

# Arable/Horticulture Opportunities

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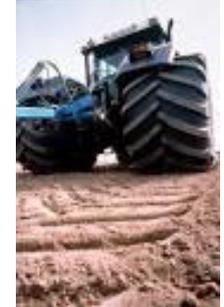
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# Some sources of variability in crop production



**Taste not Waste...**

A photograph of three vegetables: a yellow potato, a white carrot, and a red carrot. They are arranged vertically against a blue sky background.

At Mauth Direct we don't discriminate against Carly Carrots, Not so pretty Parsnips and Sculptured Spuds. No awful destiny awaits them because they happen to be unique. Enjoy our taste without the waste!



# So what can Agri-EPICentre do to mitigate variability in crop production?



- It's all about collecting data from satellite farms and relating variables to outcomes
  - Soil structure → crop establishment → yield & quality
  - Soil health → rate of growth → disease & pest risk
  - Seed health → disease risk → crop resistance
  - Crop response to pesticides → yield & quality → public acceptability
  - IPM v Conventional cropping → gross margins
  - New technologies → grower acceptability → gross margins
- The permutations are numerous
- **Crop production in the UK is going to change**

Farm gate value	(£M)	Total industry		Sector							
		£M	%	Edible horticulture		Ornamental horticulture		Other edible (cereals, oilseeds, pulses, potatoes, sugar beet)		Forestry	
				£M	%	£M	%	£M	%	£M	%
		8,973		1,668		1,243		5,658		404	
Scenario 1	Fungicides	413	5%	170	10%	164	13%	79	1%	0	0%
Scenario 1	Herbicides	123	1%	57	3%	1	0%	66	1%	0	0%
Scenario 1	Insecticides	369	4%	204	12%	152	12%	6	0%	6	1%
Scenario 1	All pesticides	905	10%	431	26%	317	26%	151	3%	6	1%

## Endocrine disruptor review – ongoing at EU level

**Scenario 1 - Active substances most likely to be lost - 10 fungicides, 3 herbicides and 4 insecticides – the best case scenario**

Large losses in edible horticulture crops: **yield losses of >50%** in protected salad leaves and rhubarb.

Additional crops **>33% reductions in yields** include leeks, salad onions, asparagus, carrot, blackberry, raspberry, strawberry, and hops.

Farm gate value		Total industry				Sector					
		Edible horticulture		Ornamental horticulture		Other edible (cereals, oilseeds, pulses, potatoes, sugar beet)		Forestry			
		£M	%	£M	%	£M	%	£M	%	£M	%
	(£M)	8,973		1,668		1,243		5,658		404	
Scenario 2	Fungicides	587	7%	291	17%	199	16%	97	2%	0	0%
Scenario 2	Herbicides	513	6%	122	7%	2	0%	388	7%	1	0%
Scenario 2	Insecticides	465	5%	285	17%	162	13%	13	0%	6	1%
Scenario 2	All pesticides	1567	17%	697	42%	364	29%	498	9%	7	2%

**Scenario 2 - Scenario 1, plus active substances less likely to be lost unless a strict definition is taken – an additional 11 fungicides, 7 herbicides and 2 insecticides**

In scenario 2, crops expected to suffer **yield losses >50%** include; leeks, asparagus, baby leaf brassicas, celery, protected salad leaves, rhubarb, strawberry, and hops.

Additional crops with **yield losses >33%** include; salad onions, beetroot, lettuce, blackberry, raspberry, pome fruit, Sweet Williams (cut flowers), sugar beet and vines.

		Total industry		Sector							
				Edible horticulture		Ornamental horticulture		Other edible (cereals, oilseeds, pulses, potatoes, sugar beet)		Forestry	
Farm gate value (£M)		£M	%	£M	%	£M	%	£M	%	£M	%
		8,973		1,668		1,243		5,658		404	
Scenario 3	Fungicides	1149	13%	424	25%	257	21%	468	8%	0	0%
Scenario 3	Herbicides	851	9%	275	16%	94	8%	480	8%	1	0%
Scenario 3	Insecticides	926	10%	610	37%	211	17%	99	2%	6	1%
Scenario 3	PGR	226	3%	0	0%	0	0%	226	4%	0	0%
Scenario 3	All pesticides	3003	33%	1168	70%	566	46%	1262	22%	7	2%

