What have we learnt from the Pea YEN so far?

Intro

Perhaps due to lower cropping area, resources for fundamental research of peas in the UK has lagged behind that of the major crops. This means that whilst we have fantastic agronomy guides from PGRO, some of the things we take for granted for the major crops such as crop development growth benchmarks don't exist for pulses. In 2016 an enthusiastic group of growers and industry sponsors, steered by ADAS and PGRO, stepped in to help bridge this gap for combining peas with a participatory network approach. The Yield Enhancement Network (YEN) framework of collecting in depth yield, crop physiology & nutrition, climate and agronomy data is well suited to understanding crop fundamentals. This was highlighted by the agreement of Oilseed YEN data analysis with the "conventionally" produced growth guide.

Whilst smaller than its sister projects, the Pea YEN has recently reached a data set of 104 combining pea yields in 2023. Methods for assessing crop metrics on farm were developed from 2016-18 and a standardised methodology since 2019 has led to five years worth of in depth crop data. The NCS project, led by PGRO, aims to unlock the greenhouse gas emission reduction potential of pulses for UK agriculture. This is through supporting the production and feeding of pulses to livestock, and has allowed us to take a deeper look than usual into the Pea YEN data. We aim to follow in the footsteps of the Bean YEN 2019-2021 analysis[1.] to do several things:

1) Investigate the data we have collected as a network of farmers, industry and scientists over the last 8 years to understand how the variation of the different crop metrics we have measured associates with yield. This will help us prioritise targets within our own on farm testing or as larger research projects.

2) Highlight where the Pea YEN has helped our understanding of UK pea crop growth and development so we can better manage our crops.

3) Compare and contrast information about pea crops from other climates and countries to sense check whether the learnings from international research are relevant to UK crops.

Notes on the analysis

The analysis used to investigate associations within the data set was a REML approach. This type of statistical analysis lets us partially account for some factors that might co-influence yield in the data set. We tried to account for cropping year, whether crops came from the same farm over several years as well as variety or type where possible.

It's important to note that this analysis cannot determine true cause and effect though and that some of these associations would not continue forever (for example the positive association of achieving taller crops with yield will eventually tail off as lodging comes into play). To confidently state cause and effect we would need to set up direct treatment comparisons (see the section on the NCS project below).

The analysis is carried out on the variation within the network, so if the farms within the Pea YEN are generally not very varied for a particular factor (e.g if all farms are within the realms of best practice) this means the factor may not be highlighted as *statistically* significantly associated with yield. Therefore it's still important to follow the best practice in the PGRO agronomy guides even if that factor is not highlighted as statistically significant here. The association analysis is best at highlighting cropping factors that may be currently overlooked and so highlights avenues for future on-farm testing and research. It should also be noted that the ability of the analysis to resolve differences is often related to the size of the data set and so the number of pea crops is given for each metric. As a rule of thumb we are more confident in analysis results where we have more data.

Where data is numerical (e.g rate of fertiliser applied) the direction of any *statistically* significant association is highlighted in the tables below with arrows (↑ ↓). We've added in columns to show the average parameter value of the top and bottom 25% of yields. These averages don't try and account for year, variety, type or repeated farms in the same way the association analysis does. However, they may give an idea of the level of variation and could form the basis of benchmarks in the future. Data collection has evolved in the Pea YEN over time as the capture of certain types of data has come in and out of focus. The years where the data were available from are included in the tables.

Where data is categorical (e.g manure type used) the predicted mean yield for each category is given and if this is *statistically* significant in the yield analysis the row is shown in bold.

Analysis is across varieties and so associations may be related to both genotype, environmental and agronomic conditions. This means we may describe certain "ideotype" crops which are mixtures of characteristics caused by genotype, management and environmental conditions.

Site & season

Whilst it isn't possible to swap a site's characteristics or the weather we experience within a given season, reviewing these influences on crop growth can help us consider mitigation methods to better deal with imperfect situations.

Weather conditions over the last several years of the Pea YEN have been extreme and sometimes opposing from year to year. The vast majority of Pea YEN crops are from the east of England and so the lower range of locations compared to other YENs may provide less variation between crops within given years. The results of the analysis of monthly rainfall (mm), solar radiation (MJ/m2) and temperature (°C) of 87 crops from 2018 to 2023 is below. Generally, the analysis points to warmer winters and cooler and wetter summers being associated with higher combining pea yields.

Table 1. Weather factors.

Month	Rainfall	Solar radiation	Temperature
September			
October			
November			
December			↑
January			
February			
March			
April			
May			
June	↑	↓	↓
July			
August			

Contrary to expectations, solar radiation in June was negatively associated with yield, however, this likely also co-associated with higher temperatures impacting yield.

