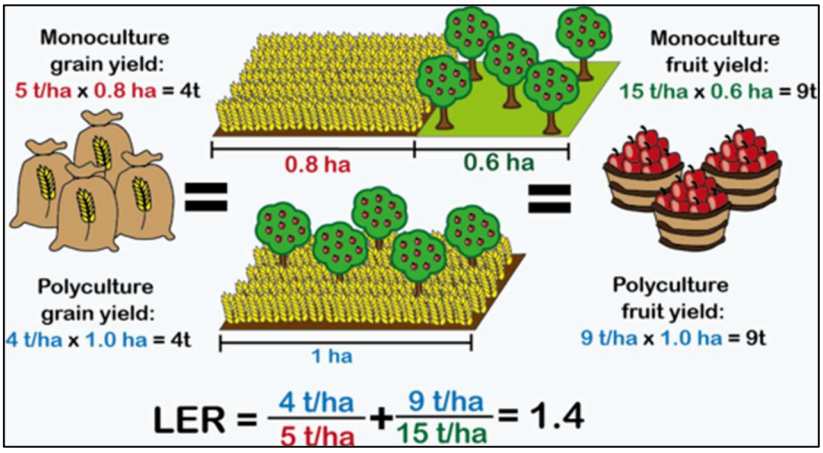
LEGUMINOSE Trial Results 2024

Background to the trial

The LEGUMINOSE trials were based around trial strips of the two control plots as well as one trial strip of the 2 crops as an intercrop. Seed rates, varieties and species were all under farmer control as were all fertiliser and agrochemical inputs. Crop yield and grain samples were taken at harvest as well as soil samples from all plots. There were 12 trial plots drilled although the wet spring and other issues with seed quality and harvesting issues resulted in 5 plots being used in crop analysis. There were losses of individual trial plots and where useful, analysis of remaining yields has been used in the final conclusions.



Crop yields were compared using Land Equivalent Ratios (LER) which is the ratio of the area under sole cropping to the area under intercropping needed to give equal amounts of yield at the same management level. It is the sum of the fractions of the intercropped yields divided by the sole-crop yields.

The example above shows that we would need 1.4 ha of land in monocrops to produce the same yield as I ha of intercropping.

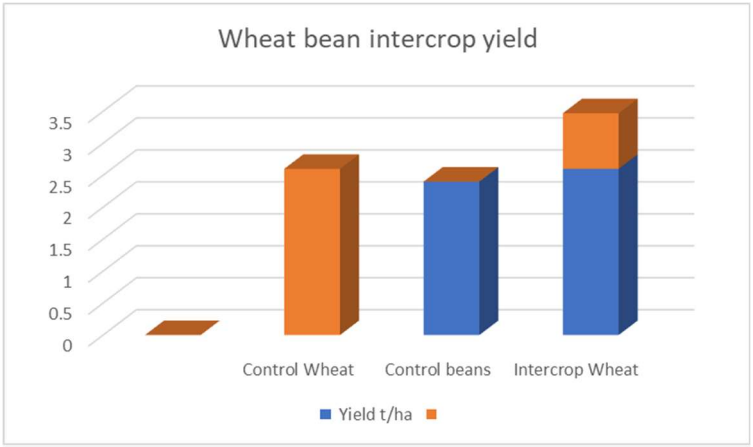
2024 Trial Yield results

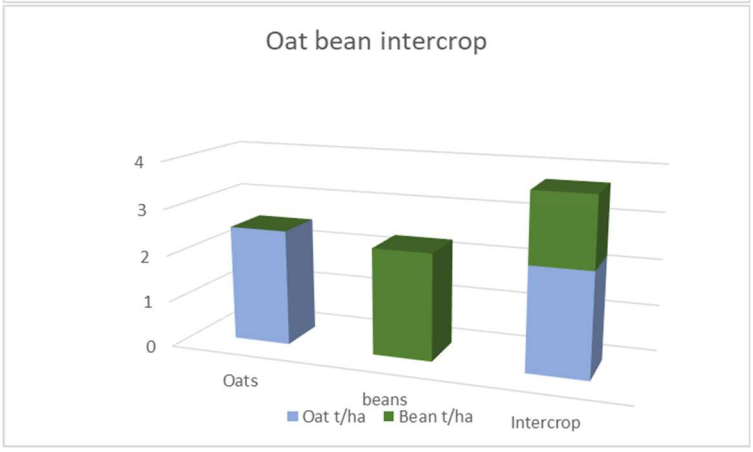
The results of the completed trials show the following outcomes:

	Plot	Plot yield	LER
Trial 1	Control Wheat	2.6	
	Control beans	2.4	
	Intercrop Wheat	3.5	1.43
Trial 2	Control Barley	5.2	
	Control peas	4.6	
	Intercrop Barley	5.6	1.15
Trial 3	Control Oats	2.5	
	Control beans	2.3	
	Intercrop	3.7	1.53

Conclusion on yield data

The LER calculations demonstrated that there is increased resilience from having intercrops and all crops produced more product per ha than if grown as monocrops. Although not organic, trial 1 suffered badly from yellow rust in the wheat. Despite not being treated, it still demonstrated benefits from intercropping.





Economic analysis

The economics were assessed by taking ex-farm crop prices available on 2/12/2024 without any premiums, penalties, charge for separation or any specific contract specifications.

