Crop Mixtures

Welcome ☺

We will start at 17.30
This meeting will be recorded ☺

@agricology @SEAMixtures @plantteams

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Agenda

- **Ali Karley and Rob Brooker, James Hutton Institute** - Overview of crop mixtures in research and practice
- **Andrew Gilchrist, Scottish Agronomy** – Experience of trialling 7 different cereal – legume mixtures
- **Gordon Cairns, Stracathro Estates** - Growing Beans and Rye for for whole crop (AD)
- **Charlotte Bickler, Organic Research Centre** - Selecting mixtures and what to do with the end product?

18.30: Comments, questions and discussions

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Technical bit..

- Small chance of being ejected into cyberspace – log back in! ☺
- Chat box – comments and questions / personal messages
- Questions
  - Add in chat to 'everyone' or 'raise hand'
  - Pick up some as we go and discussion at end
  - Share your own experiences
- We are recording

WHAT IS AGRICOLOGY?

Sharing farmer experience

Demonstrating agroecology in practice on farm throughout the UK, including 40 profiled farmers

Research evidence

600+ Technical guides, researcher blogs and field trials in our free online library

Podcasts

Interviews with farmers and researchers discussing agroecology in practice

Field Days

On farm walks with farmers and researchers – focusing on key agroecological practices

Video

Over 320 videos sharing the latest ideas, opinions and innovations in the field

Discussions

Engaging farmers and researchers in conversation at Field Events such as Groundswell and Cereals and on social media @agricology

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ELM FARM

COLLABORATION

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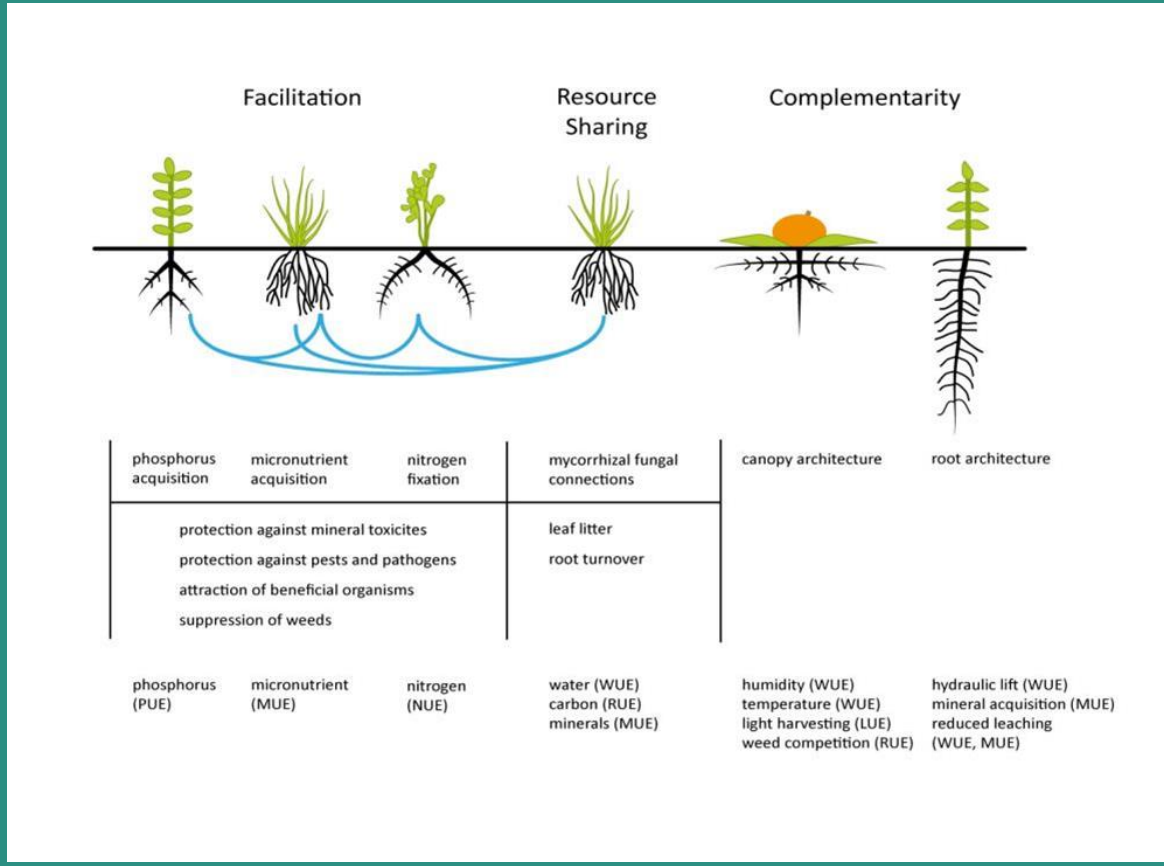
What is a crop mixture?

