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Sugar Beet Weed Control Workshop (Feb 2026)

18/02/2026

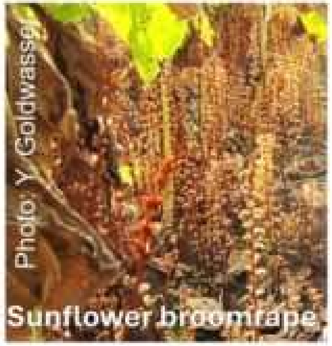
www.adas.co.uk

Why don’t we care more about managing weed issues?

- Emerging weeds and biosecurity issues
- ALS inhibitor herbicide resistance in key broad-leaved weeds

EMERGING weeds issues

Survey on parasitic weeds! Are you farming or working with farmers? We are investigating the current spread and importance of parasitic weeds in European agriculture. Please participate in this online survey!
Go to: tinyurl.com/parasiticweeds



A few pictures from UK farms 2025/26

EMERGING weeds issues – why don't we care more?

Yield losses are in the region 14 to 40%

Cuscuta campestris as a contaminant of a fertility building cover crop in an organic system

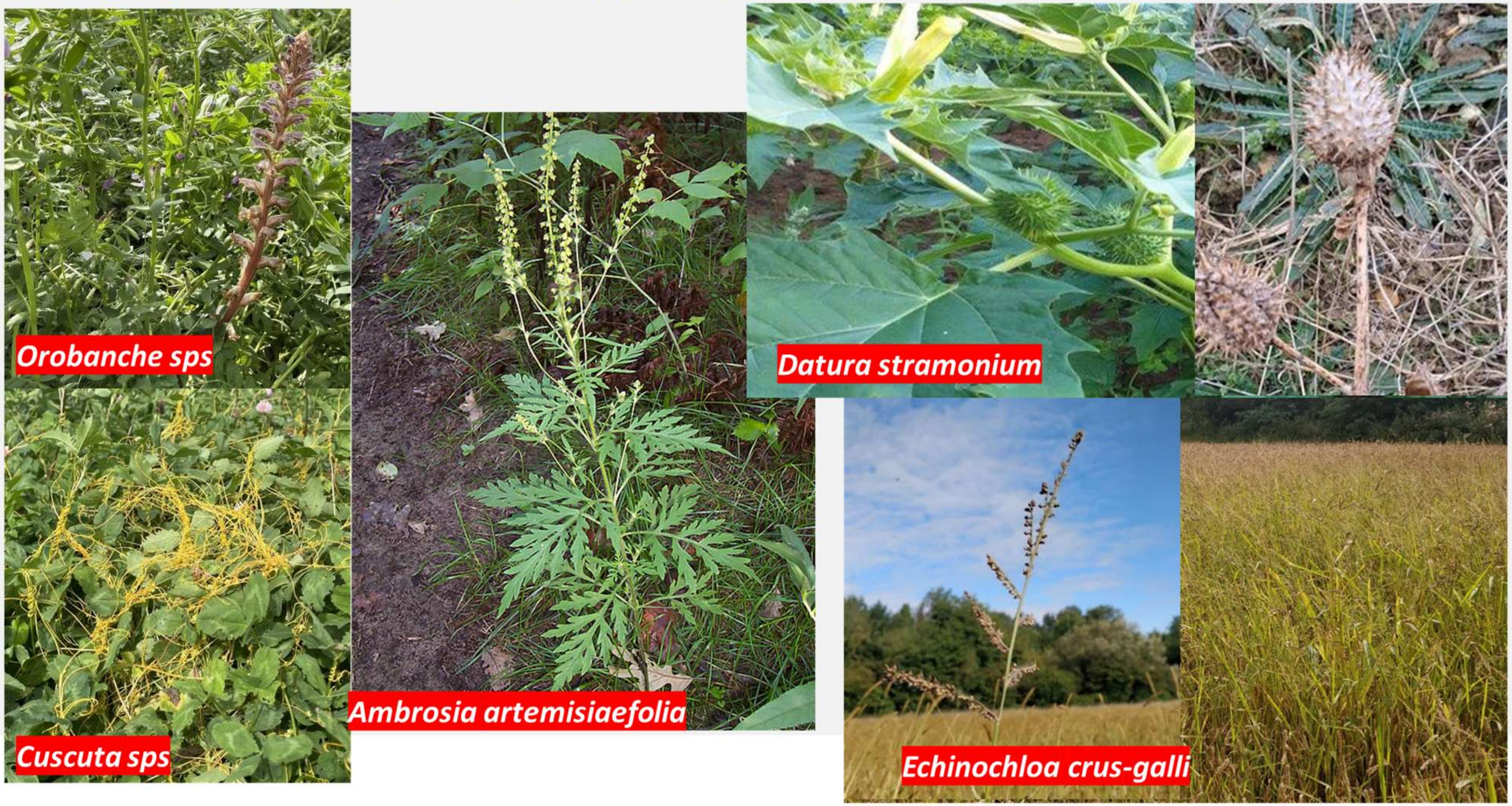
Spotted on the internet…..

