



# IPM on't farm

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## Aims

Allerton Research & Educational Trust

- To combine **productive** farming with wildlife conservation
- To research the interaction between farming, wildlife conservation, resource management & the environment
- To disseminate the results for the benefit of farmers, policy makers ど others
- C.150 published research papers





### The Allerton vision











GWCT Sussex Study invertebrate numbers, 1968–present Cereal headlands

### Chick Food Index (CFI) in arable crops



## Chick Food Index (CFI) in AES options

- Low CFI in arable crops of great concern
- More concerning/surprising to see low CFI in AES options
- Led to creation of GWCT PARTRIDGE Mix – 30 species (19 native) – up to 10 year life
- Trials at 1,300ha Rotherfield estate in East Hampshire shows promising CFI >0.7 in Advanced PARTRIDGE Mix plots

![](_page_5_Figure_5.jpeg)

**CFI replacement** 

rate = 0.7

![](_page_5_Picture_6.jpeg)

![](_page_6_Picture_0.jpeg)

## UK PPP use 1990-2020 (kg/ha)

### Pesticide usage

- Treated area of arable crops has remained stable
- Average number of spray passes risen from 4.8 (2000) to 6.2 (2018)
- Average number of actives applied risen from 11.6 (2000) to 16.7 (2018)

![](_page_6_Figure_6.jpeg)

![](_page_7_Picture_0.jpeg)

### Herbicide resistant weeds in Great Britain (2016)

![](_page_7_Picture_2.jpeg)

Compilation of data from most organisations/companies testing for herbicide resistance in the UK

![](_page_7_Picture_4.jpeg)

ADAS

![](_page_8_Picture_0.jpeg)

## Integrated Pest Management (IPM)

- Select low-risk locations
- Healthy rotations (including cover & break cropping)
- Cultivation techniques
- Crop varieties & varietal mixtures
- Seed rates & plant densities
- Sowing date & conditions
- Machinery hygiene
- Effective field nutrition
- Effective field drainage
- Protection & enhancement of beneficial field organisms
- Physical/manual weed control
- Mulching & green covers
- Biopesticides/stimulants

- Monitoring & application of pest thresholds
- Polycultures
- Trap crops, allelopathy & biofumigation
- Organic amendments
- Improve soil health
- Use clean & tested seeds/saplings
- Spot treatment of injurious species, e.g. weed wiping
- Reduced rate applications of PPPs
- Precision/variable rate application
- Preventative action based on risk factors, e.g. weather, variety
- Field work (e.g. cultivations, PPP applications) in good conditions

IPM is a very broad church....

![](_page_8_Figure_27.jpeg)

Intervention

**Prevention** 

Common name	Latin name	Competitive Index* (CI)	Nos. weed plants/m <sup>2</sup> that result in			
		(% yield loss per weed plant/m <sup>2</sup> )	a 5% yield loss (= 5 ÷ Cl value)			
Severely competitive						
Cleavers	Galium aparine	3.0	1.7			
Wild-oats	Avena spp.	1.0	5.0			
Italian rye-grass	Lolium multiflorum	1.0	5.0			
Sterile brome	Bromus sterilis	1.0	5.0			
Black-grass	Alopecurus myosuroides	0.4	12.5			
	Highly	y competitive				
Charlock/mustard	Sinapis spp.	0.4	12.5			
Oilseed rape	Brassica napus	0.4	12.5			
Scentless mayweed	Tripleurospermum inodorum	0.4	12.5			
Common Poppy	Papaver rhoeas	0.4	12.5			
	Modera	tely competitive				
Black bindweed	Fallopia convolvulus	0.3	16.7			
Chickweed	Stellaria media	0.2	25.0			
Field Forget-me-knot	Myosotis arvensis	0.2	25.0			
Fat-hen	Chenopodium album	0.2	25.0			
Redshank	Polygonum maculosa	0.2	25.0			
Knotgrass	Polygonum aviculare	0.1	50.0			
Annual meadow-grass	Poa annua	Poa annua 0.1				
Sow thistles	Sonchus spp.	Sonchus spp. 0.1				
Fumitory	Fumaria officinalis	0.08	62.5			
Speedwells	Veronica spp.	0.08	62.5			
Red Dead-nettle	Lamium purpureum	0.08	62.5			
Crane's Bill	Geranium spp.	0.08	62.5			
Groundsel	Senecio vulgaris	0.06	83.3			
Fool's Parsley	Aethusa cynapium	0.06	83.3			
Weakly competitive						
Scarlet Pimpernel	Anagallis arvensis	0.05	100.0			
Field Pansy	Viola arvensis	0.02	250.0			
Parsley Piert	Aphanes arvensis	0.02	250.0			

### IPM methods for weed control

measures!