"The growing of two or more crop species where part or all of their crop cycle overlaps temporally and/or spatially, where one or more of the component species is taken to harvest"

Andy Howard – Nuffield Report 2016



Facilitation, resource sharing and complementarity (Brooker et al, 2015)

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Ali Karley and Rob Brooker, James Hutton Institute

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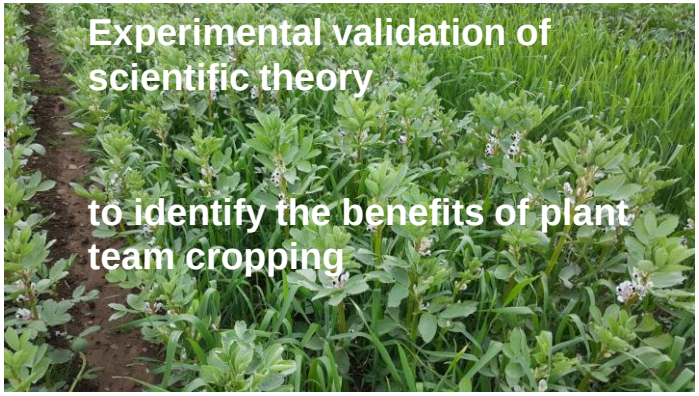
Science-practitioner knowledge exchange in DIVERSify

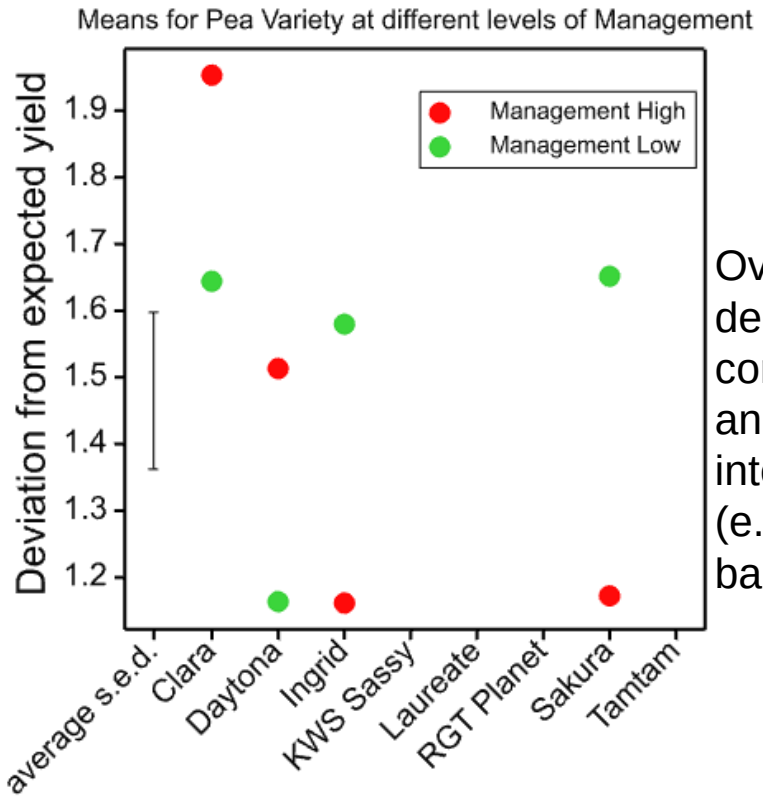
DIVERSify: Designing InnoVative plant teams for Ecosystem Resilience and agricultural Sustainability

Optimising the performance of crop species mixtures or ‘plant teams’

Horizon 2020 project with 23 academic and industry partners in the EU and internationally