Not established as a significant weed in the UK where currently it rarely sets seed. The spring & summer is not (yet) warm enough.

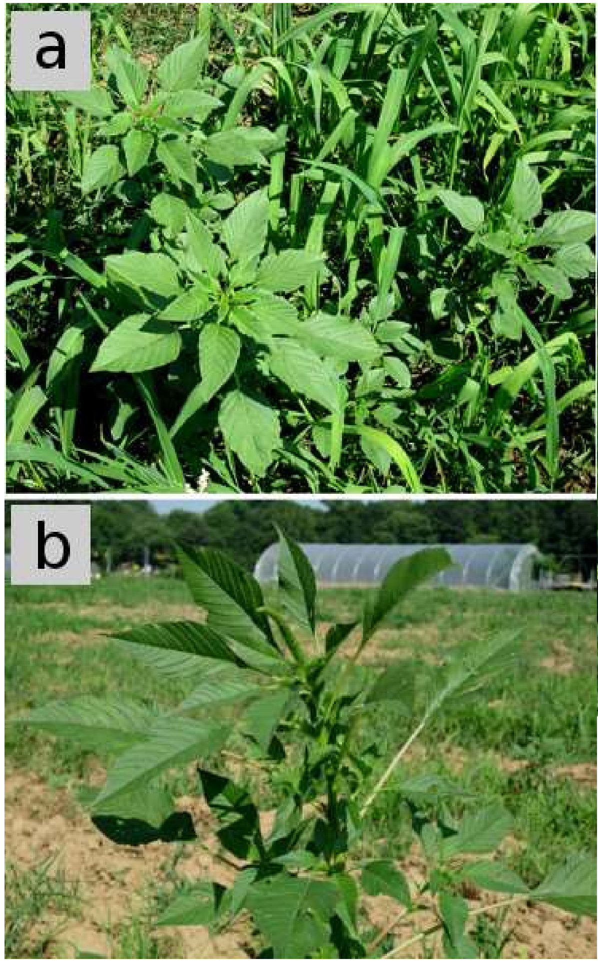
Photo of parasitised sugar beet from Invasive.org

EMERGING weeds issues

"Emerging Weeds" - Biosecurity priorities (often invasive on a national level)



EMERGING weeds issues



Wild chrysanthemum (*Artemisia vulgaris*) is surprisingly difficult to control in crops like sugar beet.

Amaranth .. There are a few species of amaranth but in the UK we are seeing *rare* examples of Palmer amaranth.

EMERGING weeds issues – why don't we care more?