	% control of black grass achieved			
Method	Mean	Range	Comments	
Ploughing	69%	-82% to 96%	Rotational ploughing has considerable benefits	
Delayed autumn drilling (by ≈3 weeks from mid September)	31%	-71% to 97%	The later the better – but increased risk.	
Higher seed rates	26%	+7% to 63%	The higher the better – but lodging issues	
More competitive cultivars	22%	+8% to 45%	Useful, but marginal effects	
Spring cropping	88%	+78% to 96%	Effective, but challenging on heavy soil and limited herbicides	
Fallowing/grass leys	70–80 % per year (of seedbank)	-	Absence of new seeding critical	

![](_page_10_Picture_2.jpeg)

There's no resistance to non-chemical control

Source: Rothamsted Research

### SFI23 IPM standards

SFI option	Description	Value (£)
IPM1	Assess integrated pest management & produce a plan	1,129/year
IPM2 (AB8)	Flower-rich grass margins, blocks, or in-field strips	798/ha
IPM3	Companion crop on arable & horticultural land	55/ha
IPM4	No use of insecticide on arable crops & permanent crops	45/ha

### Actions focussed on:

- increasing knowledge & identifying opportunities for an IPM approach
- creating habitats for natural crop pest predators
- using companion cropping to suppress weeds, reduce diseases & provide protection from crop pests
- minimising use of insecticides

![](_page_11_Picture_7.jpeg)

#### SFI actions for soils

Annual payment: £5.80 per hectare and an additonal payment of £95 per agreement SAM1 - Assess soil, test soil organic matter and produce a

soil management plan

Annual payment: £129 per hectare

SAM2 - Multi-species winter cover crops

Annual payment: £382 per hectare

SAM3 - Herbal leys

SFI actions for moorland

Annual payment: £10.30 per hectare and an additional payment of £265 per agreement

MOR1 - Assess moorland and produce a written record

SFI actions for hedgerows

Annual payment: £3 per 100 metres - one side

HRW1 - Assess and record hedgerow condition

Annual payment: £10 per 100 metres – one side

HRW2 - Manage hedgerows

Annual payment: £10 per 100 metres – both sides

HRW3 - Maintain or establish hedgerow trees

SFI actions for integrated pest management

Annual payment: £989

IPM1 - Assess integrated pest management and produce a plan (this action applies to an SFI agreement, rather than a specific area of land (an 'agreement level SFI action')

Annual payment: £673 per hectare

IPM2 - Flower-rich grass margins, blocks, or in-field surps

#### SFI actions for integrated pest management

Annual payment: £55 per hectare

IPM3 - Companion crop on arable and horticultural land

Annual payment: £45 per hectare

IPM4 - No use of insecticide on arable crops and permanent crops

SFI actions for nutrient management

#### Annual payment: £589

NUM1 - Assess nutrient management and produce a review report (agreement level SFI action)

Annual payment: £102 per hectare

NUM2 - Legumes on improved grassland

Annual payment: £593 per hectare

NUM3 - Legume fallow

SFI actions for farmland wildlife on arable and horticultural land

Annual payment: £614 per hectare

AHL1 - Pollen and nectar flower mix

Annual payment: £732 per hectare

AHL2 - Winter bird food on arable and horticultural land

Annual payment: £590 per hectare

AHL3 - Grassy field corners and blocks

SFI actions for farmland wildlife on improved grassland

Annual payment: £333 per hectare

IGL1 - Take improved grassland field corners or blocks out of management

![](_page_12_Picture_44.jpeg)

SFI actions for farmland wildlife on improved grassland

Annual payment: £474 per hectare

IGL2 - Winter bird food on improved grassland

Actions for buffer strips

Annual payment: £451 per hectare

AHL4 - 4m to 12m grass buffer strip on arable and horticultural land

Annual payment: £235 per hectare

IGL3 - 4m to 12m grass buffer strip on improved grassland

#### SFI actions for low input grassland

Annual payment: £151 per hectare

LIG1 - Manage grassland with very low nutrient inputs (outside SDAs)

Annual payment: £151 per hectare

LIG2 - Manage grassland with very low nutrient inputs (SDAs)

#### **CONTACT US**

If you have any questions about SFI, email us at ruralpayments@defra.gov.uk

or telephone 03000 200 301 (Monday to Friday 8.30am to 5pm, except bank holidays).