Science-practitioner knowledge exchange in DIVERSify

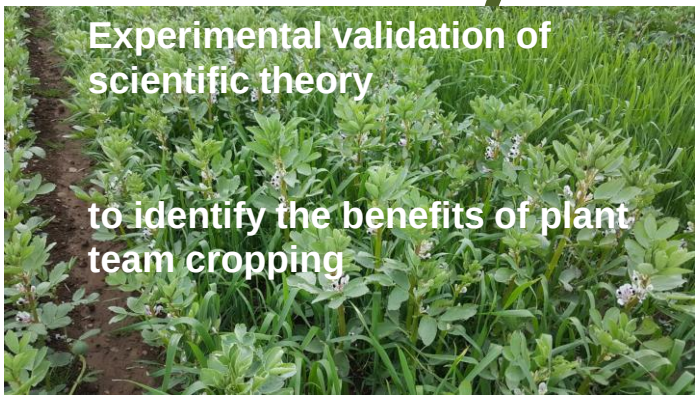




Over-yielding depends on component cultivars and management intensity mixtures (e.g. pea in pea-barley mixtures)

Science-practitioner knowledge exchange in DIVERSify

Farmers and scientists work together for data collection, trial evaluation and to share findings



SEAMS

Esmée Fairbairn FOUNDATION

Sustainability in Education and Agriculture using Mixtures

The James Hutton Institute

Four year project

Funded by the Esmée Fairbairn Foundation

Coordinated by the James Hutton Institute

buglife Scotland

Game & Wildlife CONSERVATION TRUST Scotland

RHET The Royal Highland Education Trust Patron HRH The Princess Royal

SCOTTISH AGRONOMY LTD

LEAF LINKING ENVIRONMENT AND FARMING

Soil Association SCOTLAND

NFU Scotland

Scottish Natural Heritage Dualchas Nàdair na h-Alba nature.scot

Project Aims

SEAMS

Develop, promote and implement crop species mixtures as:

- A sustainable crop production system for Scotland
- A resource for knowledge exchange on food production, agricultural ecology and environmental sustainability to a wider audience including school groups

Project Activities

Cores sites – 2020, 2021, 2022

Hubs for KE with:

- Schools
- Farmers – “farmer cluster” approach
- Buyers
- Policy makers

Network sites – 2021, 2022 – trial crop mixtures; help tailor them to local needs/conditions

Provide guidance and support for growing crop mixtures

Peas and barley, Duns Field

Peas and barley, Duns Field

Peas and barley, Hutton Bog Field, June 2020

Peas and barley, Hutton Bog Field, June 2020

Andrew Gilchrist, Scottish Agronomy


Peas and oats


Beans and oats


Peas and barley


Beans and barley


Beans, oats and peas


Barley and clover


Beans and SOSR

Gordon Cairns , Stracatho Estates, Beans and Rye for AD


Beans and Rye, Stracatho Estates 28th July 2020


Beans mono, Stracatho Estates 28th July 2020


Rye monoculture, Stracatho Estates 28th July 2020

Rye monoculture, Stracatho Estates 28th July 2020

Charlotte Bickler, Organic Research Centre

Thank you to all the farmers involved in the DIVERSify Intercropping Group on Innovative Farmers (innovativefarmers.org)

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Wheat and beans, Roundhill Farm, Wiltshire

Motivations: Weed suppression (especially wild oat), increase wheat protein?

Establishment: 1ha strips, wheat and beans in two passes

2018 *Tundra* *Mulika*	**Wheat 174kg/ha** **Beans 125kg/ha**	**Beans 125kg/ha**
2019 *Tundra* *Mulika*	**Wheat 100kg/ha** **Beans 200kg/ha**	**Beans 200kg/ha**

Processing and use: Harvested together and used on farm as a mixed feed for livestock.

