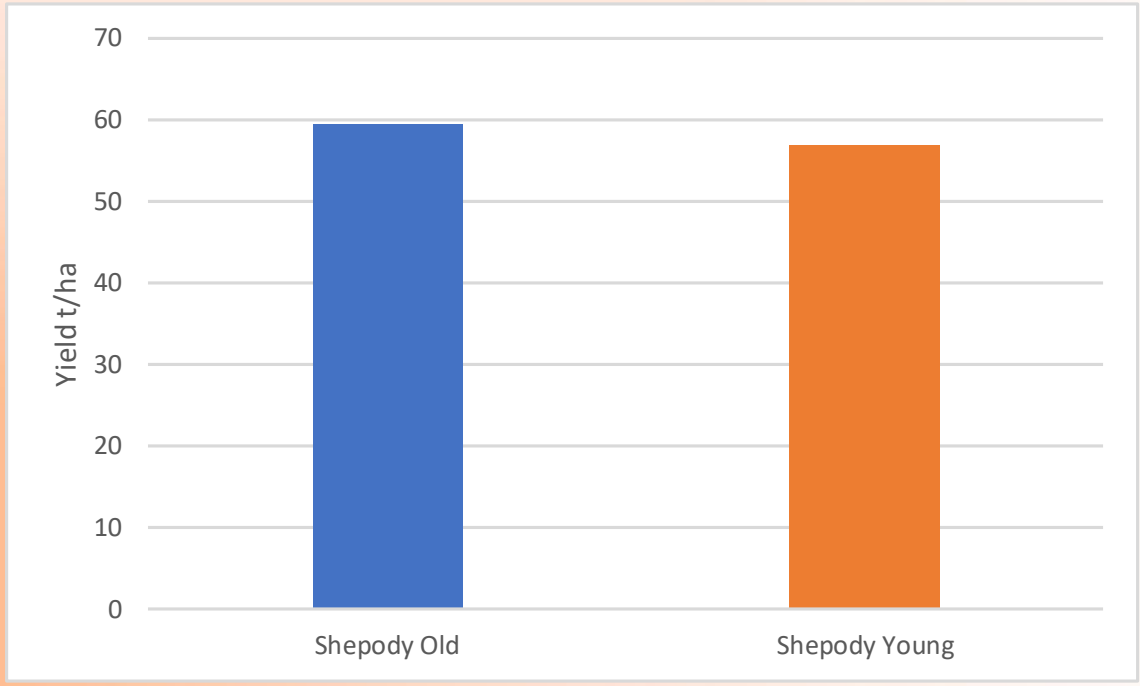
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 1 – Shepody

- Yield T/ha – 'Old' seed 4.5% higher

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 2 – Maris Peer

- Field - Yorks
  - Soil Type – Loamy Sand
  - Planting date 19th April
  - Seed Size 40x45mm
  - Planting population 96,470/ha

Single plot demonstration – harvest 6th July, 1st August and 6th September

- 10m 3 Row planted Bed, guard row on adjacent bed
- Assessment Stem numbers/tuber numbers 6th July/1st August
- Assessment yield 1st August/6th September

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 2 – Maris Peer

- Maris Peer – Chronological age, Physiological Age

  - Stock 1 Tuber Initiation - 18th May 'Old'
  - Stock 2 Tuber Initiation – 20th June 'Young'
  - Both Stocks Physiologically aged 'chitted' to 265 day degrees
  - Both Stocks Ethylene treatment 'Accumulator' 20th December-20th April
  - Both Grown in East Suffolk from identical Pre Basic input stock

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Ethylene Seed Treatment (Accumulator from Restrain company)

- Ethylene is a plant hormone which controls certain processes within plant such as fruit ripening, opening of flowers, abscission of leaves, induces root hair growth, induces seed germination and prevents stem elongation.

- The raising of temperature promotes the seed to break dormancy but the inhibition of stem elongation caused by ethylene promotes all of the eyes around a seed tuber to initiate growth. Stem elongation is limited due to ethylene

- Storage CO2 should be monitored and stores 'flushed' with fresh air if levels exceed 3000ppm as seed death can occur.