			Sale value/ha	Average Increase crop sales	% increase
Trial 1	Control Wheat	2.6	462.80		
	Control beans	2.4	516.00		
	Intercrop	3.5	720.22	230.82	32.04
Trial 2	Control Barley	5.2	785.20		
	Control peas	4.6	1081.00		
	Intercrop	5.6	1550.80	617.69	39.83
Trial 3	Control Oats	2.5	377.50		
	Control beans	2.3	494.50		
	Intercrop	3.7	654.51	218.50	33.38

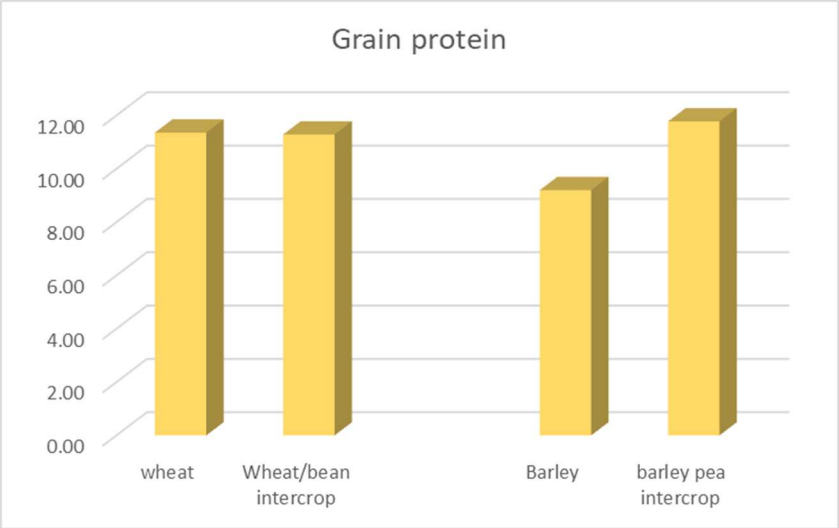
Conclusion on Economics

This demonstrates the potential of intercropping, particularly, as with trial1 where crops were affected by disease. When sold into premium markets, crop separation may be necessary and this will add a cost of £10-20/tonne. There are also extra growing costs when there is additional seed, and possibly an extra drill pass. There are also savings on spray and fertiliser costs which also need to be factored in.

The Increased returns from intercrops are higher when one of crops is a premium crop such as Peas (£235/t) when compared with beans (£215/tonne) with a LER increase of 0.15 but an economic increase of 40%.

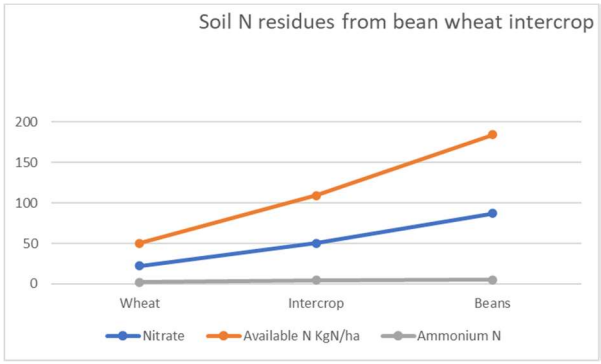
Grain Protein

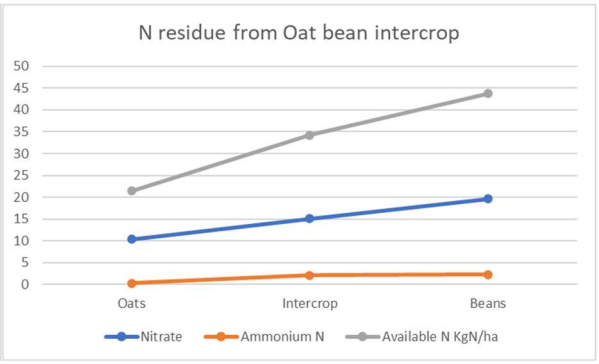
Following last years trials where intercropped wheat had higher grain protein than the monocrop wheat, we assessed wheat and barley. This year there was no increase in wheat protein although both samples were accepted for milling but there was an increase in the protein with the intercropped barley compared with the monocrop. This would have lifted the barley to a malting specification increasing price by £20 (although in 2023 the premium was over £70/tonne). We will continue to investigate this in future trials.



Soil Nitrogen

One reason for growing pulses is to provide Nitrogen for the following crops, particularly in organic systems. Soil N residues are an important potential benefit of Intercropping and soil samples from 2 sites were analysed to compare soil N levels in all 3 trial plots. The bean wheat plot did receive 60Kg Nitrogen fertiliser. A third site showed slight decreases in Soil N on the intercropped plot although this was associated with a much higher grain protein.





Conclusion

The results indicate that there is some correlation between soil N residues and pulse population despite the additional cereal. Even when grown In an intercrop, pulses will reduce the need for additional N in following crops.

Pest and predation

All samples of grain were also analysed for pest and also anecdotal evidence collected from other trialists. 2 trial sites were lost due to pigeon predation of pea seed or germinating plants soon after drilling although the intercrop plots did show higher levels of pea survival. One of the surviving intercrop plots later suffered from deer grazing which did seem to be targeting the pea plants.

Analysis of pea and bean samples showed reduced levels of pea moth larvae damage from 10% in monocrop to 5% in the intercrop plots.

Bruchid beetle damage was similarly reduced from 25% in the monocrop beans to 14% in the intercrop samples.

Overall conclusions

The intercrop trials, by comparing neighbouring plots allows a closer comparison that taking samples from different fields. As a result, we can more directly compare outcomes and see positive effects of intercropping. There are still questions about seed rates and the influence that different rates of pulses have on the partner cereal. We can demonstrate that both soil and grain N levels increase and also that intercrops do show reduced risk of pest damage and provide more resilience from both growing and economics. Although feed markets reduce the need for separation, the potential high premiums from higher specification cereals, or from high value niche crops which are at risk of predation or harder to harvest in pure stands, makes intercropping a realistic option.