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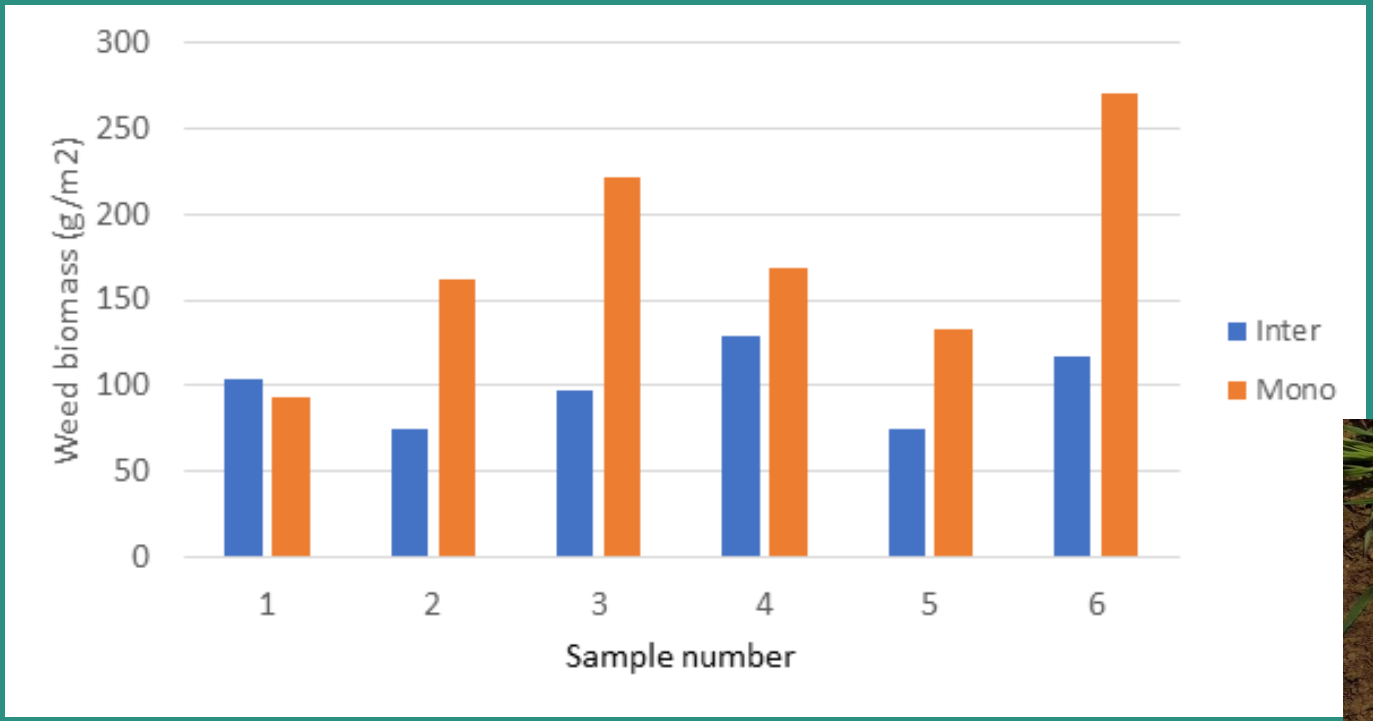
Wheat and beans, Roundhill Farm, Wiltshire

Results:

- 2018
  - **Weeds:** 74% less dry weed biomass in intercrop than monocrop
  - **Yield:** Small bean yield penalty in intercrop (wheat rate too high?)
- 2019
  - **Weeds**: 73% less dry weed biomass in intercrop than monocrop
  - **Yield:** Monoculture crop destroyed due to high weed burden



Some indication of improved wheat quality in intercrop in 2019 with protein content of 10.94 v 10.67 in monocrop.

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Linseed and oats, Bockhanger Farm, Kent (18/19)

Motivations: Oats to aid linseed establishment via reduction of pest pressure.

Establishment: Linseed and oats drilled with cross slot in one pass on 27/03/19;

- Linseed at 700 seeds/m2 / Oats at 0, 70 and 140 seeds/m2

Plot No. (Ha)	Linseed Seeds M2	Oats Seeds M2
1 (0.72)	700	0
2 (0.66)	700	70
3 (0.61)	700	140
4 (0.59)	700	0
5 (0.54)	700	70
6 (0.51)	700	140
7 (0.50)	700	0
8 (0.51)	700	70
9 (0.54)	700	140