Table 1 Species of weeds identified as contaminants of commercial seed lots where those species have confirmed cases of herbicide resistance reported globally. Contamination reported by 1. Hanson & Mason (1985) and/or Oseland et al (2020), 2. Shinoma and Konuma (2008), 3. Rubenstein et al (2021) and 4. Buddenhagen et al (2021)

Species	Seed lot type				Herbicide Resistance Traits recorded globally
	Seed Mixes Bird Food / Game Cover[1]	Arable Crops (Legume, Cereal, Sugar Beet and Oilseed)[2,3]	Lolium species seeds[4]	Trifolium species seeds[4]	
Amaranthus spp including Amaranthus retroflexus	X	X		X	2,5,6,9, 14, 27
Echinochloa Crus-galli	X	X	X	X	1,2,4,5,9,13, 15, 29
Eleusine indica	X			X	1,2,3,5,9,10,14,22
Hordeum murinum				X	1,2,9,22
Phalaris minor	X			X	1,2,5
Phalaris paradoxa	X			X	1,2,5
Setaria viridis	X	X	X		1,3,5
Setaria pumila	X	X			2,5
Sorghum halepense	X	X			1,2,3,9
Vulpia bromoides			X	X	5,22

As well as bringing new weeds onto farm which is a risk in itself, this transport of weeds seeds creates a big herbicide resistance risk.

1 ACC-ase inhibitors	
2 ALS inhibitors	
3 Mitosis inhibitors	Pendimethalin
4 Synthetic auxins	2,4-D
5/6 PS-II inhibitor	Metribuzin
9 EPSPS inhibitor	**Glyphosate**
~~10 Glutamine synthase inhibitor~~	
13 Carotene inhibitor	Clomazone
14 PPO inhibitor	Flumioxazin
15 Lipid inhibitor	Prosulfocarb
~~22 PS-I inhibitor~~	

Reviewing the weed species involved there is a particular issue for spring sown (broad-leaved) crops.

ALS resistance in broad-leaved weeds

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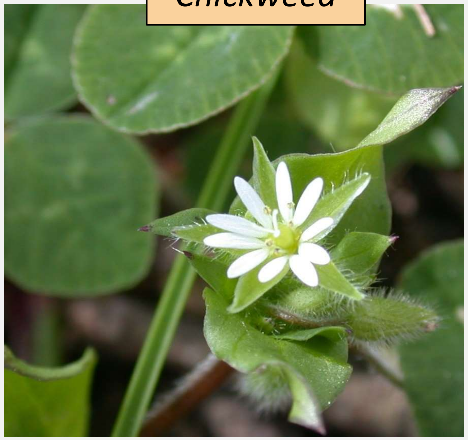
ALS inhibitors … quick refresh on the ‘chemistry’

Poppies

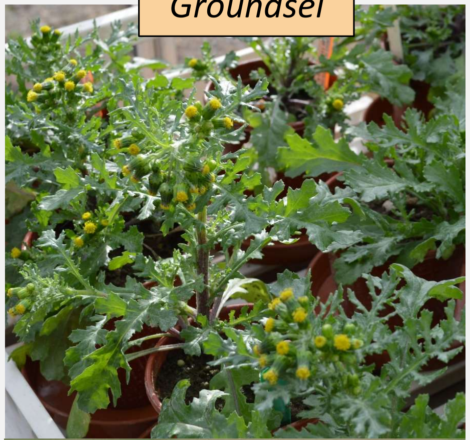
Chickweed

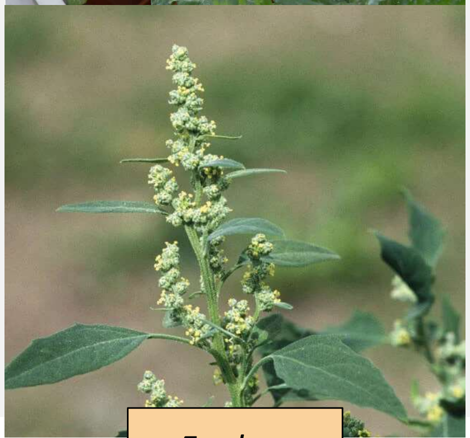


Mayweed

CONFIRMED CASES

Groundsel





Fat hen

SUSPECTED / HIGH RISK

UK Resistance in Group 2 - ALS herbicides

IMI – Imazamox
SU - Metsulfuron-methyl
SCT – Thiencarbazone-methyl
TP - Florasulam

