ORFC-Increasing Home- Grown Protein in an Organic Farming System

9 January 2025

LEGUMINOSE
the way to a green transition

Soil Association

Soya –the headline grabber

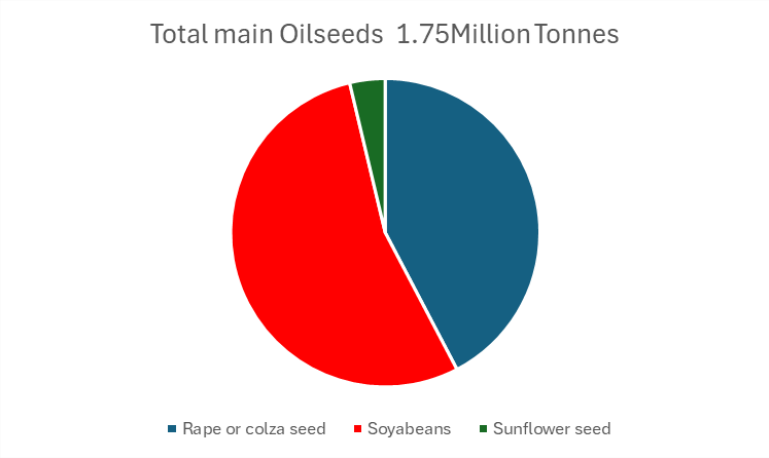

Russia
Iceland
Norway
Sweden
Finland
U.K.
Ireland
Estonia
Latvia
Lithuania
Belarus
Ukraine
Kazakhstan
Mongolia
ATLANTIC OCEAN
Portugal
Spain
France
Turkey
Cyprus
Iraq
Iran
Kyrgyzstan
Tajikistan
China
Nepal
Bhutan
India
Tunisia
Algeria
Libya
Egypt
Jordan
Saudi Arabia
Kuwait
Qatar
Laos
Vietnam
Thailand
Cambodia
Caribbean
Mauritania
Mali
Niger
Chad
Eritrea
Sudan
Ethiopia
Sri Lanka
Malaysia
Guyana
Suriname
French Guiana
Venezuela
Brazil
Peru
Bolivia
Paraguay
Chile
Argentina
Uruguay
Ghana
Togo
Gabon
Dem. Rep. of Congo
Uganda
Rwanda
Burundi
Tanzania
Kenya
Somalia
Madagascar
INDIAN OCEAN
Zimbabwe
Botswana
Namibia
South Africa
Malawi
Mozambique
eSwatini
Lesotho
ATLANTIC OCEAN

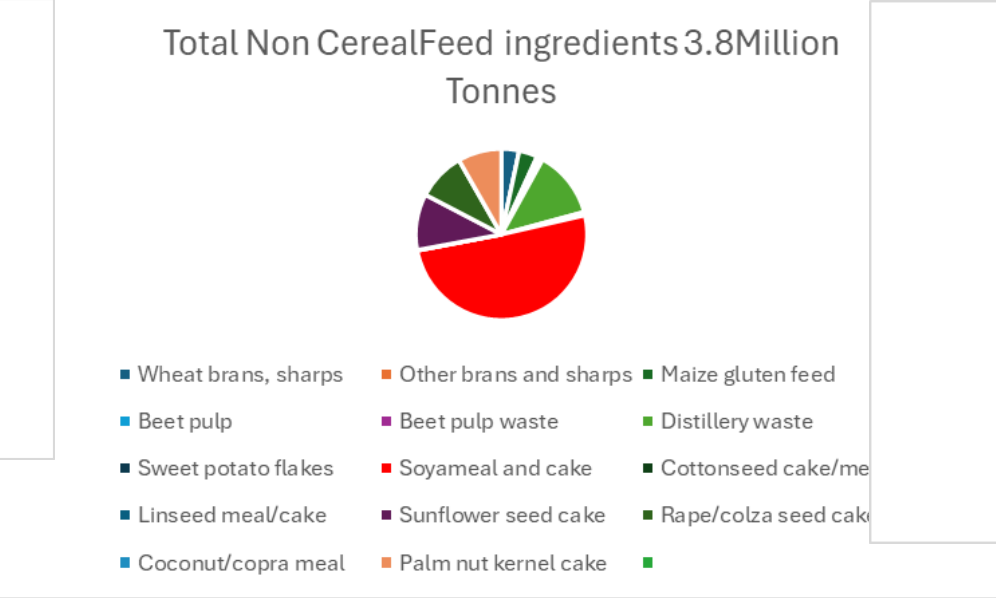
Its not just the Soya..