**Scenario 3 - Scenario 2, plus active substances for which there is insufficient information available to determine whether they will be classified as endocrine disruptors – an additional 10 fungicides, 11 herbicides (including one used as a sprout suppressant) and 8 insecticides.**

**Total loss of 31 fungicides, 21 herbicides and 14 insecticides. Worst case scenario.**

Crops suffering estimated **yield losses >50%**; bulb onions, leeks, salad onions, asparagus, beetroot, baby leaf brassicas, carrot, courgette and cucurbits, baby leaf brassicas, celery, outdoor lettuce, spinach, protected salad leaves, protected salads lettuce, blackberry, blackcurrant, raspberry, rhubarb, strawberry, pome fruit, fresh beans, fresh peas, other pulses, sugar beet, hops and vines.

Additional crops with **yield losses >33%** include; protected peppers, cider fruit, stone fruit, bulbs and outdoor cut flowers, bedding and pot plants, hardy nursery stock, oilseed rape and potatoes. All other crops are expected to suffer at least some impact.

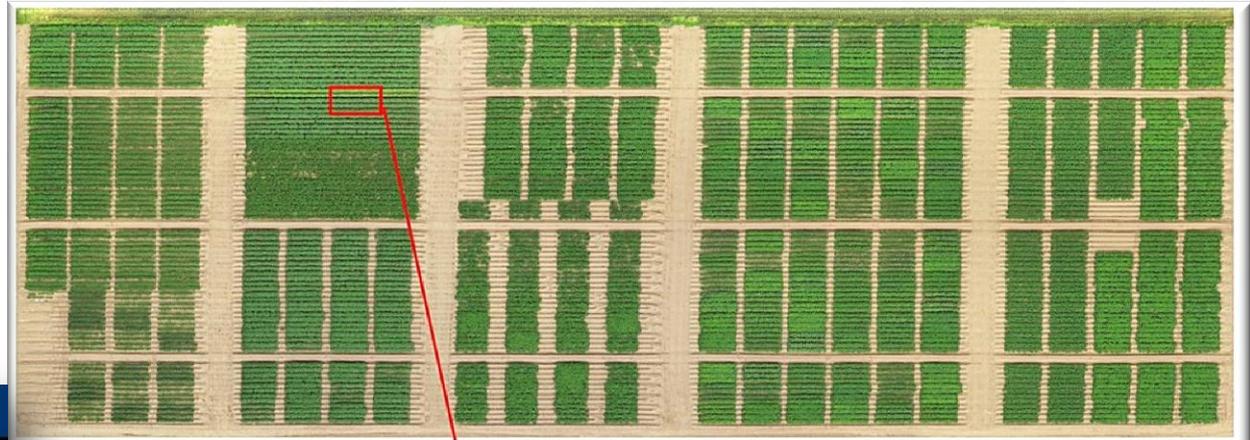
# The role of Agri-EPICentre from an R&D perspective

- Develop and integrate precision agriculture solutions from pre-planting (i.e. soil), through planting, establishment and growth of the crop to harvest and processing/grading
- This can encompass
  - Assessment of soil health/quality
  - Risk assessment of pests/diseases/weeds pre-planting or in previous crop
  - Stress/disease/pest/weed detection within the growing crop
  - Targeted management of disease/pests/weeds on detection or after field mapping (satellite/UAV/tractor/robot)
  - Assessment of crop maturity and optimal harvest date
  - Targeted harvesting for optimal quality
  - Disease/blemish detection during grading/processing
  - Manage seed/tuber borne diseases during grading
- Think tanks will play a key role in determining R&D direction and linkages between other innovation centres (e.g. AgriMetrics, CHAP) and potential industrial partners in the UK and overseas