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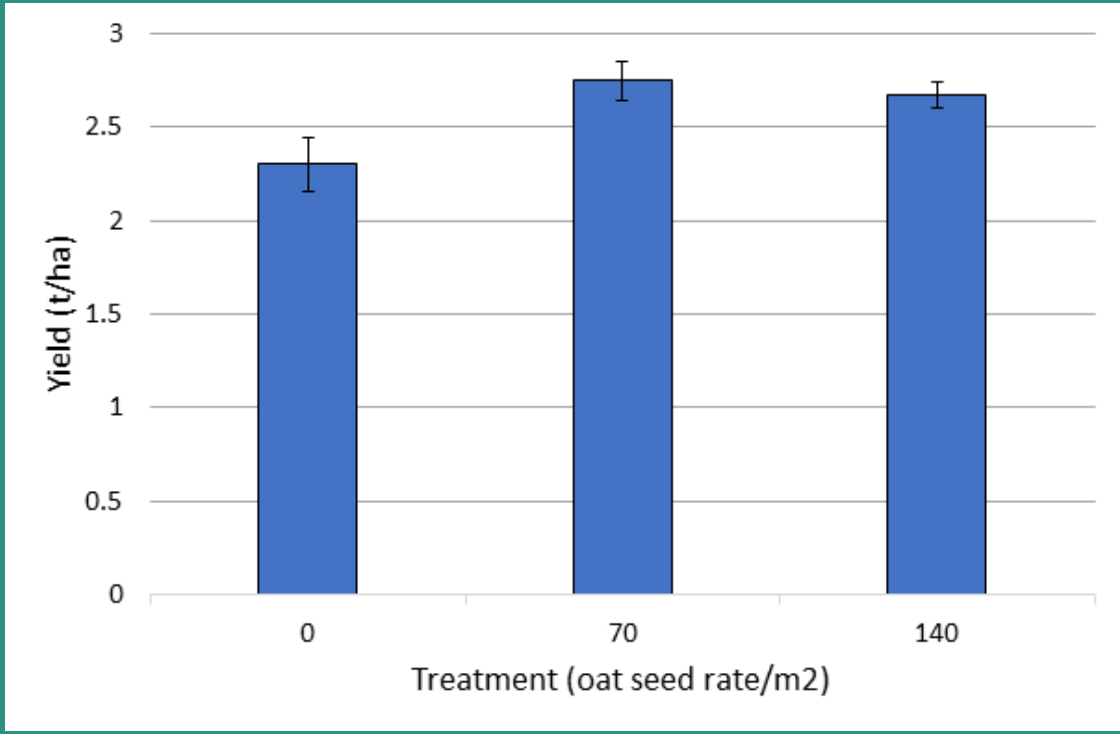
Linseed and oats, Bockhanger Farm, Kent (18/19)

Results

- **Higher average linseed yield** in treatments with oats
- **Pest traps confirmed presence of flax flea beetle** although in low abundance
- 70 seeds/m2 seed rate had a slightly lower pest damage score (NS)



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Linseed and oats 2019/20

OSR, Peas and oats, Bockhanger Farm, Kent 18/19

Motivations:

a) **Aid OSR establishment** via reduction in pest pressure;

b) OSR in supporting the pea crop and **reducing lodging**.

Establishment:
Marrowfat peas drilled at 70 seeds/m2 with and without OSR and an oat companion on 30/03/19.

The treatments were:

- Monoculture peas;
- Peas + OSR at 35 seeds/m2;
- peas + OSR at 50 seeds/m2;
- peas + OSR at 50 seeds/m2 plus oats at 70 seeds/m2.

These were replicated twice in strips across the field with monocrop replicated three times to assay in-field heterogeneity.

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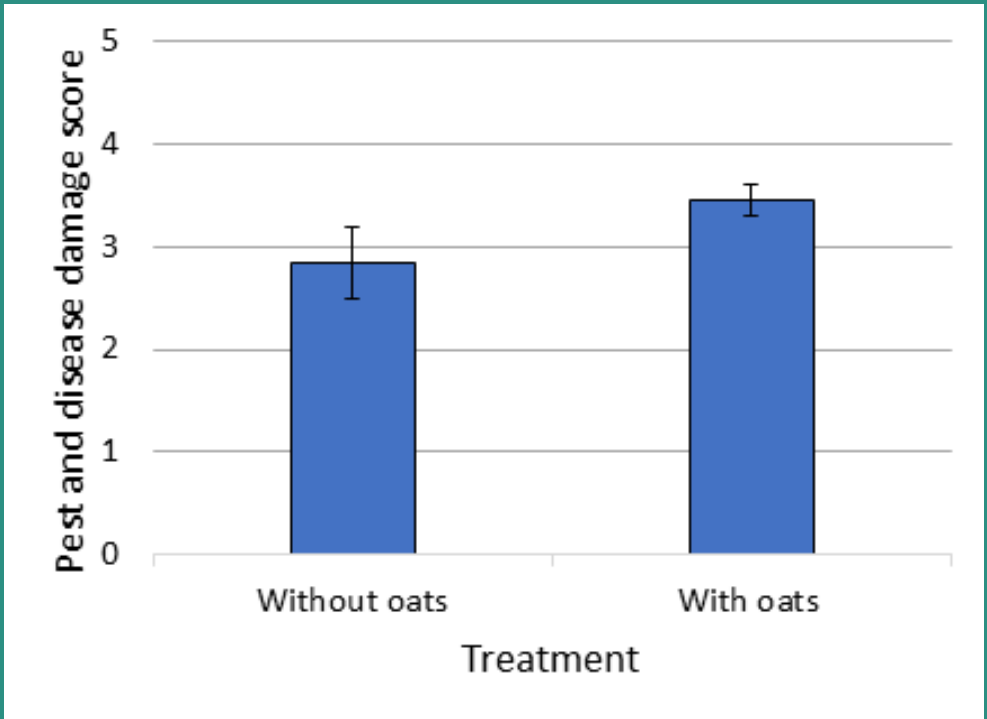
OSR, Peas and oats, Bockhanger Farm, Kent 18/19