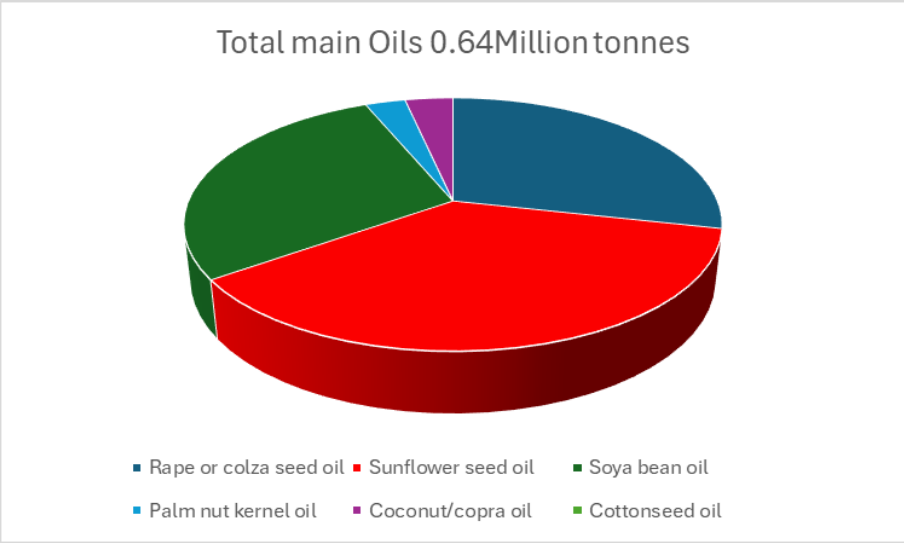
UK PRODUCTION OF PROTEIN 2M TONNES

UK export of pulses 0.2million Tonnes

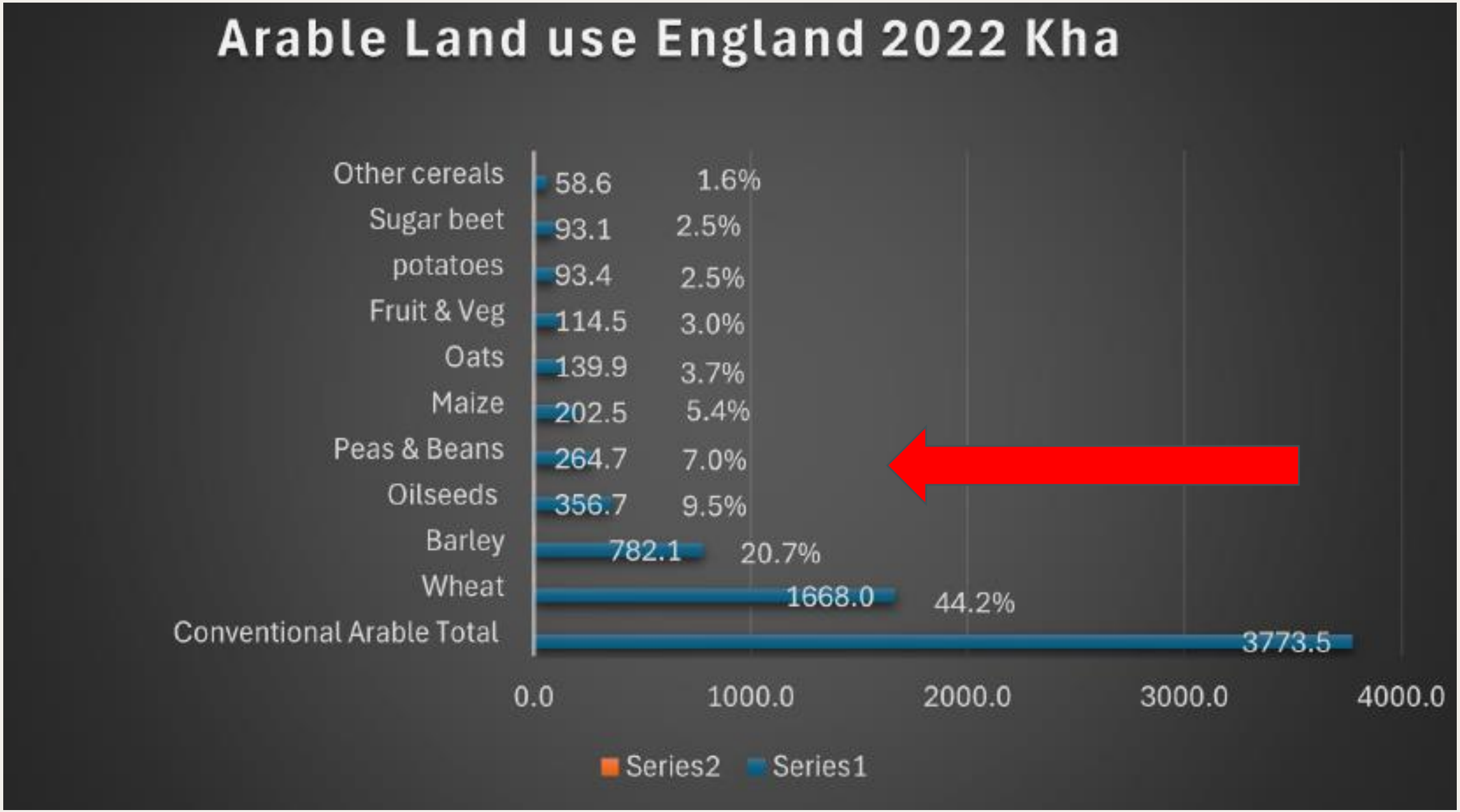
UK IMPORTATION OF PROTEIN 6M TONNES

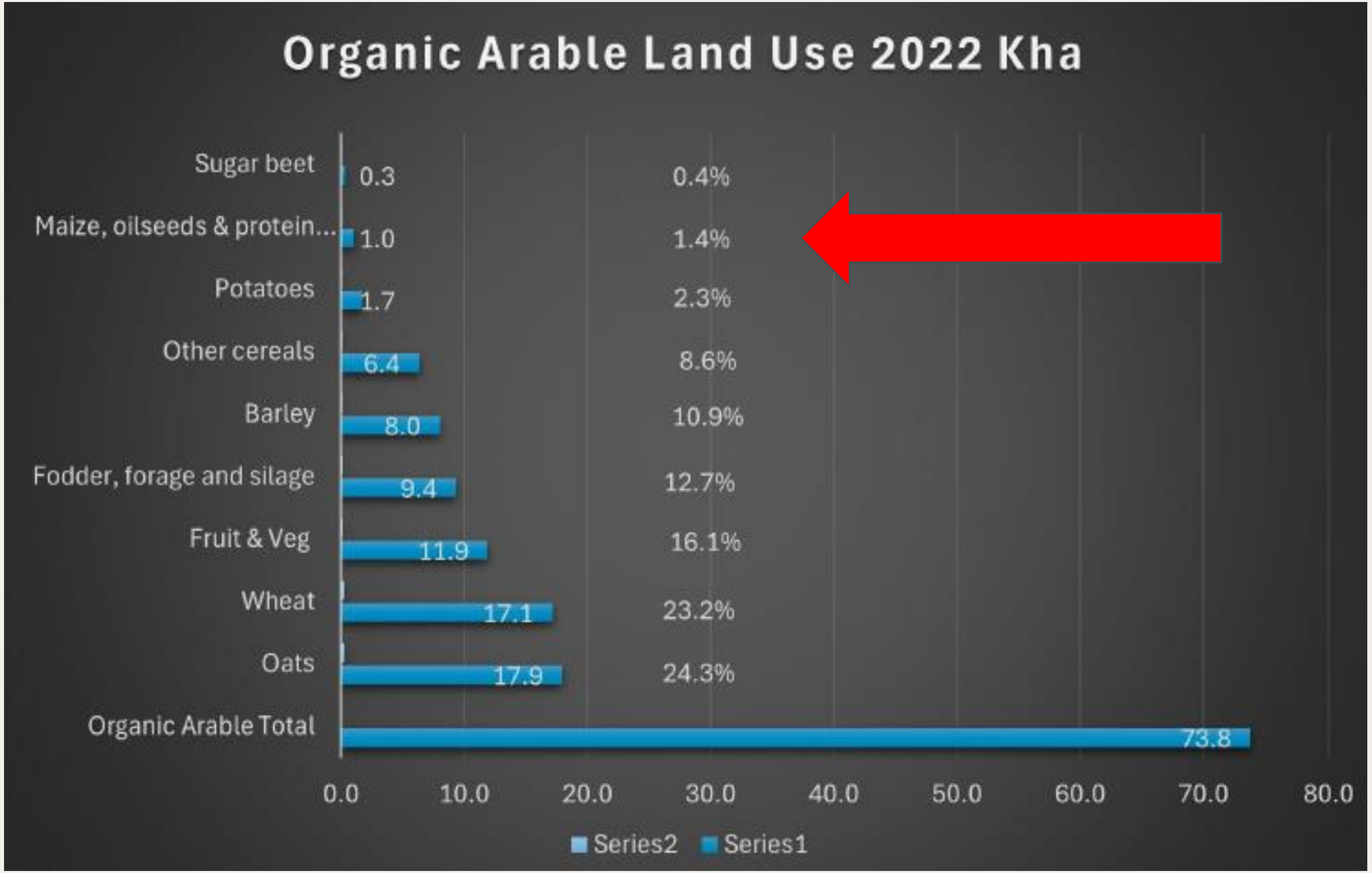




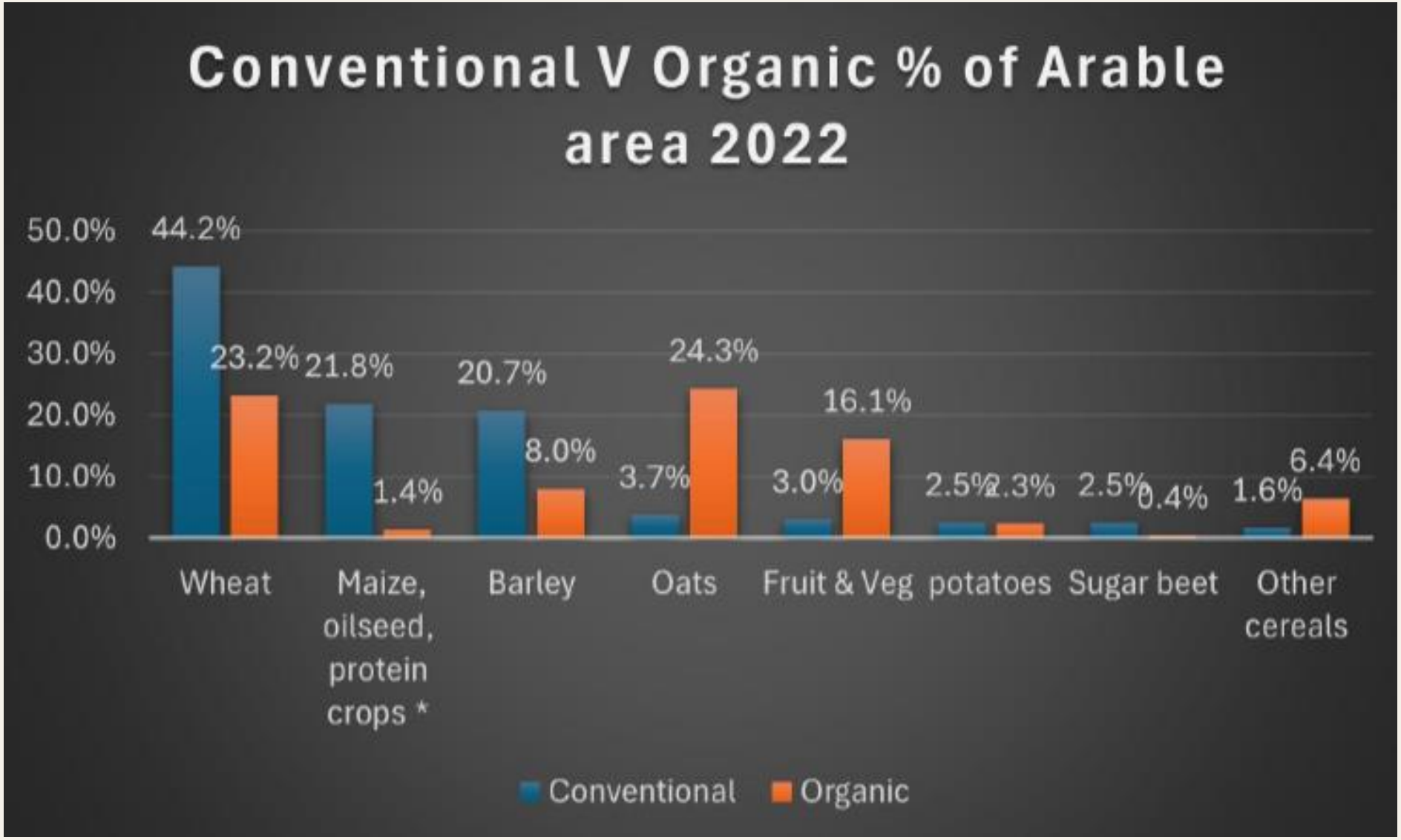


AHDB 23-24 DATA

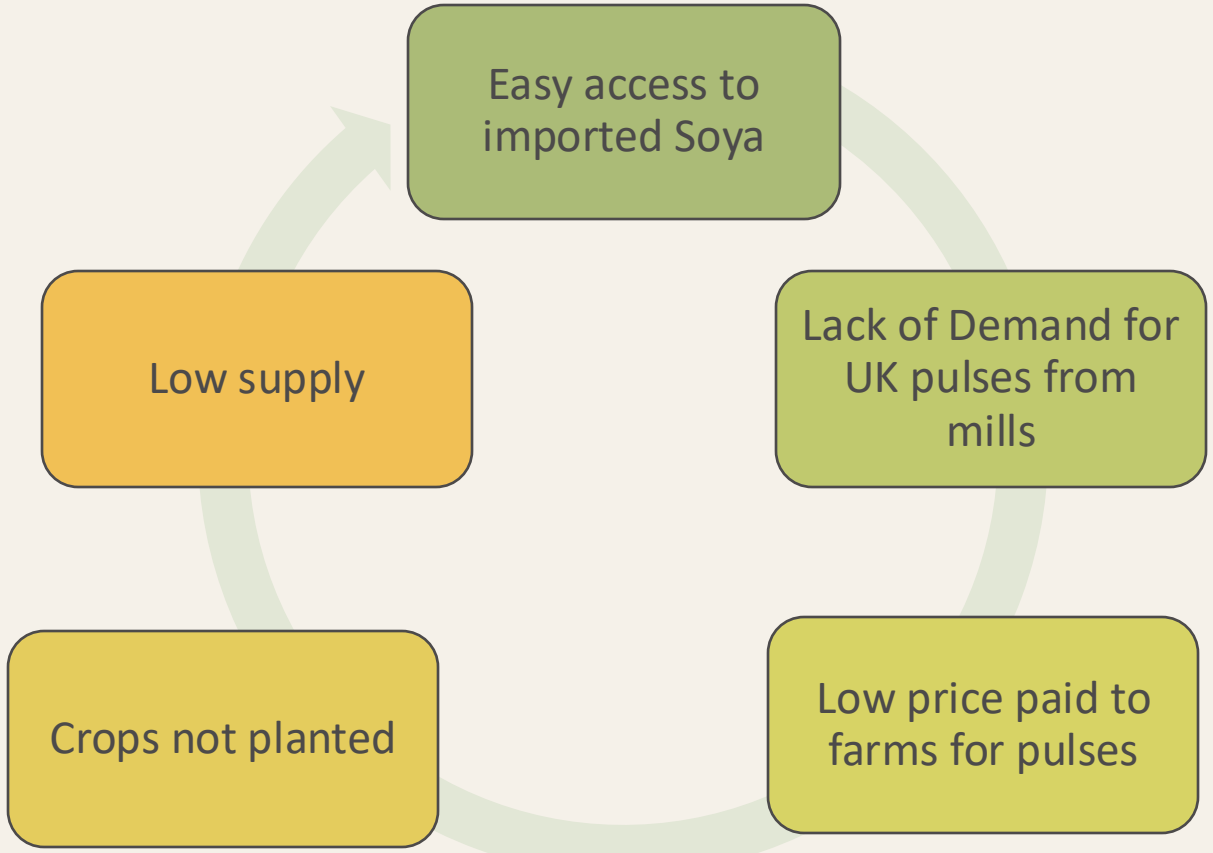

Arable Land use England 2022 Kha
Other cereals
58.6
1.6%
Sugar beet
93.1
2.5%
potatoes
93.4
2.5%
Fruit & Veg
114.5
3.0%
Oats
139.9
3.7%
Maize
202.5
5.4%
Peas & Beans
264.7
7.0%
Oilseeds
356.7
9.5%
Barley
782.1
20.7%
Wheat
1668.0
44.2%
Conventional Arable Total
3773.5
0.0
1000.0
2000.0
3000.0
4000.0
Series2
Series1


Organic Arable Land Use 2022 Kha
Sugar beet
0.3
0.4%
Maize, oilseeds & protein...
1.0
1.4%
Potatoes
1.7
2.3%
Other cereals
6.4
8.6%
Barley
8.0
10.9%
Fodder, forage and silage
9.4
12.7%
Fruit & Veg
11.9
16.1%
Wheat
17.1
23.2%
Oats
17.9
24.3%
Organic Arable Total
73.8
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Series2
Series1