ALS resistance in broad-leaved weeds

ALS inhibitors … quick refresh on the ‘chemistry’

Untreated

TP

SU
IMI
SCT

- Incomplete cross-resistance with ALS herbicides
- Patterns of cross resistance can vary between species
- This means two tests are probably required

ALS resistance in broad-leaved weeds

ALS inhibitors … quick refresh on the 'chemistry'

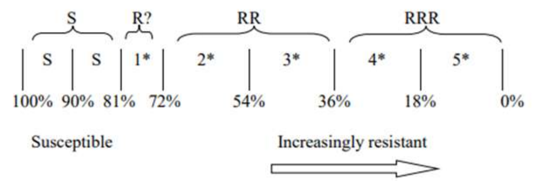
		Imidazoline ('IMI')	Sulfonylureas ('SU')										Triazolinones ('SCT')	Triazolopyrimidines ('TP')			
	Approximate Area cultivated(ha)	Imazamox	Amidosulfuron	Formsulfuron	metsulfuron	nicosulfuron	prosulfuron	rimsulfuron	sulfosulfuron	thifensulfuron	tribenuron	triflusulfuron	Thiencarbazone-methyl	Florasulam	Pyroxulam		All Sulfonylureas Area Treated (ha)
Cereals	3,000,000		5.5%		39.0%				0.03%	23.3%	30.3%	0.01%	*1.0%	30.5%	7.3%		3,876,073
OSR	293,000	0.1%	1.0%		3.9%					0.2%				0.3%			15,483
Maize	241,000			11.0%	0.1%	52.0%	3.2%	0.02%		*				1.7%			*140,000
Potatoes	120,000				0.1%			10.0%		0.9%							13,649
Sugar Beet	100,000			20.0%								65.0%	*20.0%				130,193
Peas and Beans	90,000																0
all crops area treated (ha)		11,790	167,613	23,752	1,199,699	*	*	13,649	748	696,477	915,921	106440	118,067	959,118	223,355		4,035,397