Results

- Average pest and disease damage T2 'Peola' was higher in strips without oats (NS)
- Two cabbage stem flea beetle pests were trapped across the entire trial
- Poor establishment of the OSR
- No detrimental effect on the pea in terms of nutrition or yields across treatments



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Bockhanger Farm, Kent, 19/20

- Peas and oats
- Lentils and oats
- Beans and oats
- Undersowing with microclover

Beans and Oats, 50 plants m2: Alternating rows

As above: Alternating 6m strips

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Beans and oats 2019/20

Peas and oats 2019/20


MAROT
MAROT

Triticale and Carlin peas, Greenacres Farm, Shropshire

Motivations: Scaffolding for peas; pea quality; weed suppression and harvestability

Establishment: 1ha, 12m strips

Drilled 25th April 2018 in 2 passes

Peas 250kg/ha	Peas 250 Trit 5% RD (12.5kg/ha)	Peas 250 Trit 10% RD (25kg/ha)	Peas Trit 20% RD (50kg/ha)	Peas Trit 30% RD (75kg/ha)

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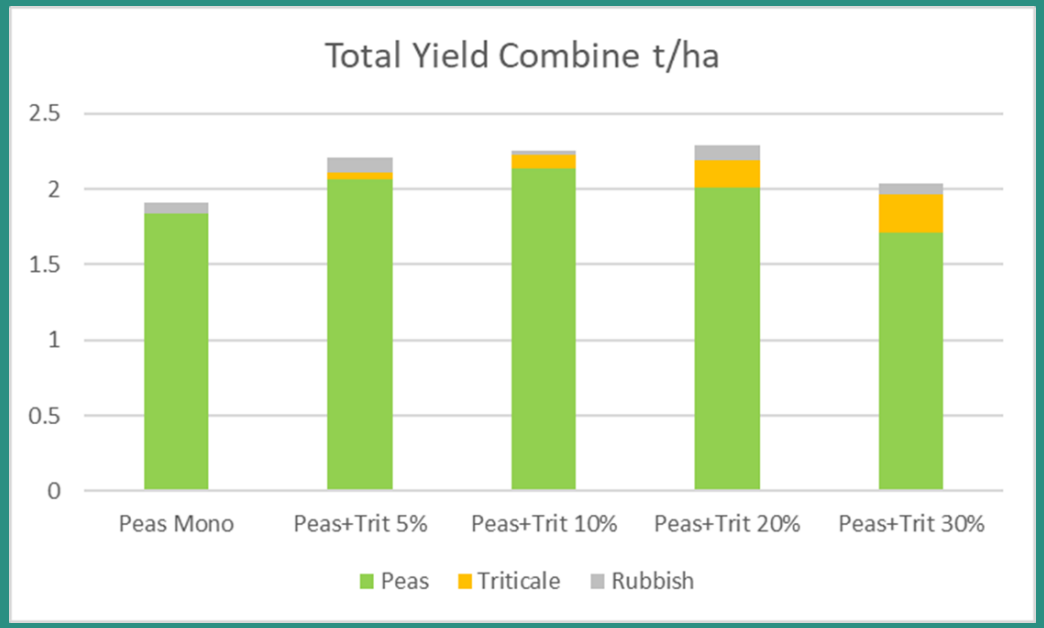
Triticale and Carlin peas, Greenacres Farm, Shropshire

Results



30% RD triticale

- Best harvestability in 30% RD treatment (75kg/ha)
- Repeated in 2019 with triticale at 20 and 40% RD
  - Suffered low yields – 40% too high
  - Foot rot issue with increasing legume in rotation?