Land use for protein crops



Market place issues



Opportunities in Organic whole farm systems

- Organic rotations-increasing use of legumes to reduce need for bought in soya protein
- Reassess rationing for organic lower yielding systems
- Increased production of human consumption pulses
- improve agronomic support for pulse producers

LEGUMINOSE

the way to a green transition

Introduction and overview of LEGUMINOSE

"Legume-cereal intercropping for sustainable agriculture across Europe"

Jerry Alford

Soil Association

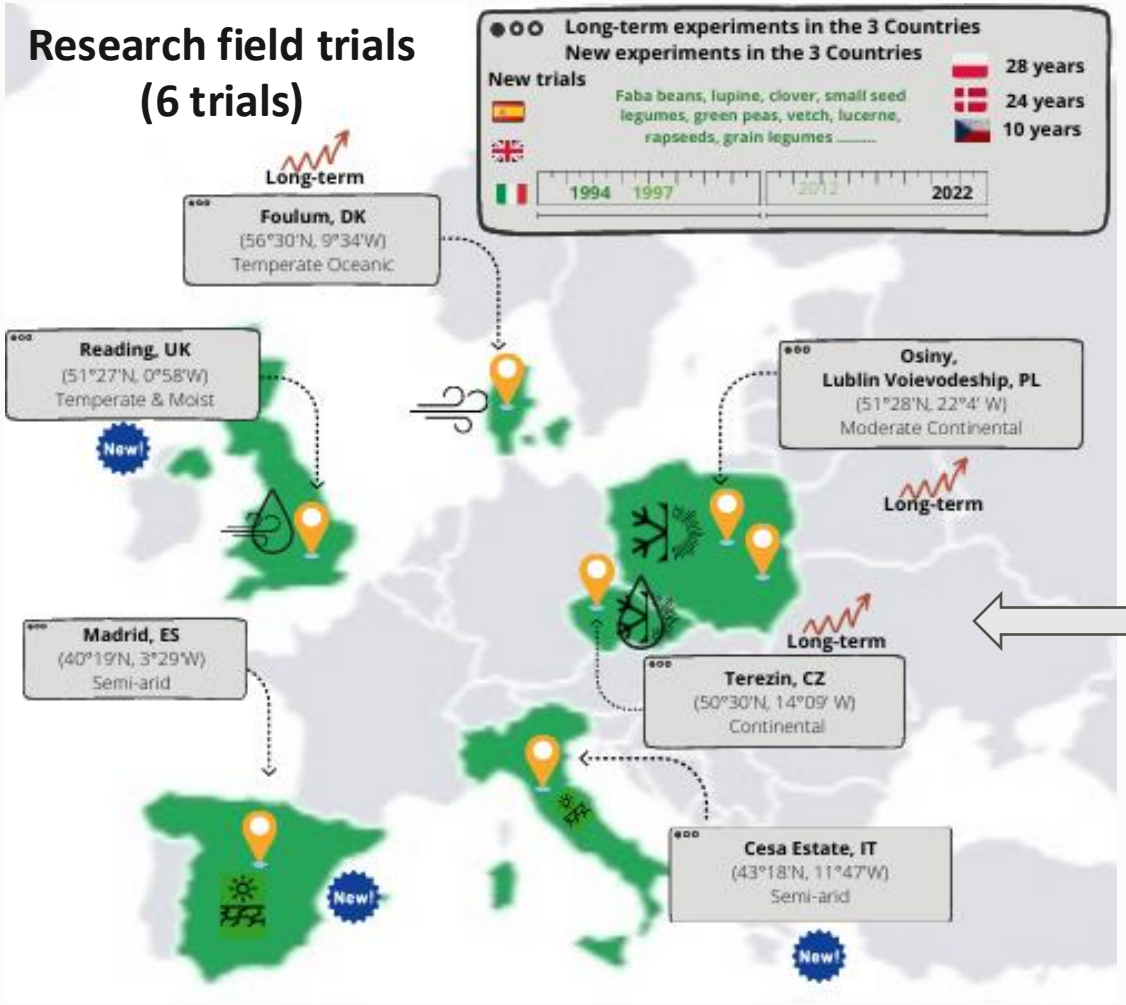
UKRI Innovate UK

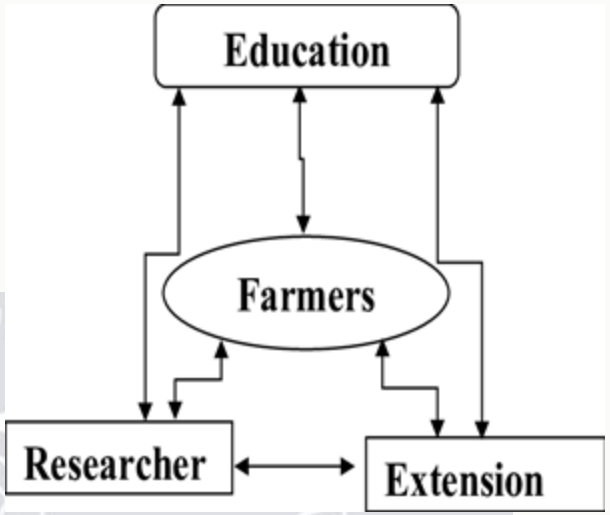
Horizon Europe

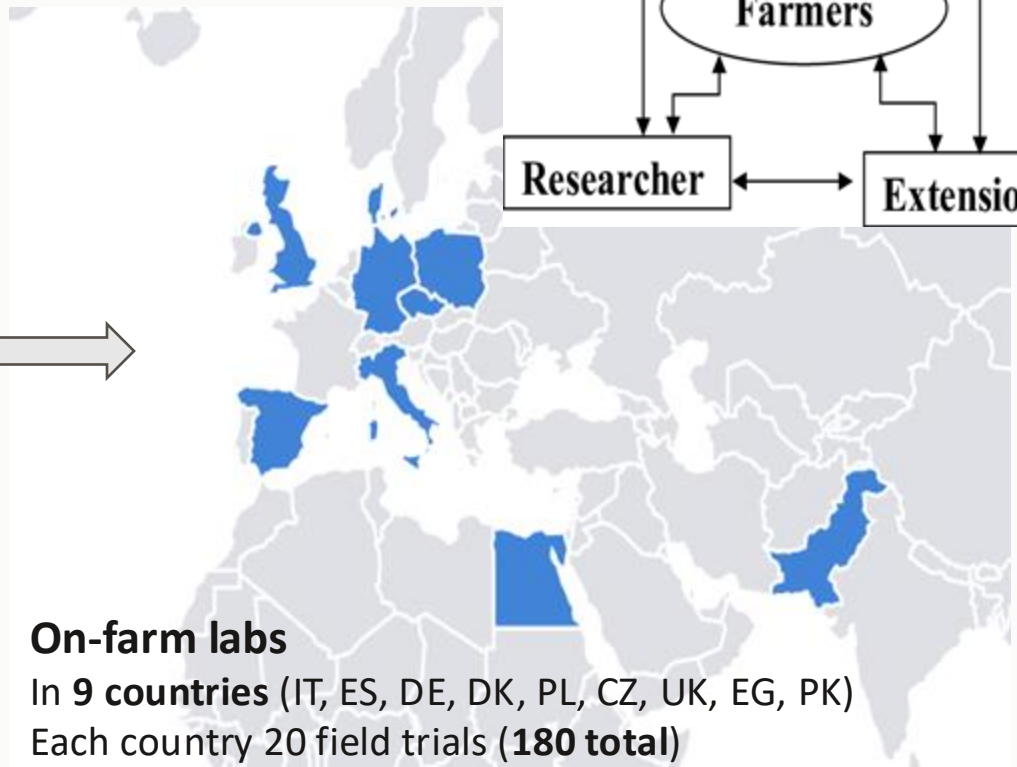
THE NEXT EU RESEARCH & INNOVATION PROGRAMME (2021 – 2027)

European Commission

Pilot demonstration (research field trials) and on-farm living labs for optimisation of legume-cereal intercropping.







On-farm labs

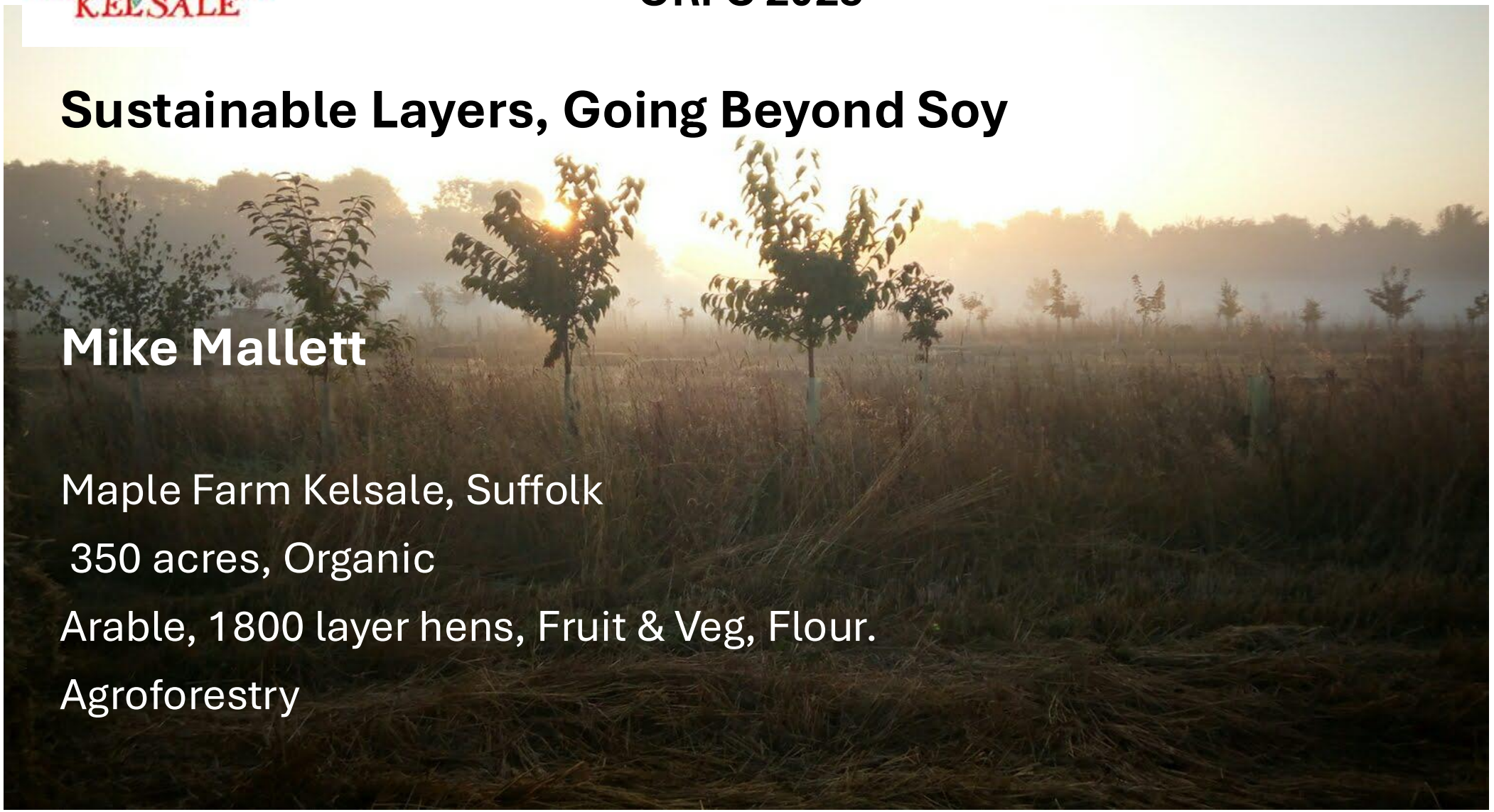
In **9 countries** (IT, ES, DE, DK, PL, CZ, UK, EG, PK)
Each country 20 field trials (**180 total**)

Funded by the European Union
Innovate UK

Mike Mallett

ORFC 2025

Sustainable Layers, Going Beyond Soy



Mike Mallett

Maple Farm Kelsale, Suffolk

350 acres, Organic

Arable, 1800 layer hens, Fruit & Veg, Flour.