# Seeing the whole field



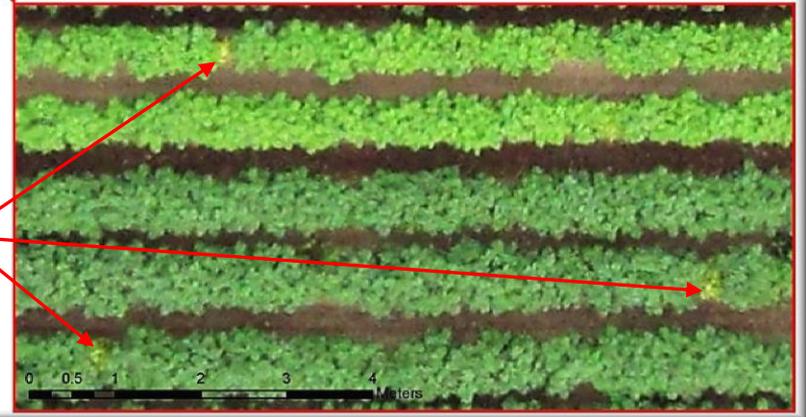
# Viewing areas in detail



0 5 10 20 30 40 Meters

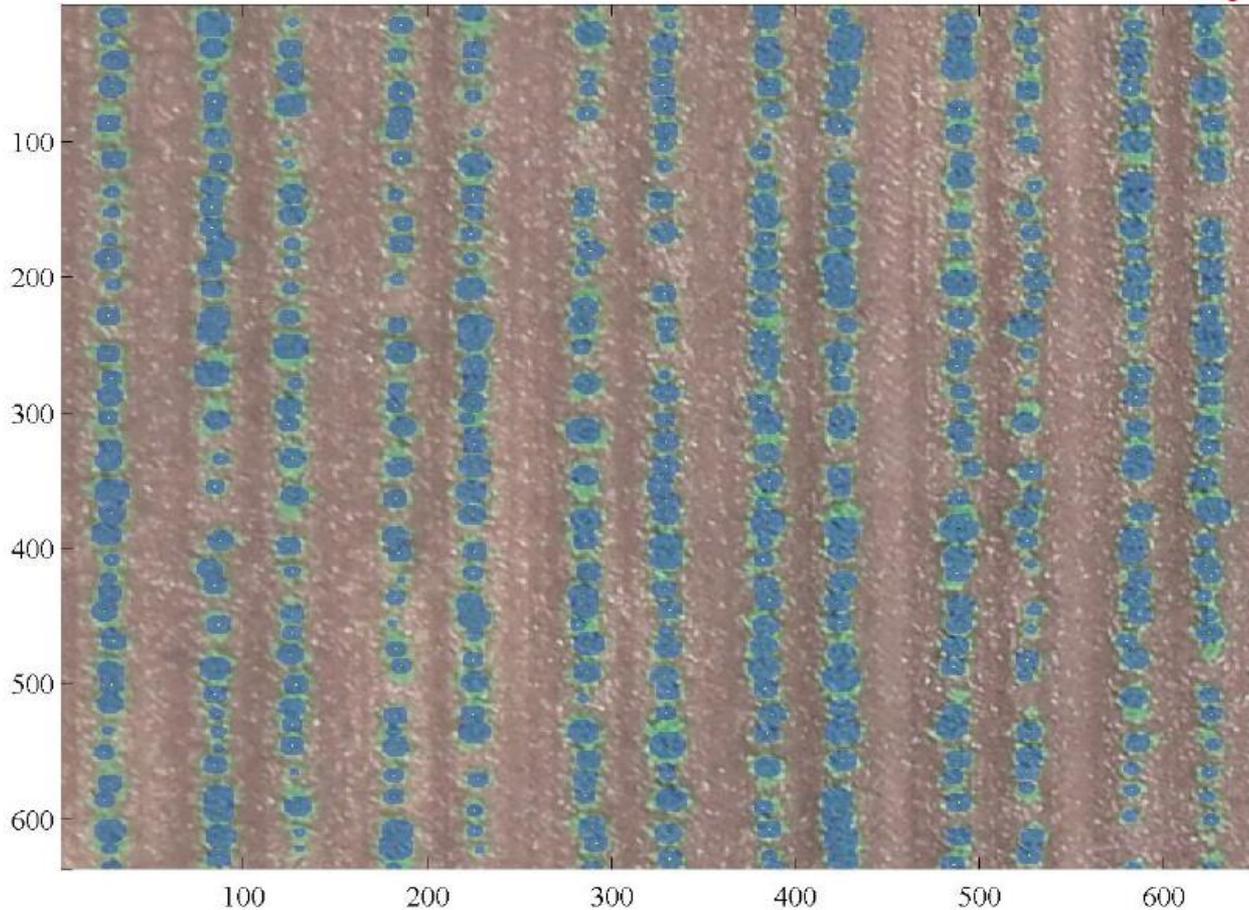


*(Diseased plants -  
Blackleg infected)*



0 0.5 1 2 3 4 Meters

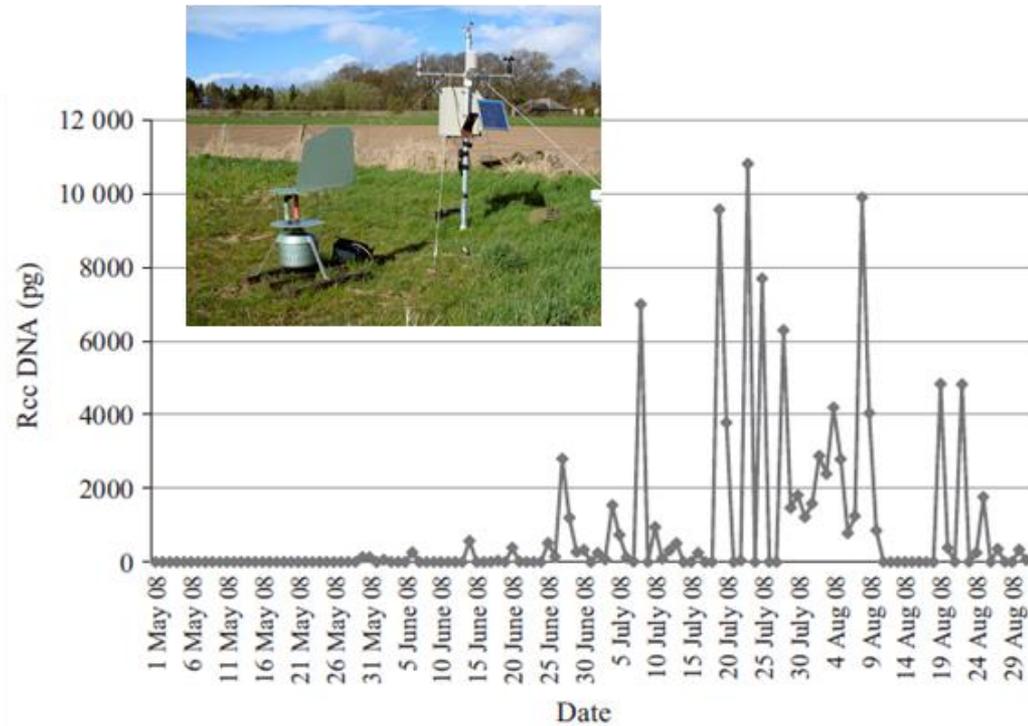
Identified Plant Locations