- Planting should take place 2-3 days after removing from store

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Ethylene Seed Treatment (Accumulator from Restrain company)

- Storing seed within an atmosphere of approx. 9ppm Ethylene (plant hormone) increases stem numbers of many varieties
- 'Slow start' ramp up required
- Storage temperature increased to 5 - 5.5 Deg C following 'Slow' start period

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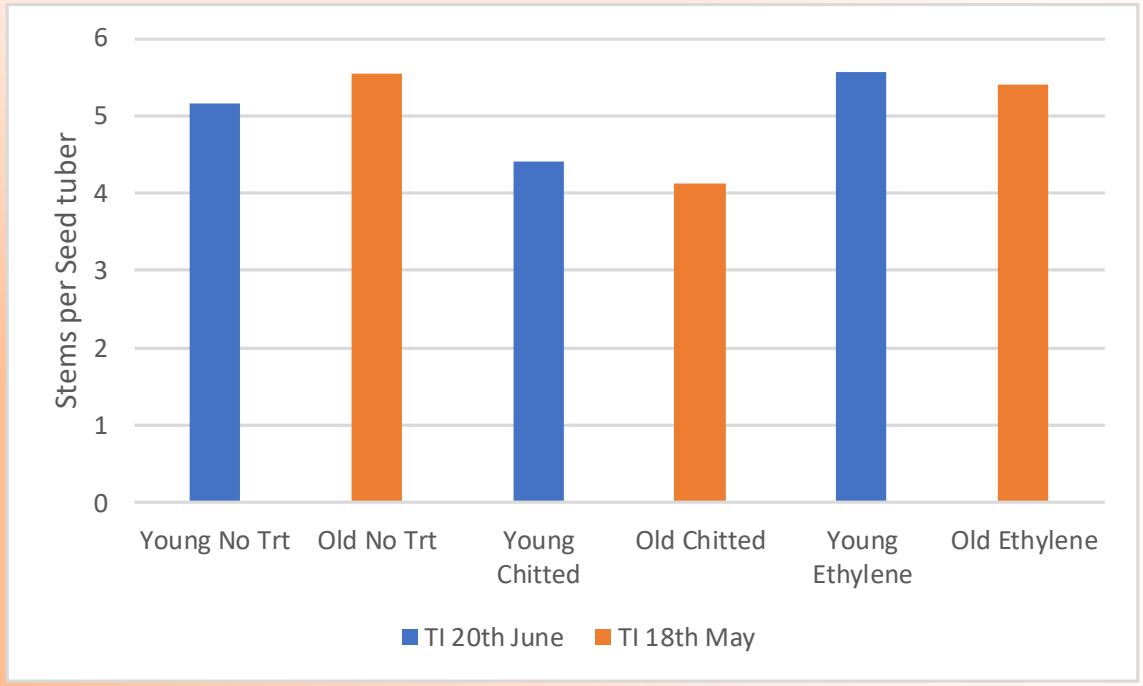
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 2 – Maris Peer

- Stems/seed piece

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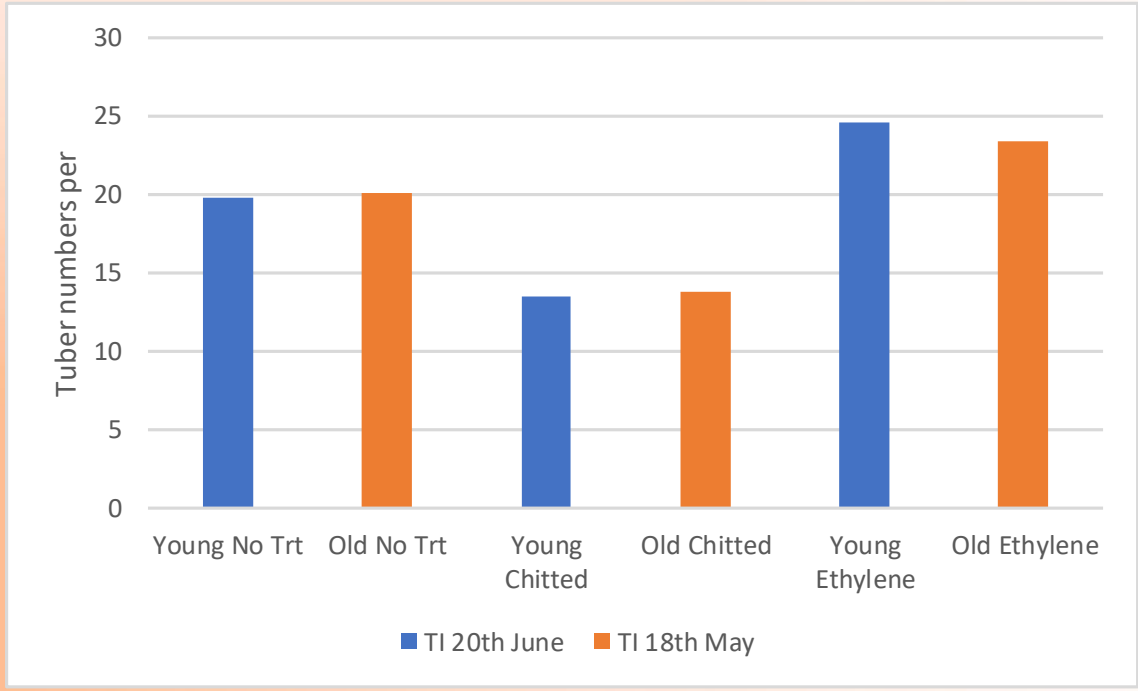
## Site 2 – Maris Peer