Agroforestry

MAPLE FARM KELSALE

CLIMATE FARM DEMO

7 McGregor MPL 4250's

SKA Nestboxes

300 Organic Layer Birds Shed

Typically 5-6 sheds in lay

Soil Association

MAPLE FARM KELSALE

CLIMATE FARM DEMO

Stocking Rate
< 320 birds Ha

Agroforestry Rows

Rows of Young Agroforestry Trees across Field

Hybrid hens
Sussex
BBF Blues
Black Rocks Rhodes Rocks

MAPLE FARM
KELSALE

CLIMATE
FARM
DEMO

Sheds moved
Weekly March
To November

Feed every 5 days

12v Solar and
Battery System

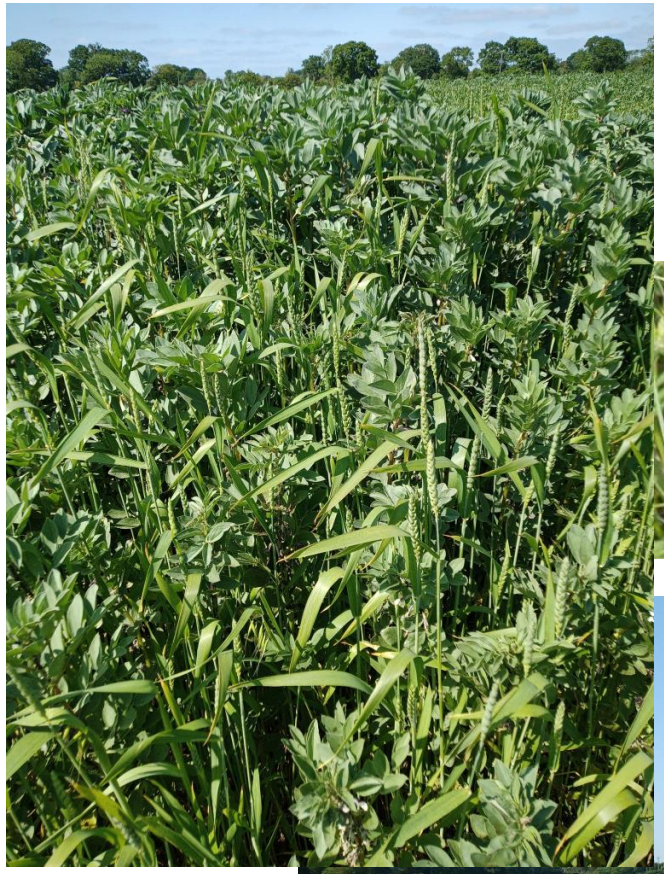
Opening and closing
by Linear actuators

3-man hours
Day average

MAPLE FARM
KELSALE

CLIMATE
FARM
DEMO

Arable Cropping



Heritage Wheat
Fava Beans
Spelt, Rye
Barley Peas
Vetch
Cover crops
& Leys grazed

Medium Clay Soil
Akaline Ph 7-7.5
Low phosphate
About 3 miles from the coast
Long term average rain fall
Circa 650mm per year

MAPLE FARM KELSALE

CLIMATE FARM DEMO

Heritage Wheat grown on the Farm is Milled for Flour

Layer enterprise Started to make use of Mill Waste Mids and Bran

We have always mixed our own feed

"Why can't we feed our hens a UK based diet?"

OK NET ecofeed

Protein crops in our rotation

Vetch (Vicia Sativa)

Field Pea (Pisum Sativum Arvense)

Field Beans (Vicia Faba)

- **Field Beans** Typically 26% protein
  Use in Monogastric feed limited by tannins and trypsin inhibitors
- **Vetch** a 26% protein Pulse Crop
- Commonly grown as a companion crop and green manure
- As well as Tannins and trypsin inhibitors, Vetch also contains Y-Glutamyl-B-Cyanoalanine which can be toxic to poultry.
- Both crops require processing to realise full potential
- **Field Peas** 21% protein Good levels of Lysine, low Methionine
- Lower levels of toxins so can be used without processing

MAPLE FARM KELSALE

Soy Expeller 44% CP
Field Beans 26% CP
Need 1.7 times the amount
Of field beans to match Soy protein