# AUTOMATED RESULTS

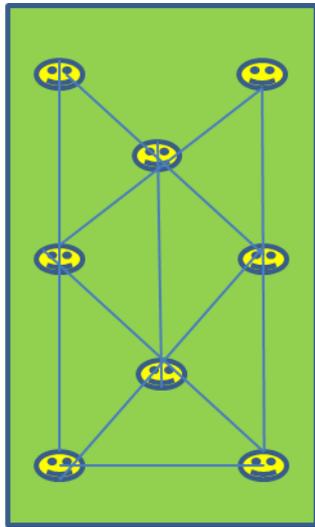
Automated Count: 450 plants

# ‘Sensing’ of crop stress and early detection of crop and storage pests and disease



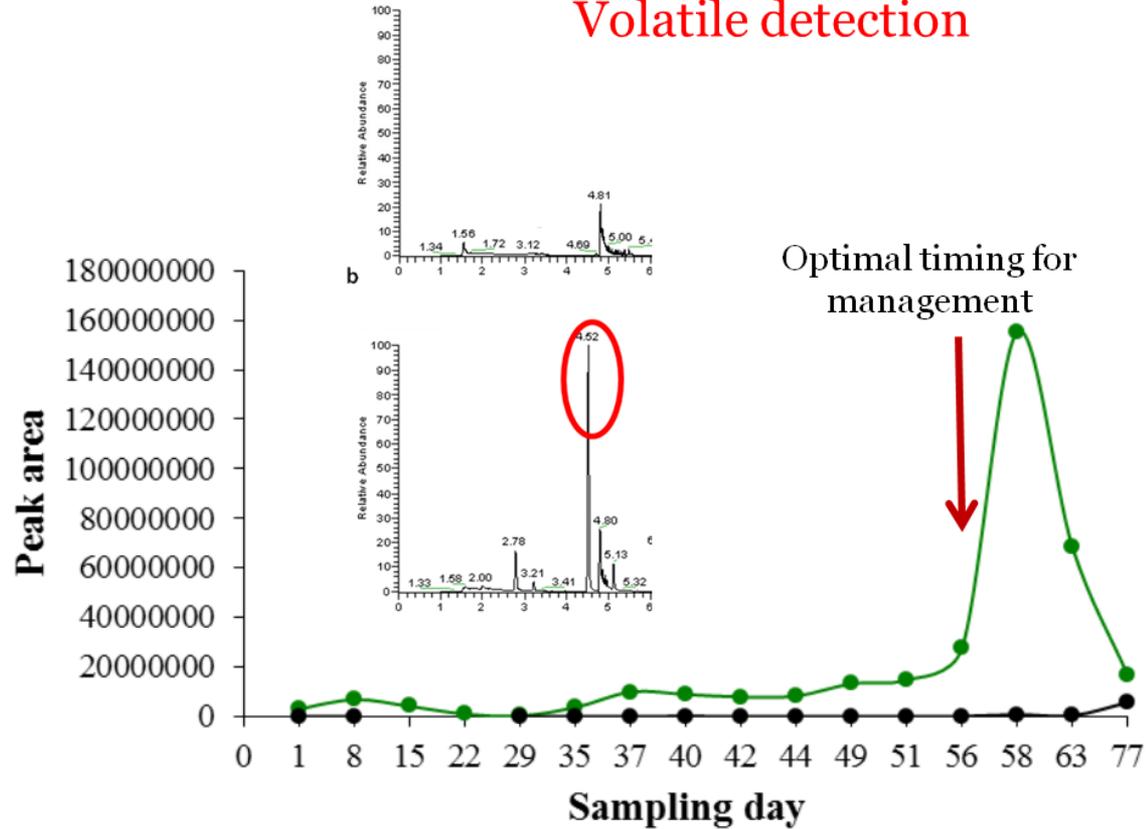
Forecasting disease risk with real-time spore traps and weather data