- Tuber per seed piece
  - 32 % decrease chitting, 16-24% increase due to ethylene treatment

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## Site 2 – Maris Peer

M.Peer ‘old’ cold store

M.Peer ‘old’ Physiologically aged

M.Peer ‘old’ Ethylene

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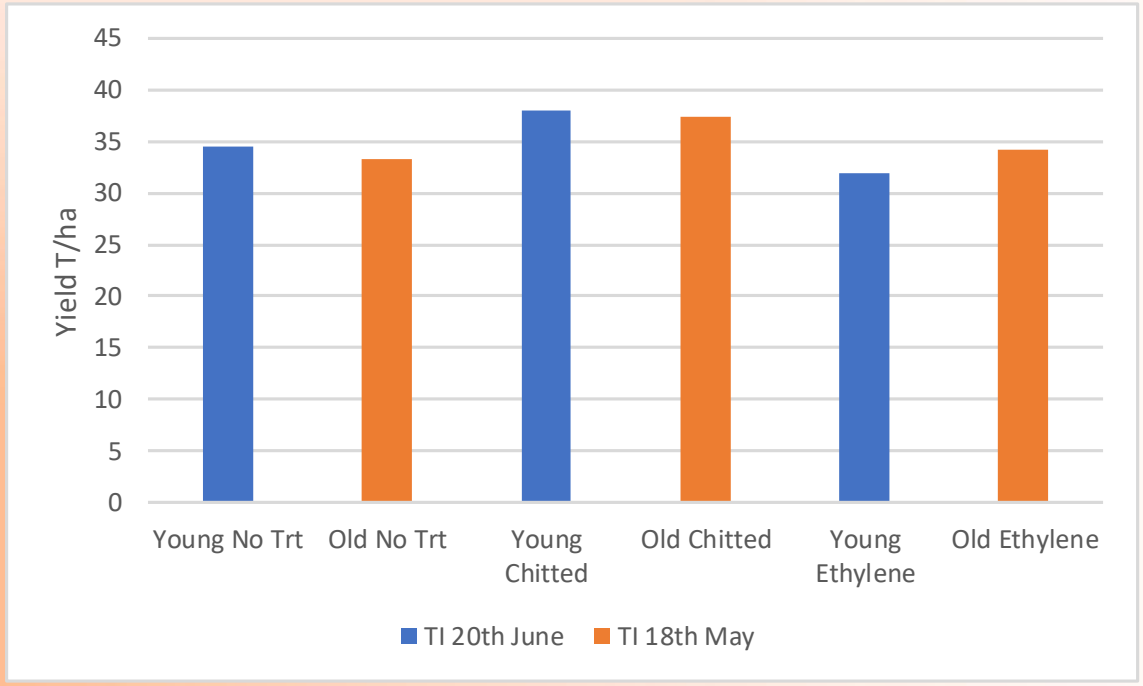
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 2 – Maris Peer

- Yield T/ha 10% increase 'young', 12% increase 'old' Chitting, limited differences ethylene