*Estimates: some data are missing or erroneous on PUSSTATS website

From pesticide usage survey data (2025) pustats.fera.co.uk

ALS resistance in broad-leaved weeds

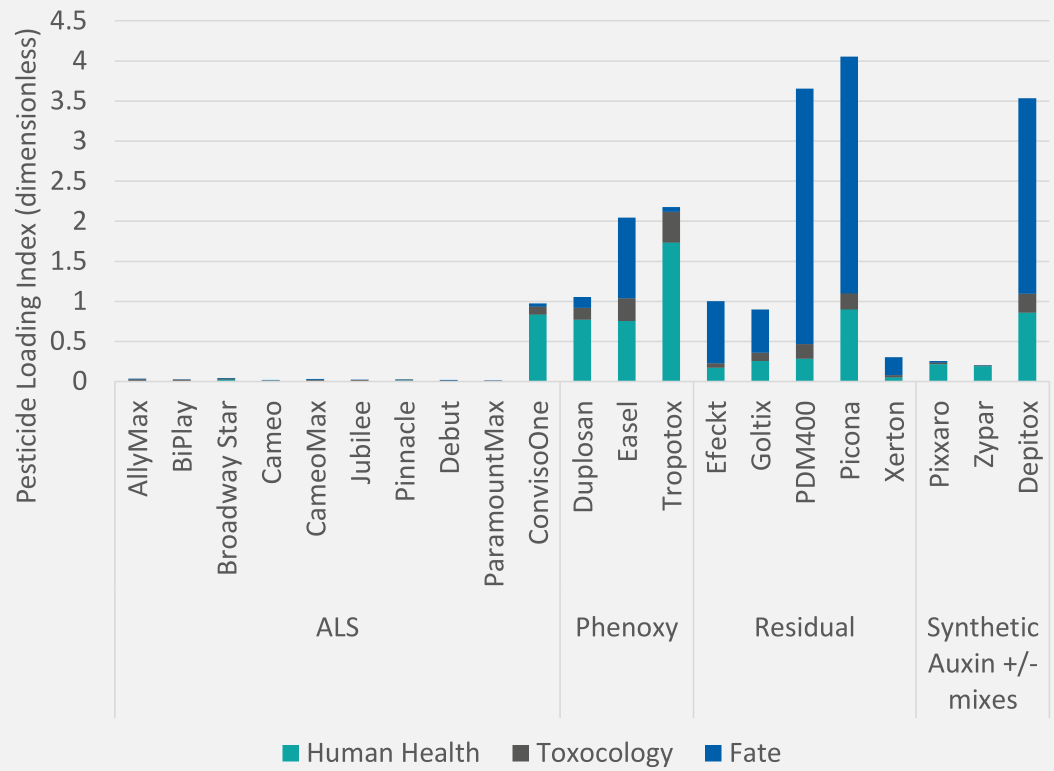
Sample	Resistant individuals				Susceptible		
	Pro-197-Ser	Pro-197-His	Pro-197-Leu	Total R mutations	Wild Type	Effective Control	R-rating
1	2	6	1	9	0	0	RRR
2	0	1	9	10	0	0	RRR
4	0	8	0	8	0	0	RRR
7	0	10	0	10	0	0	RRR
16	0	0	8	8	2	20	RRR
18	1	0	7	8	2	20	RRR
8	0	5	2	7	2	22	RRR
13	0	0	5	5	2	29	RRR
20	2	5	0	7	3	30	RRR
3	4	2	1	7	3	30	RRR
14	0	0	5	5	3	38	RR
5	0	1	4	5	4	44	RR
19	5	0	0	5	4	44	RR
6	0	3	1	4	6	60	RR
9	0	3	0	3	7	70	RR
12	0	2	0	2	7	78	R?
10	0	2	0	2	8	80	R?
17	0	0	1	1	9	90	S
11	0	0	0	0	10	100	S
15	0	0	0	0	7	100	S



Evaluating the potential for a molecular diagnostic for broad-leaved weed ALS resistance;

- Testing 20 suspect populations of **poppy** we found both resistance and sensitive individuals and populations.
- The presence of so many different mutations (even within populations) implies high rates of selection are possible.
- Mutation frequences can imply higher levels of resistance so converting to existing ‘R’ rating useful.
- These are 197 mutations. We also found 2 populations had the 574 (->TP) mutation confirming the need for a double-test.

ALS in broad-leaved weeds – why don't we care more?



These PLI values are calculated from Kudsk et al (2018). The proposed UK index (Rainford et al 2023) is based on this index.

The 2025 UK National Action Plan (NAP) for the Sustainable Use of Pesticides introduces a new **Pesticide Load Indicator (PLI)** to measure and reduce environmental risk. By 2030, the goal is to reduce each of the 20 metrics of the PLI by at least 10% compared to a 2018 baseline, shifting focus from total weight used to the actual potential harm to biodiversity and environmental persistence.

ALS in broad-leaved weeds – why don't we care more?

Some focus in the past on the financial implications of what are seen as 'BIG' herbicide resistance problems:

Black-grass resistance on two farms in Essex = $154/ha
Orson (1999) The Cost to the Farmer of Herbicide Resistance. *Weed Technology*

Glyphosate resistance (in Lolium) increase control costs but IWM implementation delays development.
Weersink et al (2005) Economics of pre-emptive management to avoid weed resistance to glyphosate in Australia. *Crop Protection*

Effective resistance management in glyphosate provides $137/ha long-term benefit in corn-soya rotation
Livingstone et al (2016) Economic Returns to Herbicide Resistance Management in the Short and Long Run: The Role of Neighbor Effects. *Weed Science*