‘Sensing’ of crop stress and early detection of crop and storage pests and disease

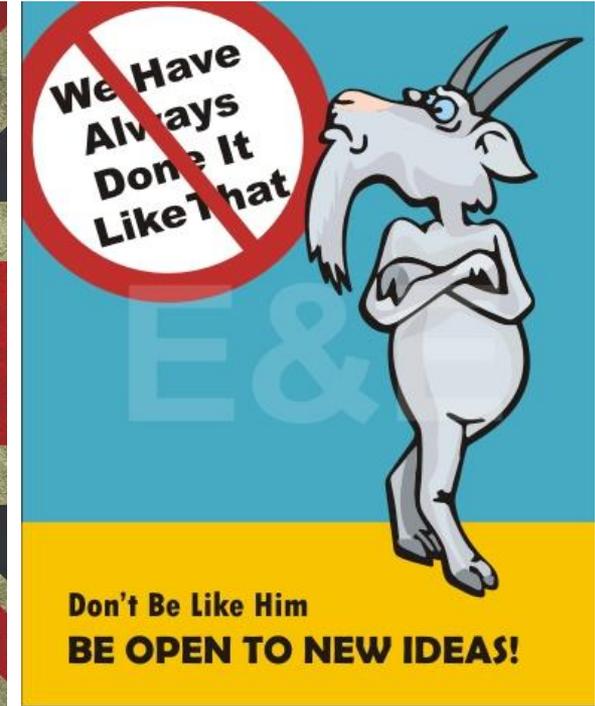


Sentinel ‘sensors’ in the crop signalling crop stress or pest presence

## Volatile detection



Be all ears and open to new ideas



INSTEAD OF THINKING  
OUTSIDE THE BOX,  
GET RID OF THE BOX.

DEEPAK CHOPRA