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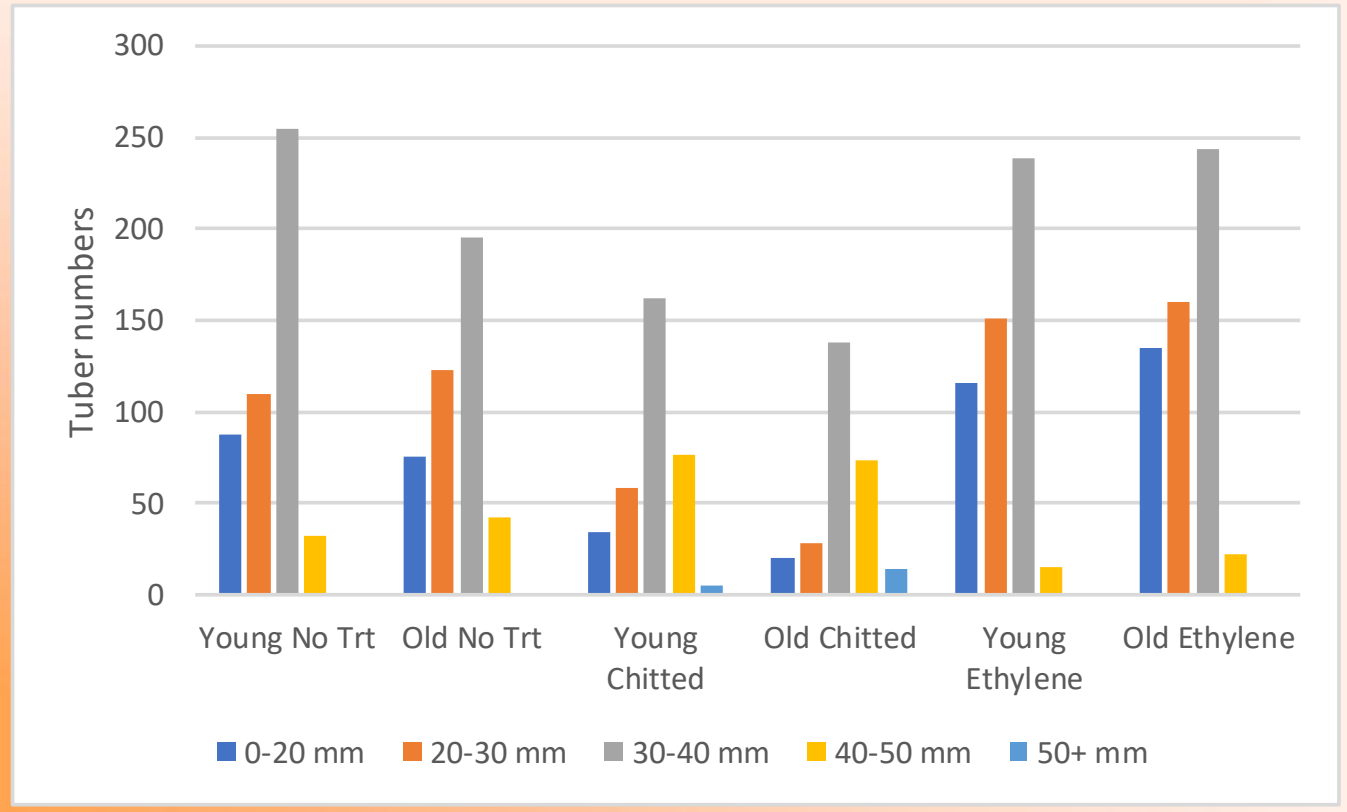
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Site 2 – Maris Peer

- Tuber size distribution – high yield if crop fully developed to size spec

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

Ethylene Seed Treatment & Early ‘Old’ Seed

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

| Pre Planting | | At Planting | | Post Planting | |
|---|---|---|---|---|---|
| Variety | ↓ ↑ | | | | |
| Physiological Age – Chitting | ↓ | | | | |
| Chronological Age | ↑ | | | | |
| Ethylene seed treatment | ↑ | | | | |
| | | Spatial arrangement – inc rows | ↑ | | |
| | | Planting Date | ↑ | | |
| | | Seed rate/Seed Size | ↓ ↑ | | |
| | | Seed bed compaction | ↓ | | |
| | | Phosphate | ?? ↑ | | |
| | | Rhizoctonia Control | ↑ | | |
| | | | | Rhizoctonia control | ↑ |
| | | | | Nitrogen deficiency | ↓ |
| | | | | Novel Products | ↑ |
| | | | | Excessive Stress – e.g. waterlogging | ↓ |

# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Seed Size

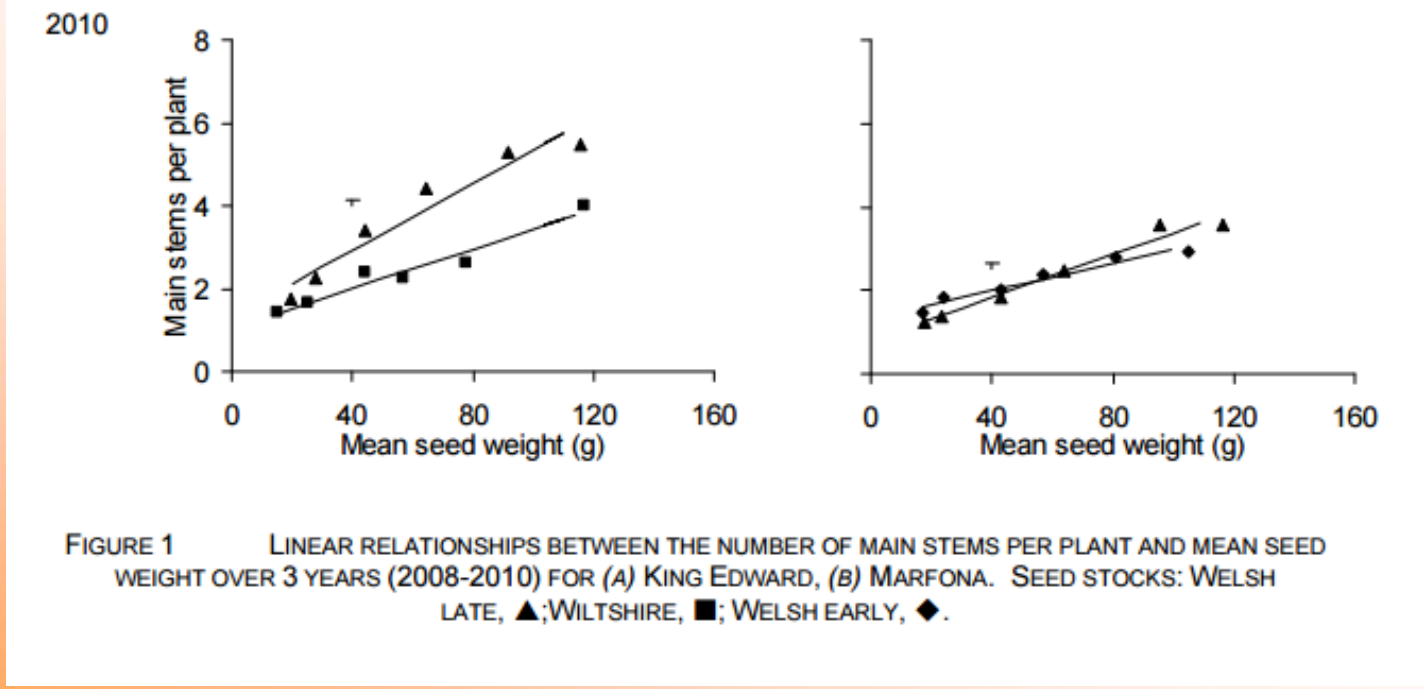


FIGURE 1 LINEAR RELATIONSHIPS BETWEEN THE NUMBER OF MAIN STEMS PER PLANT AND MEAN SEED WEIGHT OVER 3 YEARS (2008-2010) FOR *(A)* KING EDWARD, *(B)* MARFONA. SEED STOCKS: WELSH LATE, ▲;WILTSHIRE, ■; WELSH EARLY, ◆.

Potato Council Report R296 – Factors affecting tuber numbers per stem leading to improved seed rate recommendations – D.M .Firman S.J. Daniells - February 2011

- Increasing seed size increases the stem numbers per plant for all varieties but with different relationships

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# AHDB SPot Farm East 2017– Manipulating Tuber Numbers

Stem Numbers – Tuber Numbers (within a particular variety)