CLIMATE FARM DEMO

OK NET ecofeed

Soya, Vetch and Faba Bean Comparison

Common UK Protein sources

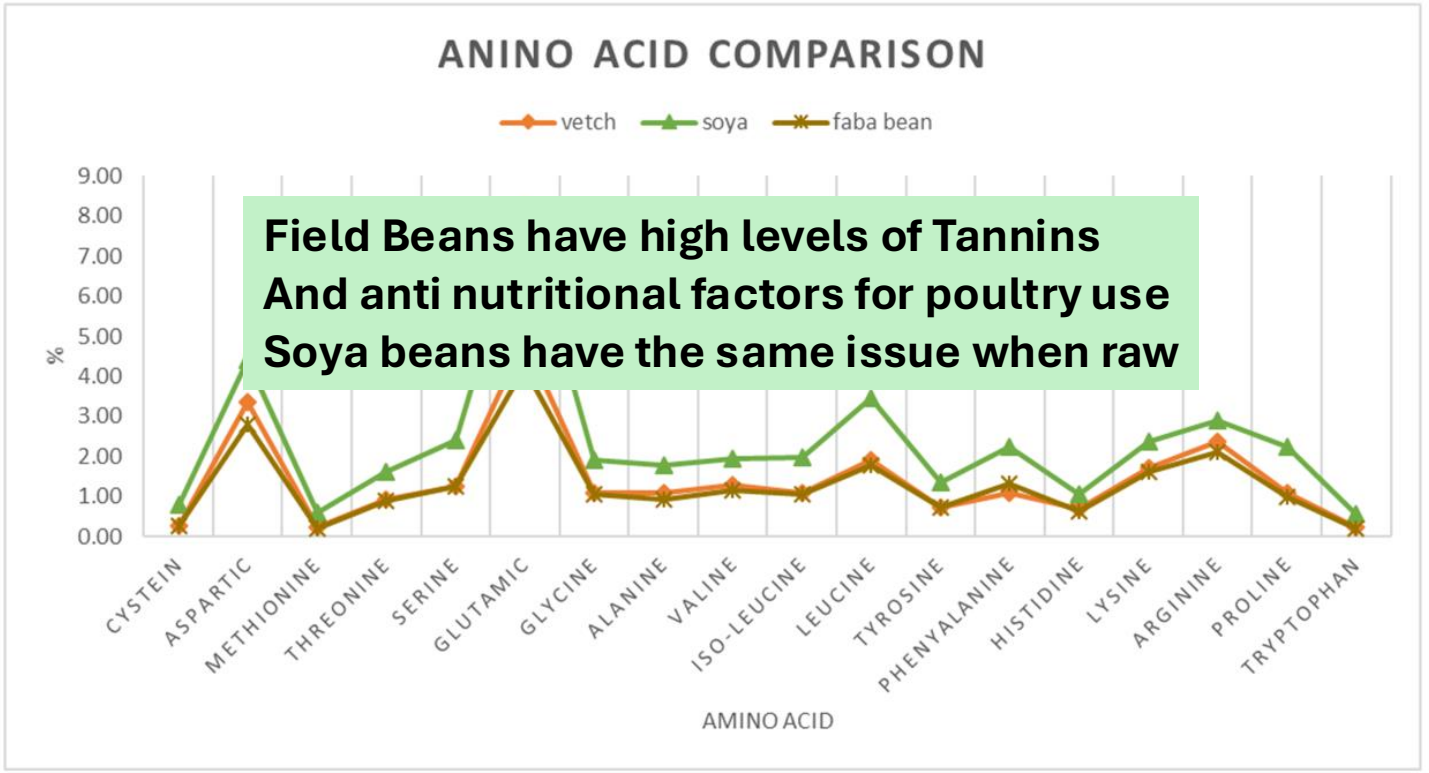
Field Beans 24% CP

Peas 21% CP

Lupins 30% CP

Oil Seed Rape Meal 30-40% CP

Brewers grains
Bio-digest Cake

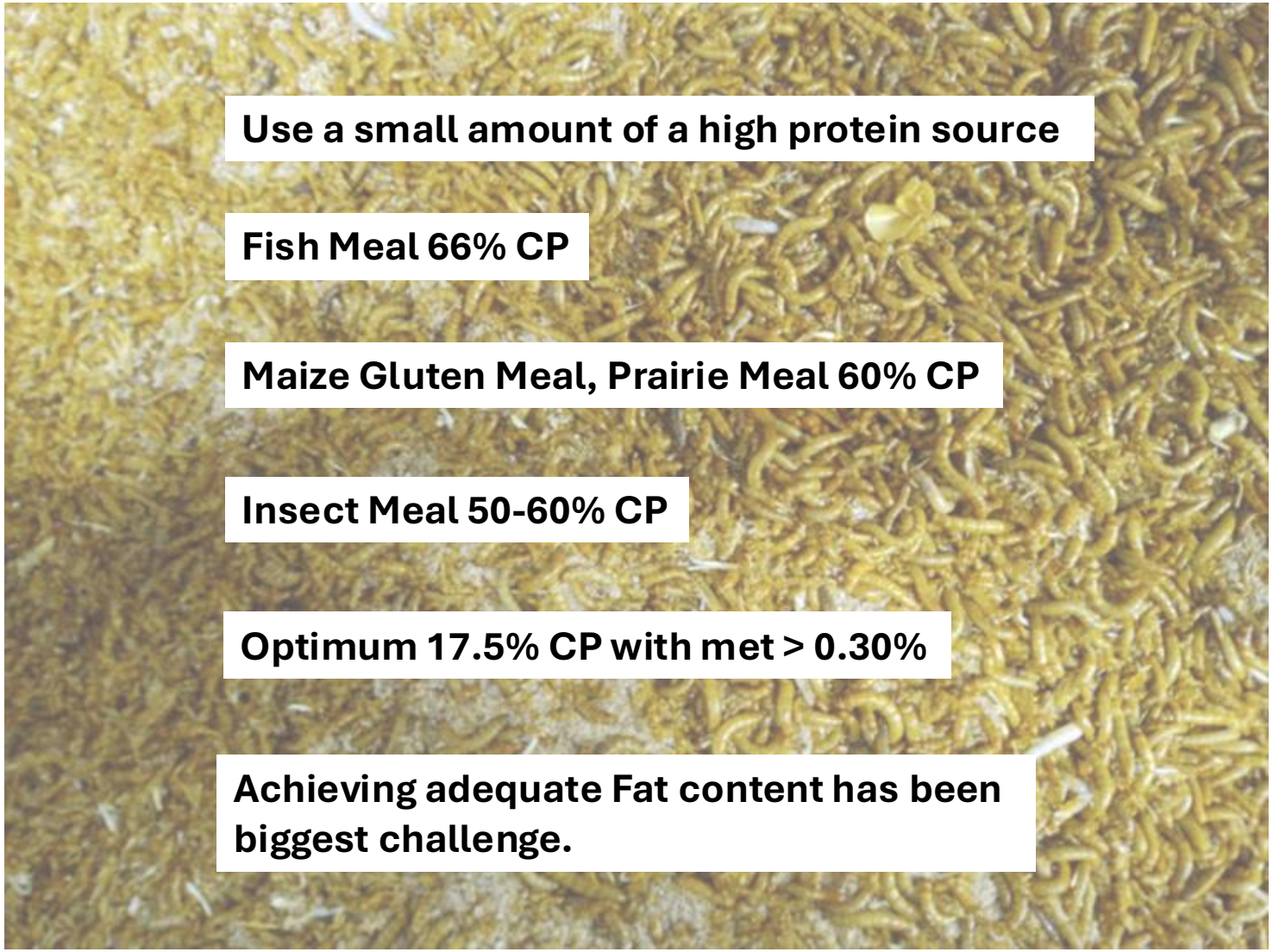


Field Beans have high levels of Tannins
And anti nutritional factors for poultry use
Soya beans have the same issue when raw

Imported Protein
Sunflower Expeller 30%CP

MAPLE FARM KELSALE

CLIMATE FARM DEMO

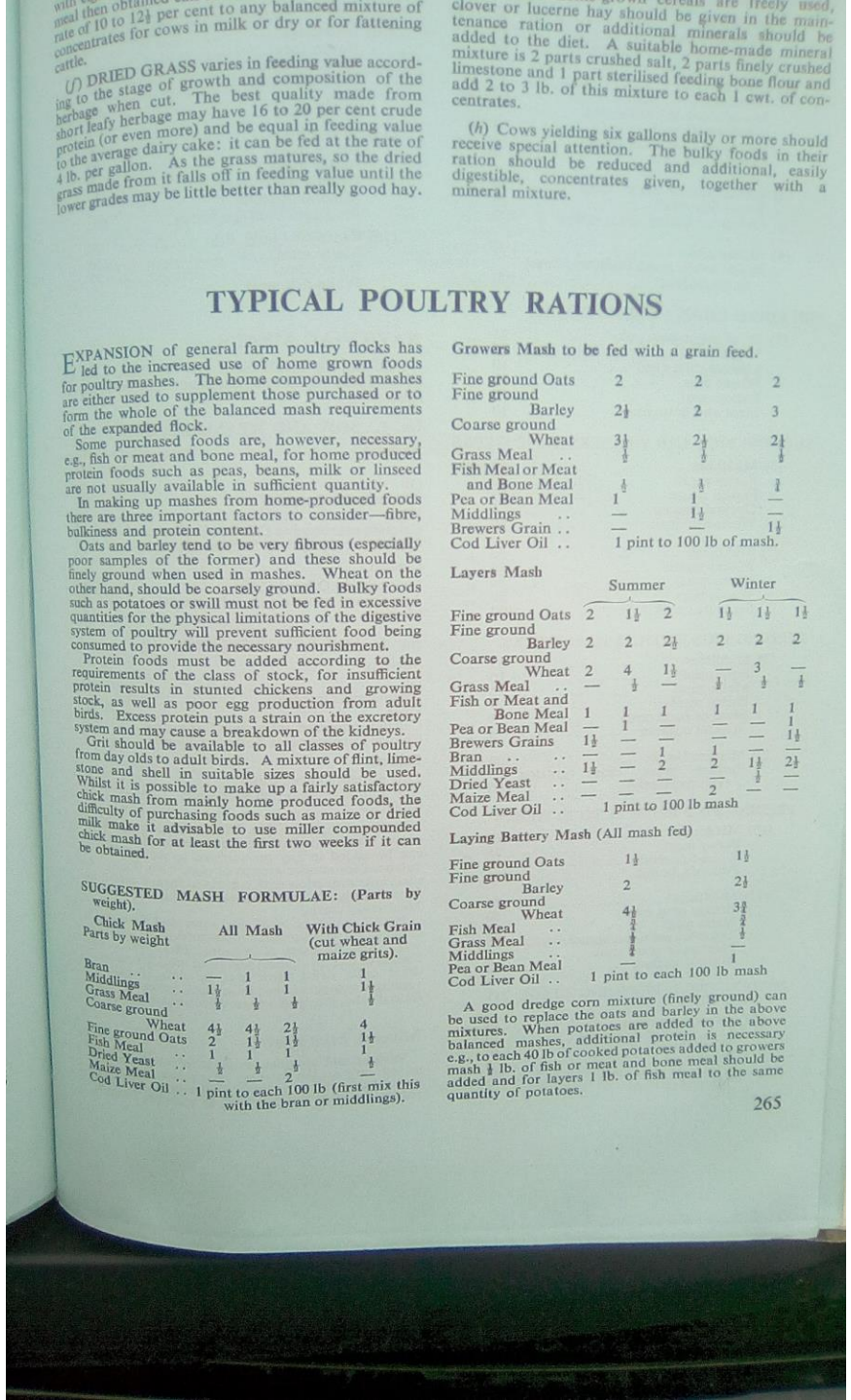


MAPLE FARM KELSALE

Farmer and Stockbreeders Year Book 1950

Oats
Barley
Wheat
Grass Meal
Brewers Grains
Bran & Middlings
Dried Yeast
Fish or Meat and Bone Meal
Pea or Bean Meal
Cod liver oil

Feed recipes back to 1904



(*f*) DRIED GRASS varies in feeding value according to the stage of growth and composition of the herbage when cut. The best quality made from short leafy herbage may have 16 to 20 per cent crude protein (or even more) and be equal in feeding value to the average dairy cake: it can be fed at the rate of 4 lb. per gallon. As the grass matures, so the dried grass made from it falls off in feeding value until the lower grades may be little better than really good hay.

(*h*) Cows yielding six gallons daily or more should receive special attention. The bulky foods in their ration should be reduced and additional, easily digestible, concentrates given, together with a mineral mixture.

TYPICAL POULTRY RATIONS

EXPANSION of general farm poultry flocks has led to the increased use of home grown foods for poultry mashes. The home compounded mashes are either used to supplement those purchased or to form the whole of the balanced mash requirements of the expanded flock.

Some purchased foods are, however, necessary, e.g., fish or meat and bone meal, for home produced protein foods such as peas, beans, milk or linseed are not usually available in sufficient quantity.

In making up mashes from home-produced foods there are three important factors to consider—fibre, bulkiness and protein content.

Oats and barley tend to be very fibrous (especially poor samples of the former) and these should be finely ground when used in mashes. Wheat on the other hand, should be coarsely ground. Bulky foods such as potatoes or swill must not be fed in excessive quantities for the physical limitations of the digestive system of poultry will prevent sufficient food being consumed to provide the necessary nourishment.

Protein foods must be added according to the requirements of the class of stock, for insufficient protein results in stunted chickens and growing stock, as well as poor egg production from adult birds. Excess protein puts a strain on the excretory system and may cause a breakdown of the kidneys.

Grit should be available to all classes of poultry from day olds to adult birds. A mixture of flint, limestone and shell in suitable sizes should be used. Whilst it is possible to make up a fairly satisfactory chick mash from mainly home produced foods, the difficulty of purchasing foods such as maize or dried milk make it advisable to use miller compounded chick mash for at least the first two weeks if it can be obtained.

SUGGESTED MASH FORMULAE: (Parts by weight).

Chick Mash Parts by weight	All Mash			With Chick Grain (cut wheat and maize grits).
Bran	—	1	1	1
Middlings ..	1½	1	1	1½
Grass Meal ..	½	½	½	½
Coarse ground Wheat	4½	4½	2½	4
Fine ground Oats	2	1½	1½	1½
Fish Meal ..	1	1	1	1
Dried Yeast ..	½	½	½	½
Maize Meal ..	—	—	2	—
Cod Liver Oil ..	1 pint to each 100 lb (first mix this with the bran or middlings).			

Growers Mash to be fed with a grain feed.

Fine ground Oats	2	2	2
Fine ground Barley	2½	2	3
Coarse ground Wheat	3½	2½	2½
Grass Meal ..	½	½	½
Fish Meal or Meat and Bone Meal	½	½	½
Pea or Bean Meal	1	1	—
Middlings ..	—	1½	—
Brewers Grain ..	—	—	1½
Cod Liver Oil ..	1 pint to 100 lb of mash.		

Layers Mash

	Summer			Winter		
Fine ground Oats	2	1½	2	1½	1½	1½
Fine ground Barley	2	2	2½	2	2	2
Coarse ground Wheat	2	4	1½	—	3	—
Grass Meal ..	—	½	—	½	½	½
Fish or Meat and Bone Meal	1	1	1	1	1	1
Pea or Bean Meal	—	1	—	—	—	1
Brewers Grains	1½	—	—	—	—	1½
Bran	—	—	1	1	—	—
Middlings ..	1½	—	2	2	1½	2½
Dried Yeast ..	—	—	—	—	½	—
Maize Meal ..	—	—	—	2	—	—
Cod Liver Oil ..	1 pint to 100 lb mash					

Laying Battery Mash (All mash fed)

Fine ground Oats	1½	1½
Fine ground Barley	2	2½
Coarse ground Wheat	4½	3½
Fish Meal ..	½	½
Grass Meal ..	½	—
Middlings ..	—	1
Pea or Bean Meal	—	—
Cod Liver Oil ..	1 pint to each 100 lb mash	

A good dredge corn mixture (finely ground) can be used to replace the oats and barley in the above mixtures. When potatoes are added to the above balanced mashes, additional protein is necessary e.g., to each 40 lb of cooked potatoes added to growers mash ½ lb. of fish or meat and bone meal should be added and for layers 1 lb. of fish meal to the same quantity of potatoes.

CLIMATE FARM DEMO

Soil Association

2107 OK net ecofeed trial
Sprouting vetch seeds

MealWorms (Tenebrio Molitor)

Our 200 tray Production Faciity

Temperature maintained at 23 Celsius through their own body heat. No external heating source used.