Reduced gross profits due to black-grass resistance is £400 million per year
Varah et al (2024) "The costs of human-induced evolution in an agricultural system." *Nature Sustainability*

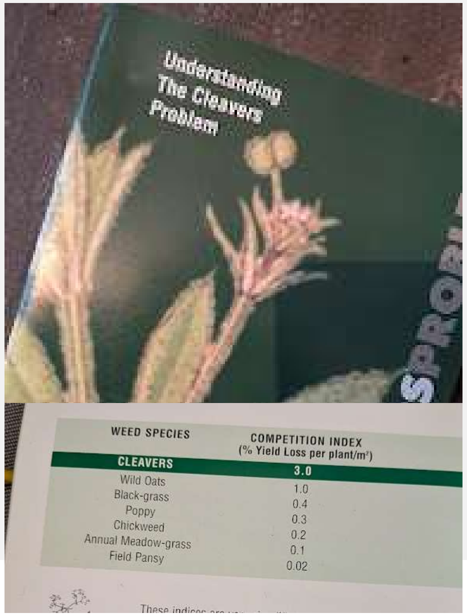
Resistance in black-grass is slowed and long-term profitability is increased by adopting pro-active resistance management strategy
Varah et al (2024) "Acting pre-emptively reduces the long-term costs of managing herbicide resistance." Nature Scientific Reports

ALS in broad-leaved weeds – why don't we care more?

What are the implications of a 'small problem'; What if all chickweed, poppy and mayweed populations became ALS resistant?

- Growers and advisors adapt
- Only the area of crop currently adopting high risk (ALS only applications) are affected **[need better data to highlight this use case!]**
- Yield penalties if we assume some small reduction in overall weed control **[need some ballpark estimates of weed competition]**
- Cost implications of switching to different MoA or adding herbicides from different MoA groups **[need some pricing information]**

COSTS	**ONLY** the area of crop where currently there are ALS only (blw) herbicide applications
YIELD	**For all crops in rotations** where high-risk applications are currently being applied in any crop



ALS in broad-leaved weeds – why don't we care more?

What are the implications if all chickweed, poppy and mayweed populations became ALS resistant?

- Growers and advisors adapt
- Only the area of crop currently adopting high risk (ALS only applications) are affected **[need data to highlight this use case!]**
- Yield penalties if we assume some relatively small reduction in overall weed control
- Cost implications of switching to different MoA or adding herbicides from different MoA groups

COSTS

ONLY the area of crop where currently there are ALS only (blw) herbicide applications

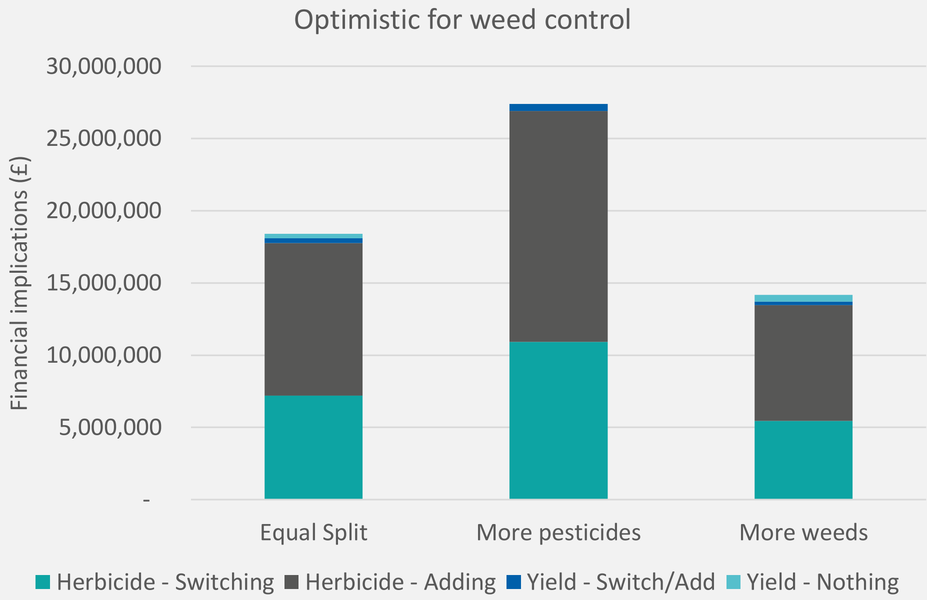
ADAPTATION	Implications	Equal	More pesticide	More weed
Do Nothing	No cost implication	33	0	50
Switch	Switch *e.g.* to Haulaxifen product	33	50	25
Add herbicide	Add different MoA *e.g.* a phenoxy	33	50	25