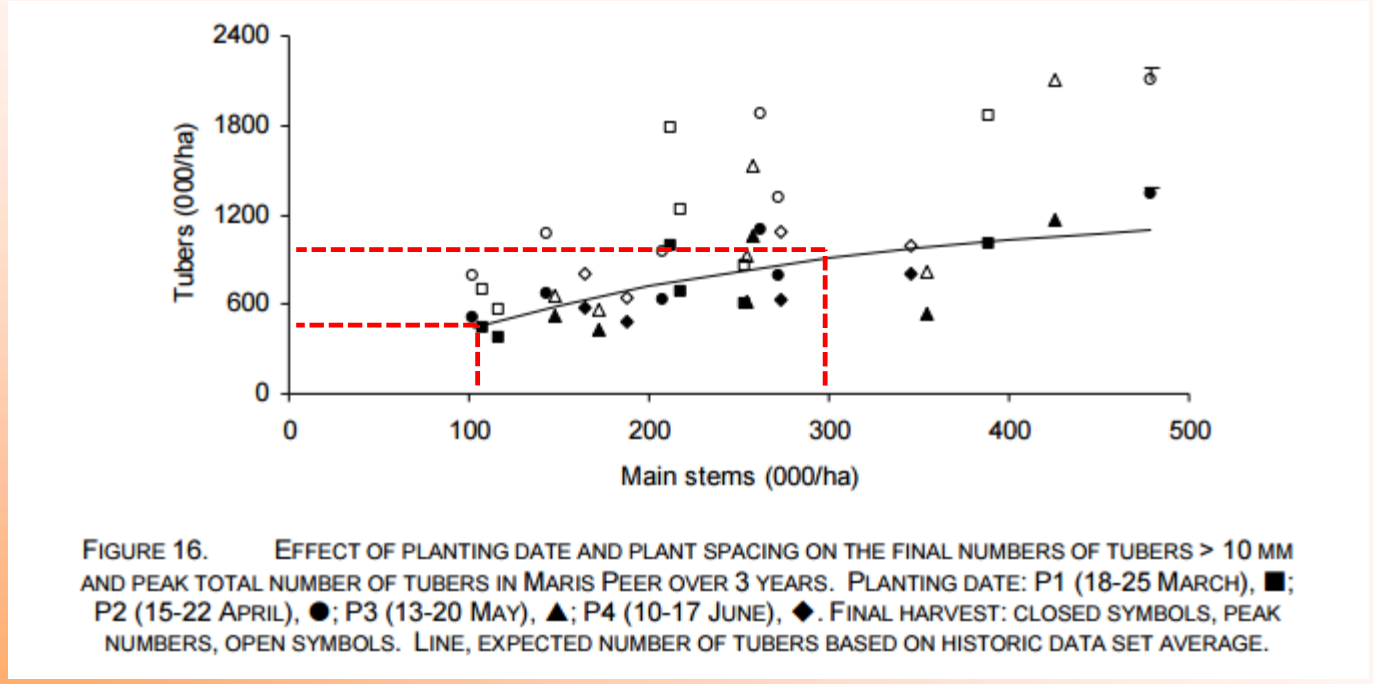


FIGURE 16. EFFECT OF PLANTING DATE AND PLANT SPACING ON THE FINAL NUMBERS OF TUBERS > 10 MM AND PEAK TOTAL NUMBER OF TUBERS IN MARIS PEER OVER 3 YEARS. PLANTING DATE: P1 (18-25 MARCH), ■; P2 (15-22 APRIL), ●; P3 (13-20 MAY), ▲; P4 (10-17 JUNE), ◆. FINAL HARVEST: CLOSED SYMBOLS, PEAK NUMBERS, OPEN SYMBOLS. LINE, EXPECTED NUMBER OF TUBERS BASED ON HISTORIC DATA SET AVERAGE.

Potato Council Report R296 – Factors affecting tuber numbers per stem leading to improved seed rate recommendations – D.M .Firman S.J. Daniells - February 2011

- Increase in mainstems 100,000 to 300,00 – increase in daughter tubers 500,000 to 950,000
- Within a variety either increase stem numbers or tuber numbers/stem

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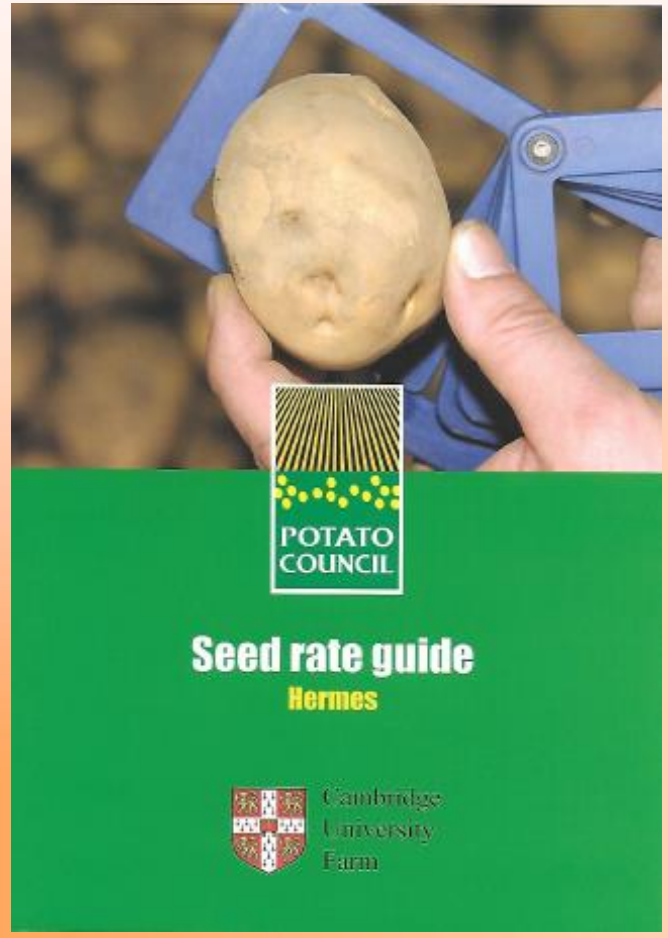
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Seed Density – Rate T/ha

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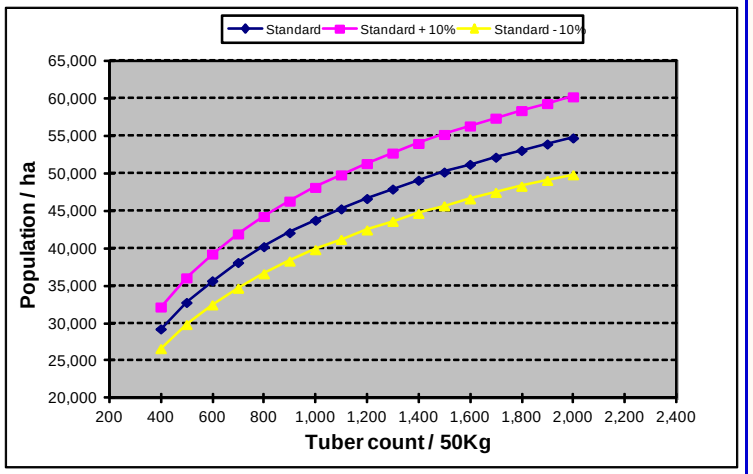
Lady Rosetta Seed Rate