Organic Bran from the mill and waste vegetables as feed stock

Frass really useful source of organic fertiliser

MAPLE FARM
KELSALE

CLIMATE FARM DEMO

The Feed Equipment

MAPLE FARM
KELSALE

CLIMATE
FARM
DEMO

Plate Mill
Purely for de-husking
Fava beans

Rotary continuous flow Oven
Operates at 190C
Easy operation
Right Scale for the farm
Energy use offset by Solar

MAPLE FARM
KELSALE

CLIMATE
FARM
DEMO

Beans are processed by
Removing skins
Loses 12-15% By weight
Milled to a coarse granule
Heats To 120C for 10-12 minutes

Improves
Palatability
Digestability
15-20% inclusion rate

On-farm optimisation of faba beans for use in poultry diets as part of a balanced agroecology production system

Project lead: Ashraf Alkhtib, Nottingham Trent University.

Project members: Mike Mallett, Maple Farm Kelsale; Emily Burton, Nottingham Trent University

Project summary: Chicken is the most consumed meat in the UK and has a lower carbon footprint that any other meat, but this could be lowered further if we stop importing soya for chicken feed. Soya replaced fishmeal as a high-quality protein source for poultry in Europe when concerns focused on declining fish stocks. Global concern now focuses on the environmental cost of changing land use from tropical rain forest to soya production, and reliance of global supply chains to transport soya to the UK as animal feed. Reliance on imported feed materials also makes the UK vulnerable to global issues such as wars and extreme price fluctuations. This project aims to make UK faba beans into a poultry feed material that can be used in place of soya in chicken feed would not only greatly reduce the environmental cost of producing poultry meat but also make the UK food supply change more resilient.

Nottingham Trent University

Dr. Ashraf Alkhtib
Prof. Emily Burton

MAPLE FARM
KELSALE

We use our own
Wheat
Wheat & Beans
Barley & Peas

CLIMATE FARM DEMO

We also buy In Organic
Screenings & Out-grades
From Local seed Merchants
And food producers
Especially Hodmedods

Our Soy Free Hen Feed is
86% Home grown and UK produced
14% Imported

52% Direct Agri Crops
39% Food & Agri By products
9% Non-Agri Products

Starter crumb
Pullet mix
Summer & Winter Feed mix

MAPLE FARM
KELSALE

CLIMATE FARM DEMO

Bi-Cropping
Companion planting
Under-sowing

Suppresses weeds

Plant Support

Symbiotic relationship
Increases Biodiversity
Exchange of nutrients
and Root exudates

Beans & Wheat

Peas & Barley

Maximise
SFI Options

Clover under sown cereal

Legumes play an important part in our 6 year rotation
Improving soil health and crop nutrition

Its more than just growing the pulse crop, its setting up the next phase of the rotation

MAPLE FARM
KELSALE

Sheds are parked during wet
Winter periods and when
Flock-down is enforced.

Sheds and surround is then
heavily strawed. When able the
Sheds are moved and the straw/muck
Is collected and composted.

Compost is then used to feed
The soil in the Market garden
Area.

Fruit and Vegetables
Are then sold locally and
through the shop.

No external inputs

MAPLE FARM KELSALE

CLIMATE FARM DEMO

Circular Sustainable System

Nothing leaves the farm in a bulk lorry

Produce leaves the farm in either;
Bulk bag, 25kg sack, 16kg bag
or retail pack

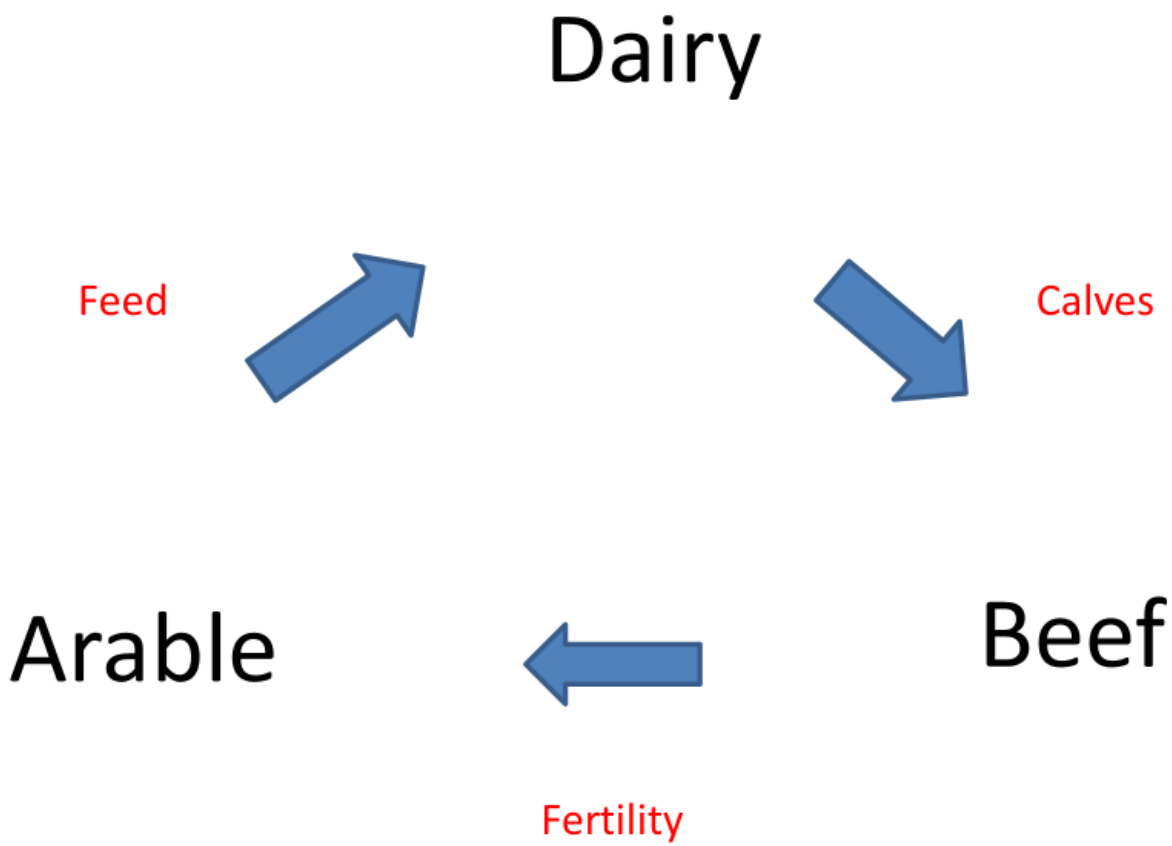
All produce sold direct to consumer or into retail

TOM GREGORY

TOM GREGORY

HOME FARM


CLAAS


Dairy
Feed
Calves
Arable
Beef
Fertility

Some numbers

- 16% concentrate £450-£480
- 16% peas and barley mix £380
- 16% spring wheat £325
- Farm saving this year £7805

Conclusion

- Arable enterprise offers forage security
- High quality silage has increased yield
- We can grow and feed bi cropped pulses
- Did we make millions? No
- Did we save money? Yes

ERIN MATLOCK

Increasing Home Grown Protein

Erin Matlock

Outline

- Benefits of pulses in rotation
- Cultural control methods
- Intercropping
- NCS Project

Crop Benefits

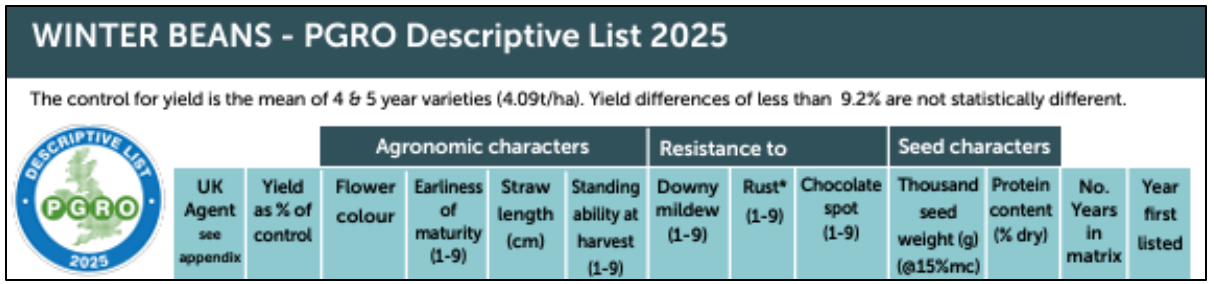
- Improve soil health
- Nitrogen fixing
  - Able to provide 50-75 kg N/ha to the following crop
- Provide habitats for beneficial insects
- Break up disease cycles for other crops, particularly cereals
- Could be utilised as a protein source in animal feed, if unable to make food grade

Building block to successful production

- Crop rotation
  - Recommendation to not grow grain legume or pulse closer than every 6 years to mitigate risk of foot rot
    - PGRO does offer a soil test for pea foot rot pathogens
  - Monitor for *Sclerotinia sclerotium* in multiple crops in the rotation, including oilseed rape and linseed
    - Causes stem rot in peas and beans
- Seed Bed Preparation
  - Good drainage and avoidance of compaction can lower risk of foot rot (cover crop, ploughing)

Building block to successful production

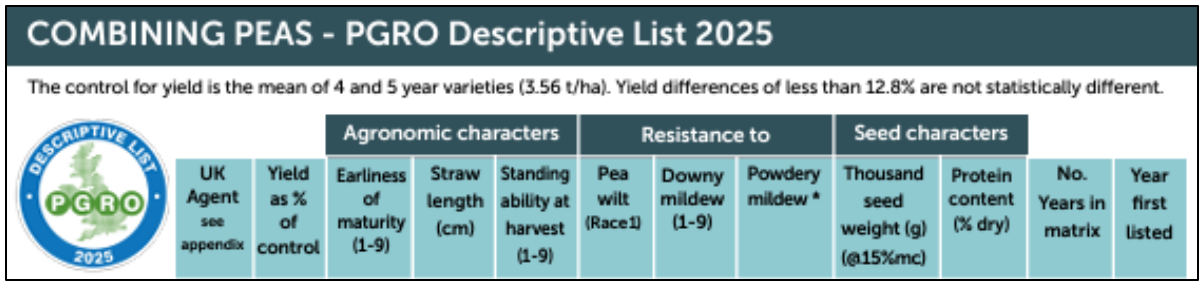
- Start with disease free seed
  - Seed should be tested for levels of Ascochyta
    - In peas, levels higher than 5% should be discarded
    - In beans, levels should not exceed 1%
  - Peas should also be tested for marsh spot as it can cause germination issues
  - It is recommended to test peas for pea seed-borne virus
  - It is recommended to test beans for the presence of stem nematode
- Look at the Descriptive List for both peas and beans to see what genetic disease resistance suits your needs
  - Available at pgro.org or in the winter edition of the pulse magazine



WINTER BEANS - PGRO Descriptive List 2025

The control for yield is the mean of 4 & 5 year varieties (4.09t/ha). Yield differences of less than 9.2% are not statistically different.