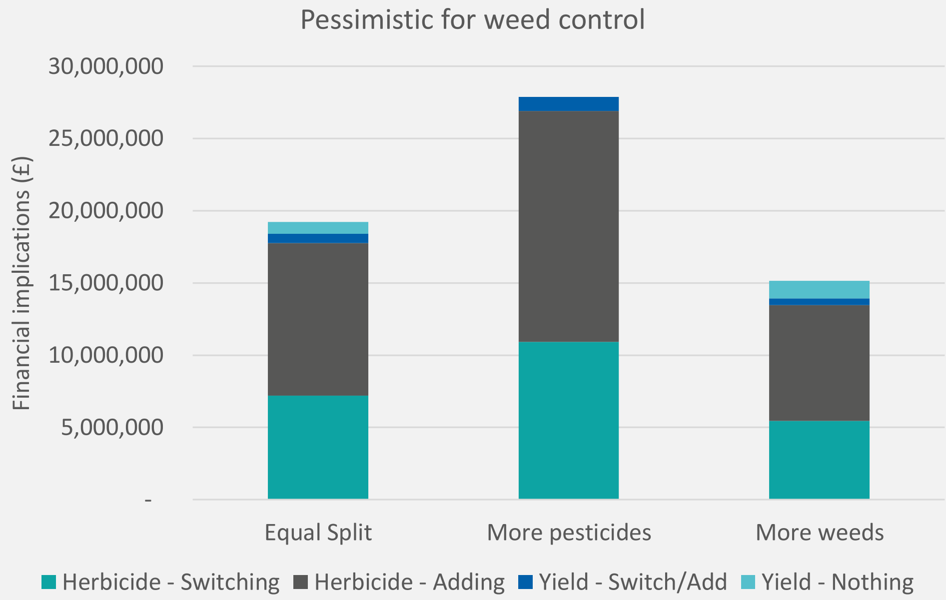
YIELD

For all crops in rotations where high-risk applications are currently being applied in any crop

	Optimistic	Pessimistic
Do Nothing	↑10 weeds per ha	↑25 weeds/ha
Switch	↑5 weeds per ha	↑10 weeds/ha
Add herbicide		

ALS in broad-leaved weeds – why don't we care more?





Even with very conservative estimates the implications are about £15 to £25 million per year.
Assuming more implications in seen in herbicide use (and expenditure) since there will be adaptation to maintain weed control.

ALS in broad-leaved weeds – why don’t we care more?

ALS resistance in broad-leaved weeds;

- Increases pesticide load metrics and makes targets harder to meet
- Has a significant financial implication in lost crop and/or increase costs
- Is a particular issue for broad-leaved crops especially where the outlook for herbicide actives availability is uncertain

So, there’s a big focus on testing and monitoring for herbicide resistance in broad-leaved weed;

At Resistance Roadshow events I asked farmers in the audience;

“Bearing in mind that collecting a sample for resistance testing might take 1 to 2 hours … what level of cost would you accept “

Simple (broad-leaved weed)	Responses
FREE	90%
£ 50	50%
£ 60	33%
£150	10%

A pot test is currently £200+VAT and that could be reduced to £120-£120 using a molecular diagnostic approach and perhaps to £100 (we’re currently exploring other quicker tests).