Mar-14

| Details for Standard | | | | | Seed Spacing (inches) | | |
|---|---|---|---|---|---|---|---|
| 50 Kg Tuber Count | Tuber Density | Tonnes Ha | Tonnes Ha +10% | Tonnes Ha -10% | 36" 2 Row | 72" Bed 3 Row | 80" Bed 4 Row |
| 400 | 29,285 | 3.66 | 4.03 | 3.29 | 14.7 | 22.1 | 26.5 |
| 500 | 32,819 | 3.28 | 3.61 | 2.95 | 13.1 | 19.7 | 23.6 |
| 600 | 35,707 | 2.98 | 3.27 | 2.68 | 12.1 | 18.1 | 21.7 |
| 700 | 38,148 | 2.72 | 3.00 | 2.45 | 11.3 | 16.9 | 20.3 |
| 800 | 40,263 | 2.52 | 2.77 | 2.26 | 10.7 | 16.0 | 19.3 |
| 900 | 42,128 | 2.34 | 2.57 | 2.11 | 10.2 | 15.3 | 18.4 |
| 1,000 | 43,797 | 2.19 | 2.41 | 1.97 | 9.8 | 14.8 | 17.7 |
| 1,100 | 45,307 | 2.06 | 2.27 | 1.85 | 9.5 | 14.3 | 17.1 |
| 1,200 | 46,685 | 1.95 | 2.14 | 1.75 | 9.2 | 13.8 | 16.6 |
| 1,300 | 47,952 | 1.84 | 2.03 | 1.66 | 9.0 | 13.5 | 16.2 |
| 1,400 | 49,126 | 1.75 | 1.93 | 1.58 | 8.8 | 13.2 | 15.8 |
| 1,500 | 50,219 | 1.67 | 1.84 | 1.51 | 8.6 | 12.9 | 15.4 |
| 1,600 | 51,241 | 1.60 | 1.76 | 1.44 | 8.4 | 12.6 | 15.1 |
| 1,700 | 52,201 | 1.54 | 1.69 | 1.38 | 8.3 | 12.4 | 14.9 |
| 1,800 | 53,106 | 1.48 | 1.62 | 1.33 | 8.1 | 12.2 | 14.6 |
| 1,900 | 53,963 | 1.42 | 1.56 | 1.28 | 8.0 | 12.0 | 14.4 |
| 2,000 | 54,775 | 1.37 | 1.51 | 1.23 | 7.9 | 11.8 | 14.2 |
| 2,100 | 55,548 | 1.32 | 1.45 | 1.19 | 7.8 | 11.6 | 14.0 |
| 2,200 | 56,285 | 1.28 | 1.41 | 1.15 | 7.7 | 11.5 | 13.8 |
| 2,300 | 56,989 | 1.24 | | | 7.6 | 11.3 | 13.6 |

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# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Seed Density – Rate T/ha AHDB

- Seed rate in t/ha for a given tuber count (in 50kg)
- Assumption of an intended average tuber size
- Variation for an intended crop yield
- Variation for seed chronological age

**Seed rate guide for Hermes for specified yield with a target average tuber size of 58.5mm* and a planting date of 15 April**

| Tuber count / 50kg | Yield (t/ha) 50 Plant density (000/ha) | 50 Seed rate (t/ha) | 55 Plant density (000/ha) | 55 Seed rate (t/ha) | 60 Plant density (000/ha) | 60 Seed rate (t/ha) |
|---|---|---|---|---|---|---|
| **Early seed (emerged 1 May)** | | | | | | |
| 2400 | 80 | 1.67 | 98 | 2.05 | 123 | 2.57 |
| 2000 | 71 | 1.79 | 87 | 2.19 | 110 | 2.74 |
| 1600 | 61 | 1.91 | 75 | 2.34 | 94 | 2.94 |
| 1200 | 50 | 2.06 | 61 | 2.53 | 76 | 3.17 |
| 1000 | 43 | 2.15 | 53 | 2.63 | 66 | 3.29 |
| 900 | 39 | 2.19 | 48 | 2.68 | 61 | 3.36 |
| 800 | 36 | 2.24 | 44 | 2.74 | 55 | 3.43 |
| 700 | 32 | 2.29 | 39 | 2.80 | 49 | 3.51 |
| 600 | 28 | 2.34 | 34 | 2.86 | 43 | 3.58 |
| 500 | 24 | 2.39 | 29 | 2.92 | 37 | 3.66 |
| 400 | 20 | 2.44 | 24 | 2.99 | 30 | 3.75 |
| **Standard seed (emerged 1 June)** | | | | | | |
| 2400 | 87 | 1.81 | 106 | 2.21 | 133 | 2.78 |
| 2000 | 77 | 1.93 | 95 | 2.37 | 119 | 2.97 |
| 1600 | 66 | 2.08 | 81 | 2.54 | 102 | 3.19 |
| 1200 | 54 | 2.24 | 66 | 2.75 | 83 | 3.44 |
| 1000 | 47 | 2.34 | 57 | 2.86 | 72 | 3.58 |
| 900 | 43 | 2.38 | 53 | 2.92 | 66 | 3.66 |
| 800 | 39 | 2.44 | 48 | 2.98 | 60 | 3.74 |
| 700 | 35 | 2.49 | 43 | 3.05 | 54 | 3.82 |
| 600 | 31 | 2.55 | 37 | 3.12 | 47 | 3.91 |
| 500 | 26 | 2.61 | 32 | 3.19 | 40 | 4.00 |
| 400 | 21 | 2.67 | 26 | 3.27 | 33 | 4.09 |
| **Late seed (emerged 1 July)** | | | | | | |
| 2400 | 94 | 1.96 | 115 | 2.40 | 145 | 3.01 |
| 2000 | 84 | 2.10 | 103 | 2.57 | 129 | 3.22 |
| 1600 | 72 | 2.26 | 89 | 2.77 | 111 | 3.47 |
| 1200 | 59 | 2.45 | 72 | 3.00 | 90 | 3.76 |
| 1000 | 51 | 2.55 | 62 | 3.12 | 78 | 3.92 |
| 900 | 47 | 2.61 | 57 | 3.19 | 72 | 4.00 |
| 800 | 43 | 2.67 | 52 | 3.26 | 65 | 4.09 |
| 700 | 38 | 2.73 | 47 | 3.34 | 59 | 4.19 |
| 600 | 34 | 2.79 | 41 | 3.42 | 51 | 4.28 |
| 500 | 29 | 2.86 | 35 | 3.50 | 44 | 4.39 |
| 400 | 23 | 2.93 | 29 | 3.59 | 36 | 4.50 |