![](_page_12_Picture_62.jpeg)

From summer 2024...

- Camera/remote sensor guided herbicide spraying (£43/ha)
- Robotic mechanical weeding (£150/ha)
- Robotic non-mechanical weeding (£101/ha)
- Multi-species spring, summer or autumn cover (£153–163/ha)
- Simple ditch management ( $\pounds 4/100m$  (both sides))
- No-till farming (£73/ha)
- Variable rate application of nutrients (£27/ha)

![](_page_13_Picture_8.jpeg)

![](_page_14_Picture_0.jpeg)

## Use of field margins

![](_page_14_Figure_2.jpeg)

Wheat yield in field margins, Allerton Project

![](_page_14_Picture_4.jpeg)

Figure 1: The field distribution of the beetle *Poecilus cupreus*. Contours were derived from the total number of beetles caught at each sampling position

## IPM spatial dynamics

- Carabid *Poecilus cupreus* vs cereal aphids
- High densities of carabids associated with low densities of aphids
- 17,200 beetles estimated in one 2.75ha field
- c.65% had eaten aphids

![](_page_15_Figure_6.jpeg)

Figure 2: The field distribution of the aphid *Metopolophium dirhodum*. Contours were derived from the maximum number recorded at each sampling position

![](_page_15_Figure_8.jpeg)

![](_page_15_Picture_9.jpeg)

![](_page_16_Picture_0.jpeg)

## Insecticides & invertebrates

- Fields home to hundreds of insect species few become pests due to natural predation
- Insecticides are toxic to most arthropods including pest predators – and insects important as bird food
- GWCT IPM research measured the abundance & distribution of natural pest predators from the field to landscape scales
- Primarily located <60m from margins & in-field habitats (value of beetle banks!) due to diversity of plants & habitat outside monocropped area
- An application of dimethoate insecticide severely reduced most species.
- Recovery was slow, with beneficial predator species recovering most slowly

### Impact of the insecticide dimethoate on the distribution of beetles (GWCT)

![](_page_16_Picture_9.jpeg)

![](_page_16_Picture_10.jpeg)

5 days pre-spray

![](_page_16_Picture_12.jpeg)

![](_page_16_Picture_13.jpeg)

5 days post-spray

19 days pre-spray

32 days post-spray

Unsprayed 6m buffer zone

### The SAFE approach

![](_page_17_Figure_1.jpeg)

SHELTER For overwintering/ dormancy & periods of inactivity/breeding.	ALTERNATIVE PREY For when pests are not present.	FLORAL RESOURCES Energy and nutrients	Environment Appropriate for survival, preferred vegetation cover and insecticide free.			
			]			
ΗΑΒΙΤΑΤ ΤΥΡΕ	OVERWINTER SHELTER	ALTERNATIVE PREY FLC	RAL RESOURCES			
SHRUBBY VEGETATION (HEDGES)						
UNCULTIVATED AREA (GRASSY)						
WILD BIRD SEED MIXTURE						
FLOWER-RICH HABITATS						
OVERWINTERED STUBBLES						
UNCUT, TUSSOCKY GRASS MARGINS AND BEETLE BANKS						
UNHARVESTED CEREAL HEADLAND						
UNDERSOWN SPRING CEREALS						
UNCROPPED, ANNUALLY CULTIVATED						
NON-INVERSION TILLAGE						
LOW INPUT GRASSLANDS						

RESOURCES PROVIDED FOR NATURAL ENEMIES

LOW HIGH

![](_page_17_Picture_5.jpeg)

![](_page_18_Picture_0.jpeg)

![](_page_18_Picture_1.jpeg)

# Thank you & questions?

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![](_page_19_Picture_2.jpeg)

![](_page_19_Picture_3.jpeg)