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Processing and use:
Separated with cleaner on farm. Carlin peas for Hodmedod's and Triticale for animal feed

- https://www.plant-teams.eu/watch
- Like DIVERSify page on Facebook and/or follow @PlantTeams on Twitter

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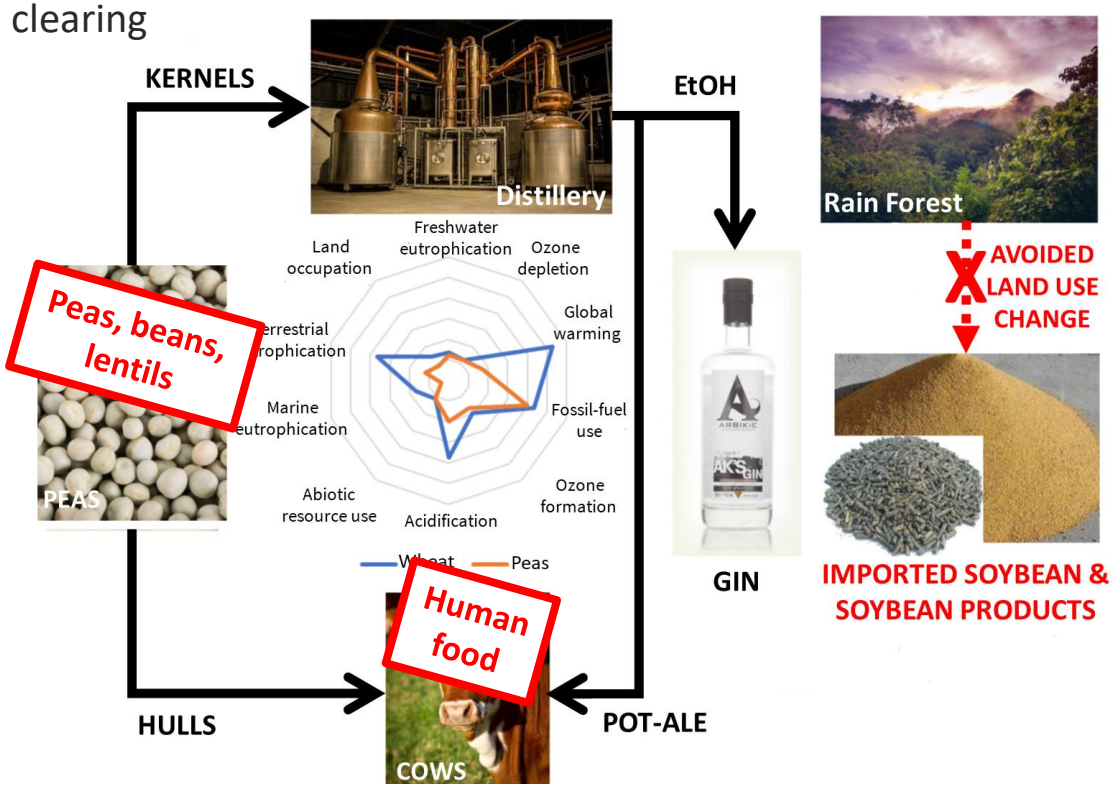
Intercropping and true cost accounting

Gin made from pea (starch)

- better than wheat-gin in 12/14 environmental impact categories
- 12% lower global warming potential
    - 2.2kg CO_2-eq avoided L^{-1} pea gin
    - due in part to avoided land clearing

www.bbc.co.uk/news/uk-scotland-tayside-central-51559180



Reported in:
Leinhardt *et al.*, (2019a), *Environment International*, 130; and,
Leinhardt *et al.*, (2019b), *Data in Brief*, 15.

For more info. email: pete.iannetta@hutton.ac.uk

Other popular products for intercrops & LCA

- "***LCA of diet***" approach is being developed and applied too, for:
  - beer & brewing co-product; and,
  - baked **faba**-beans.

CoolBeans™
- Registered under three product categories (with Hutton Ltd.) ;
  - beers,
  - neutral spirits; and,
  - agricultural services.

Brewers Spent Grains
- **Currently:** brewers pay for uplift (used for energy/AD).
- **Future:** barley-bean coproduct trialled as feed or food. Bean-beer LCA is underway.

Manuscripts for peer-reviewed publication are in preparation
For more info. email:
pete.iannetta@hutton.ac.uk

Over to you…

….questions, comments and ideas?