*Average tuber size in the grade with the greatest proportion of yield and yields indicated are the total tuber yields. The column headed 400/ha is generally suitable for crops with expected yields up to 60t/ha. Where yields >60t/ha are expected, the increased seed rate indicated for a target average tuber size of 58.5mm will reduce the proportion of large tubers but use of lower seed rates could be considered if this is not important as ware yield may be unchanged. Where the average tuber size is <58.5mm, c. 5% of yield can be expected to be below 45mm and little yield above 80mm is likely. (Coefficient of variation assumed to be c. 0.20). For net stocked area see Step Five in main text.

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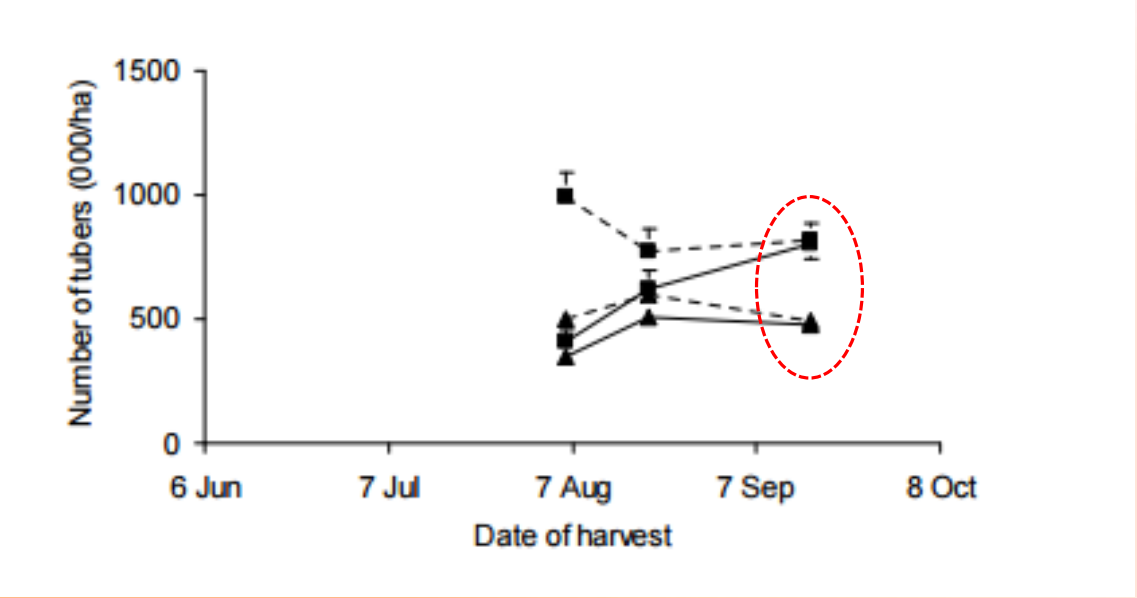
# AHDB Spot Farm East 2017– Manipulating Tuber Numbers

## Tuber number Variation due to seed spacing (density)




Potato Council Report R296 – Factors affecting tuber numbers per stem leading to improved seed rate recommendations – D.M .Firman S.J. Daniells - February 2011

Effect of planting density on number of tubers ▲ 40cm spacing, ■ 20cm spacing

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