		Agronomic characters				Resistance to			Seed characters			
UK Agent see appendix	Yield as % of control	Flower colour	Earliness of maturity (1-9)	Straw length (cm)	Standing ability at harvest (1-9)	Downy mildew (1-9)	Rust* (1-9)	Chocolate spot (1-9)	Thousand seed weight (g) (@15%mc)	Protein content (% dry)	No. Years in matrix	Year first listed



COMBINING PEAS - PGRO Descriptive List 2025

The control for yield is the mean of 4 and 5 year varieties (3.56 t/ha). Yield differences of less than 12.8% are not statistically different.

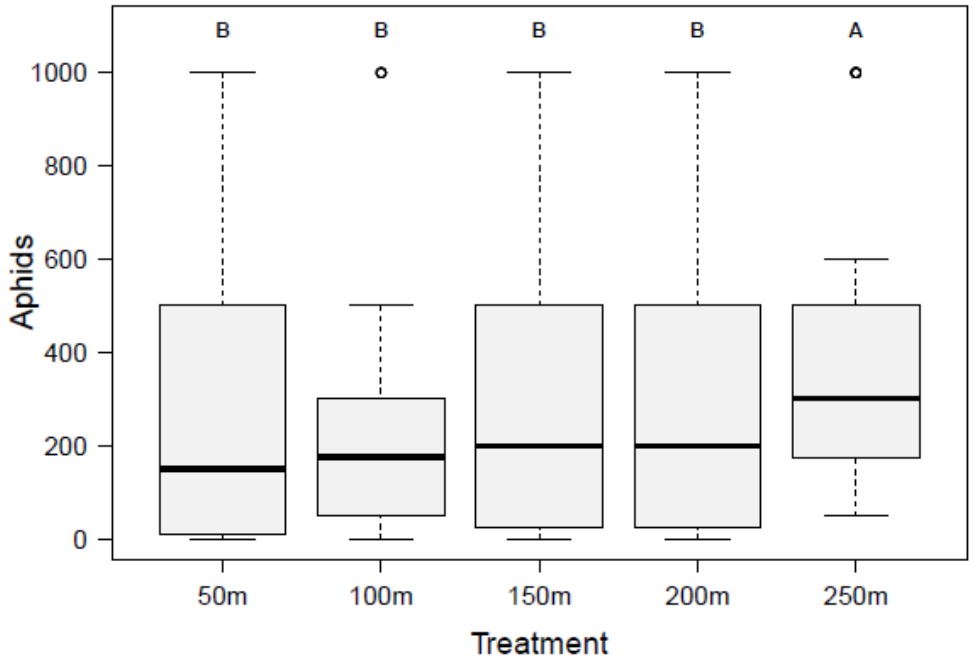
		Agronomic characters			Resistance to			Seed characters			
UK Agent see appendix	Yield as % of control	Earliness of maturity (1-9)	Straw length (cm)	Standing ability at harvest (1-9)	Pea wilt (Race1)	Downy mildew (1-9)	Powdery mildew *	Thousand seed weight (g) (@15%mc)	Protein content (% dry)	No. Years in matrix	Year first listed

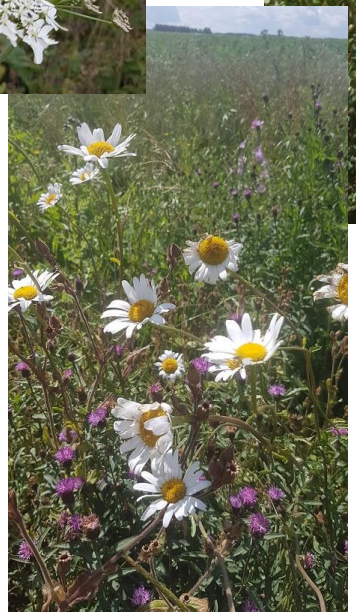
Weed Management

- Ploughing maybe required
- Mechanical weeding post-emergent
  - PGRO has looked at this in vining pea, combining pea and spring bean
  - Varying results depending on weed species present
  - Most promising timing is GS 102 and 105
  - Works best on shallow weeds and may want to consider increasing seed rate to compensate for crop damage

Pest Management

- Trap Cropping
  - Can be utilised as a tool for bruchid beetle management
- Wildflower Margins
  - Promotes habitats for predators
  - Aide in aphid management





Pest Management- Bean Seed fly (*Delia platura*)

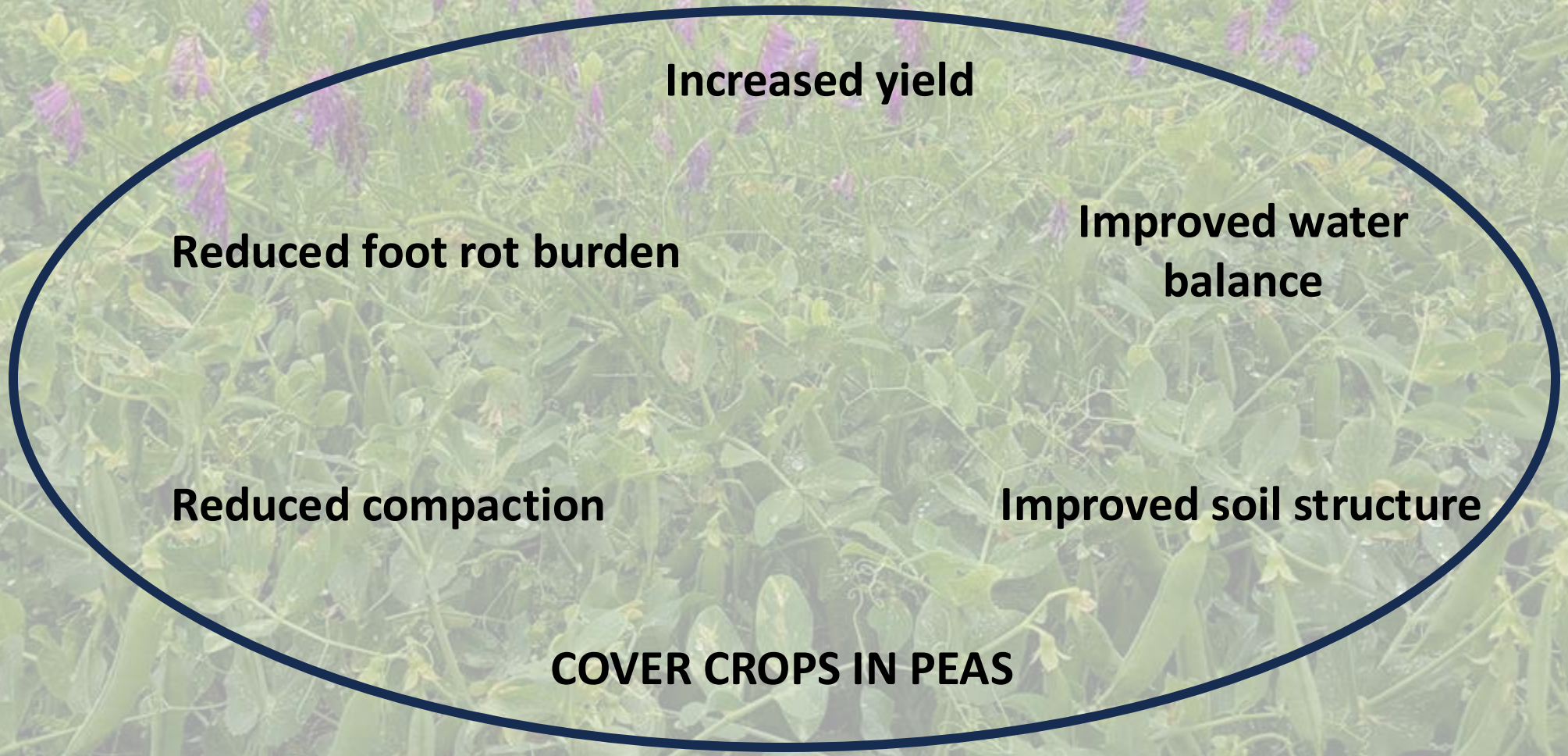



- Wide host range- affecting over 40 plant species
- Flies are often associated with soils containing high levels of organic material such as farmyard manure and plant debris
- They prefer recently cultivated soil –destroy cover crops at least 6 weeks prior to drilling
- Reduces establishment (up to 60% in worst cases) and plant growth

Cover Cropping

- PGRO looked at CC in front of vining peas
  - can transfer to combining peas
- Oat Based mixed
  - Positive effects on soil structure, reduced compaction
- Oil Radish
  - Best not used or used at <20% before peas due to trash and potential foot rot problems
- Phacelia
  - Improved topsoil structure
  - No impact on foot rot soil burden or infection in peas