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Opportunities…

- **Scotland**
  - SEAMS – contact Rob to get involved rob.brooker@hutton.ac.uk
  - Innovative Farmers and Diversify project – ali.karley@hutton.ac.uk
- **East of England**
  - PGRO looking for farmers interested in intercropping with beans and other pulses (within 2 hours radius of Peterborough, Cambs) – contact roger@pgro.org
- **England and Wales**
  - Intercropping in Arable Systems Field Lab and Diversify project– contact charlotte.b@organicresearchcentre.com

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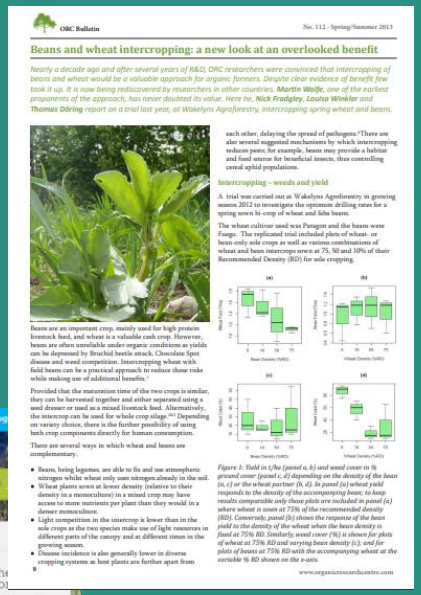
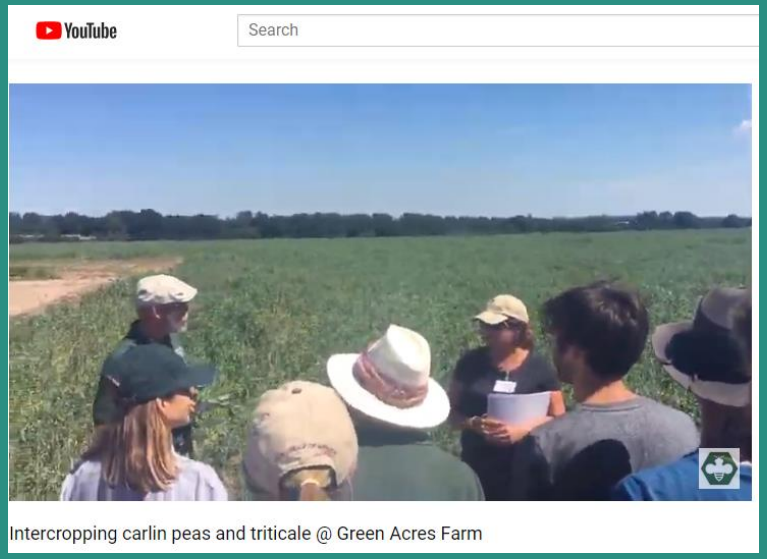
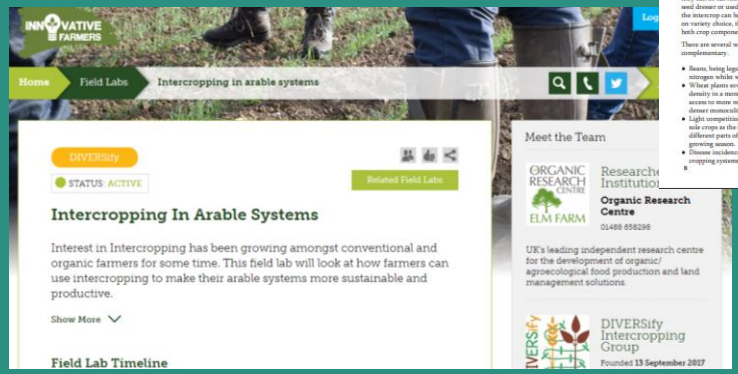
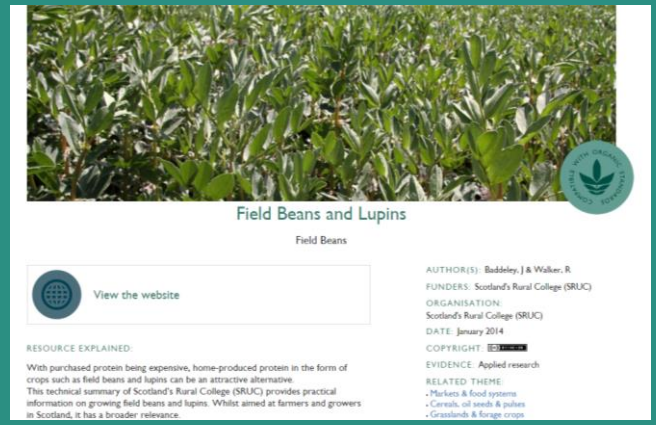
Find out more….www.agricology.co.uk @agricology and YouTube









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Thank you! ☺

Hope to see you soon

https://www.agricology.co.uk/join/events

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