Cover Cropping

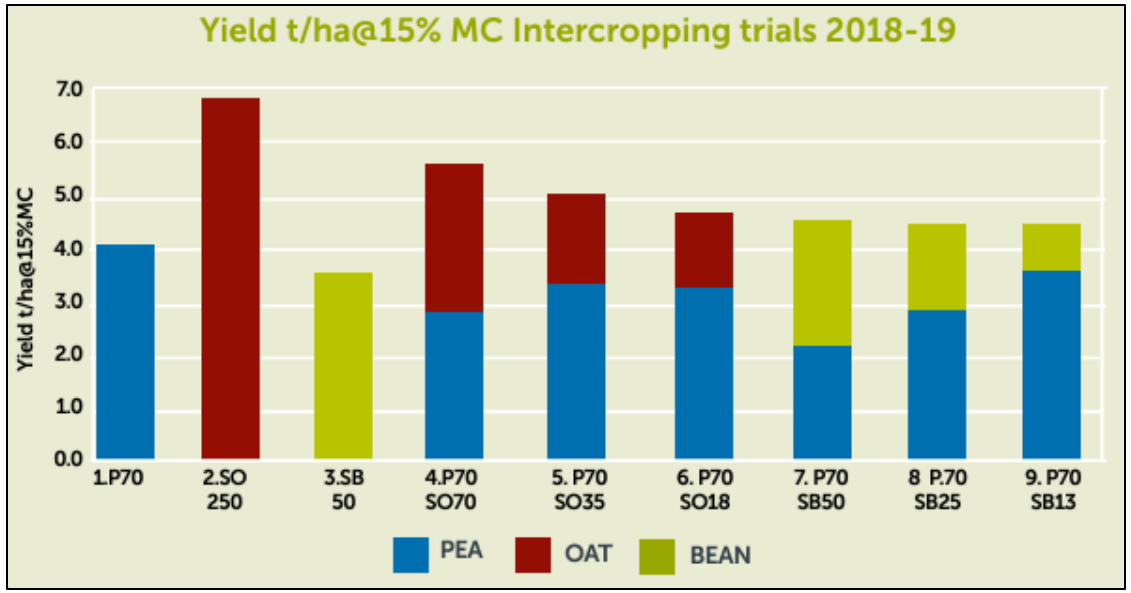


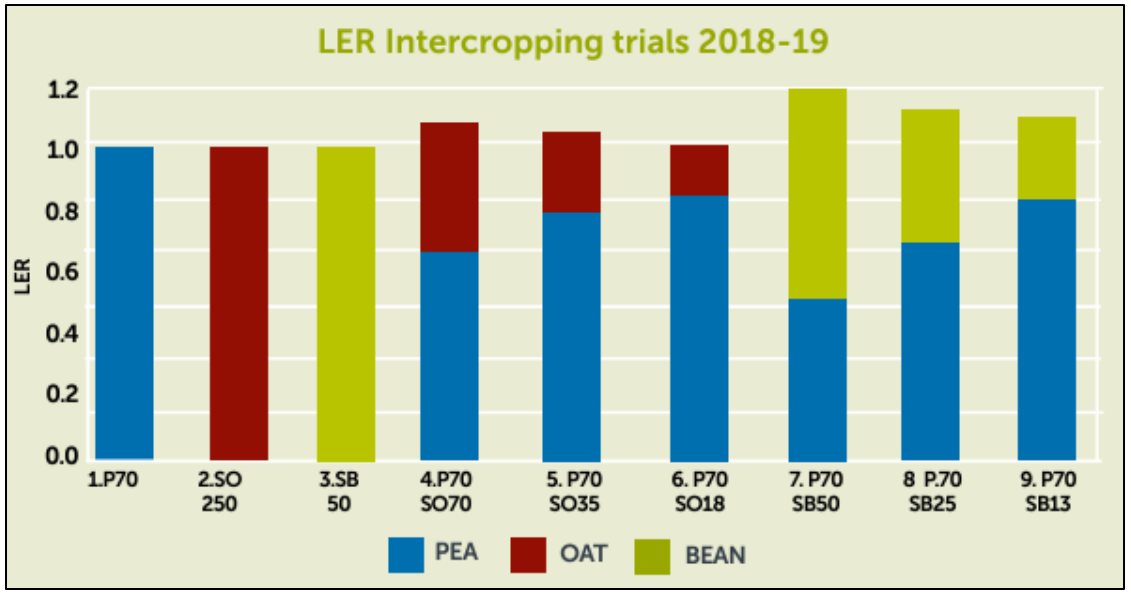
Intercropping

- Reports that it provides reduction in weed, disease and pest incidence
- Intercropping with peas or beans can provide the cereal crop with nitrogen; the cereal crop could help with pea lodging
- Key is to find the proper rates and crops that work well together and know the end market
  - Does it need to be separated, or can it be utilised as one?

Intercropping –Yield and LER

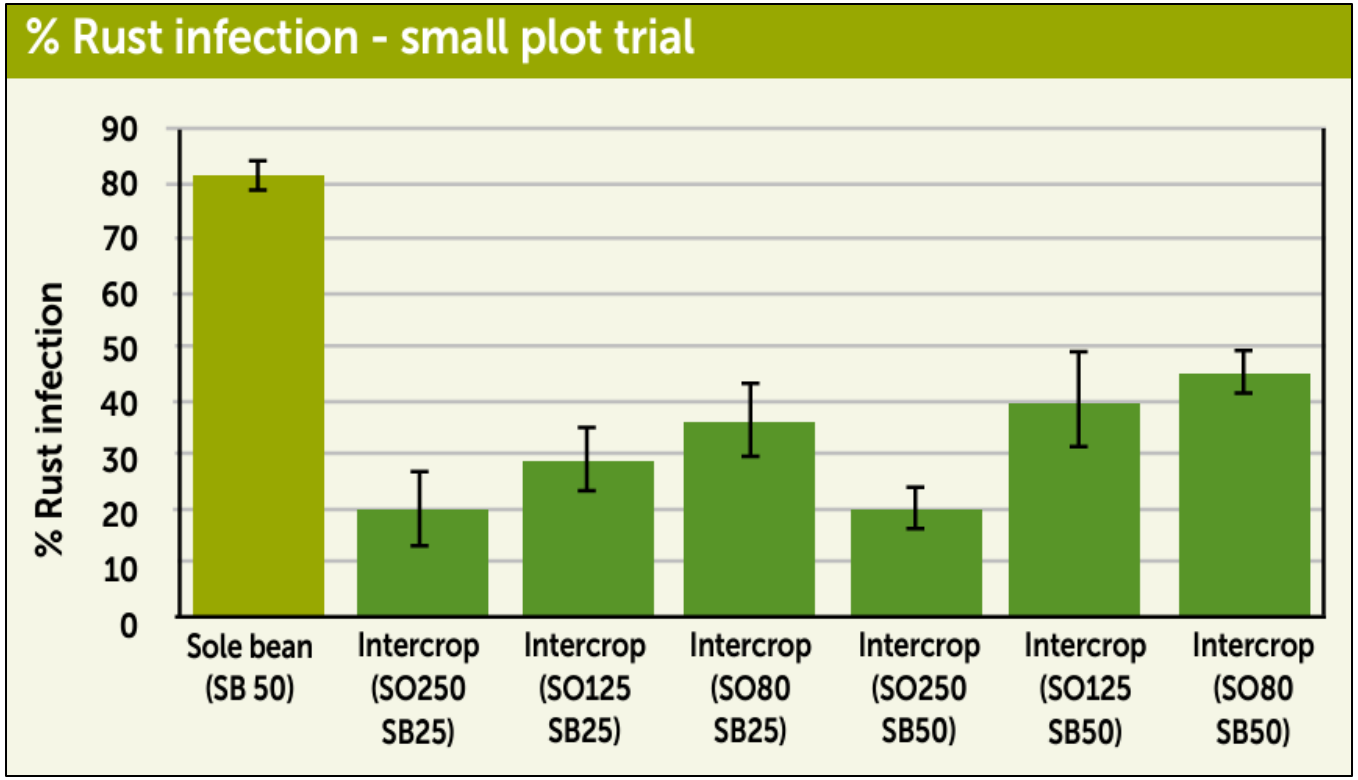
- Should not only measure yield of both crops, but look at land use ration (LER)
  - LER =(intercrop 1/pure crop 1) + (intercrop 2/pure crop 2)
  - LER>1 indicates growing crops together is potentially advantageous
  - i.e. LER =1.2 indicates 20% more yield or to get equivalent mono crop yield, need 20% more land





Intercropping –reduction in disease

- 2020 trial
- Bean rust is airborne
  - the probability of the spore to land on a host crop is reduced in an intercrop system



Intercropping –weed management?

- 2023 trials saw strong allelopathic effects on fathen

NCS Project

- Nitrogen Efficient Plants for Climate Smart Arable Cropping Systems
- Defra funded £5.9M, 4-year project
- Involves 17 industry partners and over 200 farmers

NCS Project

Reduce Carbon Emissions

To enable UK Farming to bring about a reduction of 1.5MtCO_2e p/a or 54% of the maximum potential for the industry.

Increase Pulses in Arable Rotations

To increase pulse and legume cropping in arable rotations to 20% across the UK (currently 5%).

Reduce Imported Soya Meal

To replace 50% of imported soya meal used in livestock feed rations with home-grown legumes.

- These ambitions are steered by science and proven by farmers
- Significant benefit for both crop and livestock productivity

From Soya to Sustainability

Driving the transition to a more sustainable, resilient, and secure UK food system with reduced reliance on imported soya.

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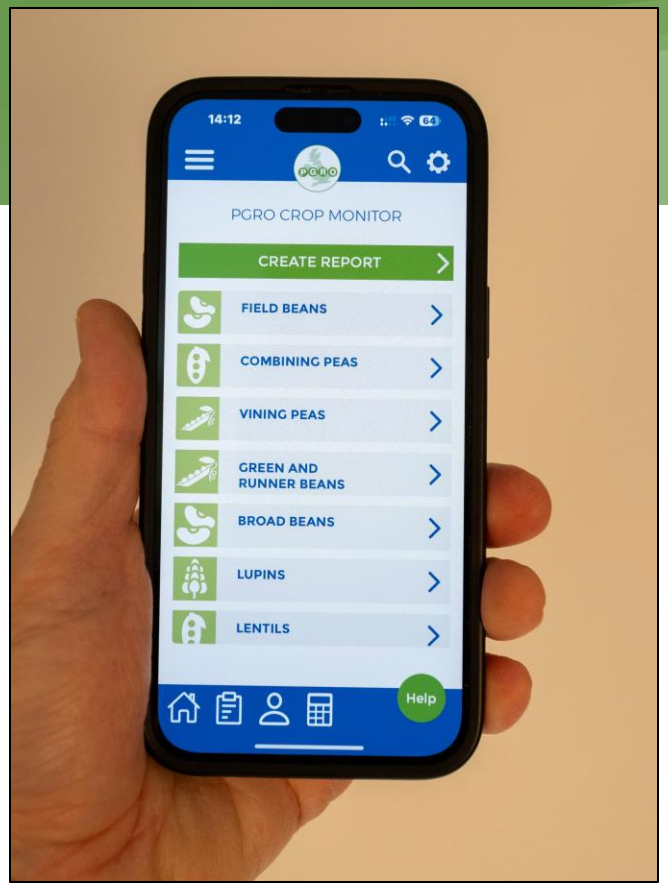
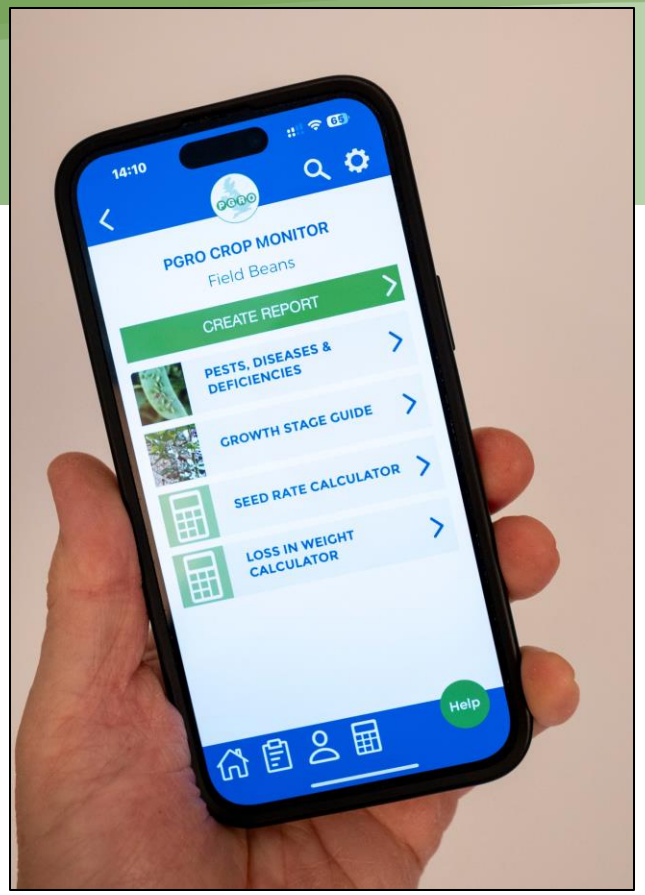
Find out more & secure tickets now:





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QUESTIONS