Factors linked to the site are found in Table 2. There was no association of yield with location within the Pea YEN data set, but this could be due to the relatively limited spread within the combining pea network. Soil texture was associated with yield, however, with sandier soils yielding less than silty soils, suggesting that water availability may be a limiting factor between sites. Generally, Pea YEN crops had high levels of SOM, again perhaps due to many being located in places like the Cambridgeshire Fens or the types of rotations the entrants have.

Table 2. Site factors. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Crop parameter	Years data present	Number of pea crops analysed	Direction of association with yield	Lower group	Higher group
Latitude (northerly)	2017-2023	103		52.48	52.64
Longitude (westerly)	2017-2023	103		0.001	-0.089
Soil clay content (%)	2020-2023	48		27.1	20.2
Soil sand content	2020-2023	48	↓	42.7	27.7
Soil silt content	2020-2023	48	↑	30.2	52.1
Estimated topsoil stone content (%)	2019-2023	83		7.6	6.2
SOM LOI	2020-2023	50		6.5	6.6
Soil depth to rock	2019-2023	74		0.91	1.05

Relevance to..

Farmers

Whilst there is not much you can do about site, factors are highlighted that could be offset by long term management. For example maintenance of good soil structure may help with soil conditions and thus soil drainage and water retention. There could be other short term practices to aid conserving/ maximizing water uptake in crops such as:

- Encouraging deep rooting by....
- Early cultivations and timely drilling
- Following good establishment guidelines - sowing into moisture, good seed to soil contact and good soil structure.

And the broader scientific understanding & industry

Reinforces the likely water limitation of peas in UK conditions and highlights that climate change impacts of hot summers, especially June, could lead to reduced yields.

Establishment decisions

The vast majority of pea crops followed wheat and so it is difficult to carry out any analysis to investigate the impact of previous crops on pea crop yield. The impact of some other establishment choices on yield are discussed below, however. Generally, most pea crops in the network followed the advice of at least a 5 year break between pulse crops, meaning it is difficult to investigate the impact of shortening this. There was a wider spread of data for longer rotational breaks but there seemed to be no obvious benefit to increasing this above 5 years (Table 3).

Table 3. Length of rotational break between pulses.

Years since last pulse crop	**Less than 5**	**5 or 6**	**between 7 and 10**	**between 10 and 20**	**More than 20**	**Never**	**unknown**
Number of crops analysed	5	14	18	22	8	5	32
Predicted mean yield	3.5	3.3	3.1	3.6	4.5	3.2	3.7

Varieties of combining peas are well known to differ in their yield potential and this is often offset by the different end markets of the variety types though. In terms of yield Large Blues were higher than Marrowfats and Whites (Table 4.). Within the data set Maple varieties averaged the highest yields, but they are the least represented variety type and therefore have the lowest level of confidence within the analysis.

Table 4. Variety type.

Variety type	**Large Blue**	**Maple**	**Marrowfat**	**White**
Number of crops analysed	49	5	41	9
Predicted mean yield	**4.06**	**4.20**	**3.22**	**3.68**

Sowing rate expressed as seeds/m^2 has only been collected since 2023 and so the data set size remains small. Within the Pea YEN the average seed rate for marrowfats was 79 and the average for other variety types was 85. The low data set size means that it was not possible to carry out a separate analysis for marrowfats and other variety types which have different target plant population target rates. PGRO has done much work on optimum plant populations however and so good guidance is available in the PGRO agronomy guide. No association was seen between final yield and drill row width (Table 5).

Table 5. Seed rate and drill row width. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Factor or parameter	Years where data was present	Number of pea crops analysed	Direction of association with yield	Lower group	Higher group
Sowing rate (m2)	2020-2023	34		81	87
Drill row width	2019-2023	74		13.81	13.3

The majority of pea crops within the network were established using plough based cultivation methods. There was a significant difference in yield between different cultivation methods within the network with deep non-inversion yielding the highest on average (Table 5). Direct drilling and min shallow tillage were the lowest, although the number of crops established with these approaches were low. It’s also unknown for how long these cropping systems have been under these management conditions and how this may affect yield, i.e it is often considered that a yield reduction may occur after a switch to a low till strategy but that this may recover over time.

Table 5. Cultivation category.

Cultivation strategy	Deep non inversion	Direct Drill	Min shallow tillage	Plough based	unknown
Number of crops analysed	16	7	3	52	26
Predicted mean yield	**4.36**	**2.80**	**2.99**	**3.79**	**3.62**

Manure frequency was significantly associated with higher yields, with crops that received manure regularly in the rotation yielding the most, followed by infrequent manuring and unknown. Crops with no history of manure use yielded the least (Table 6). Manure use as a yes or no answer reflected this association, with crops that have received manure in the rotation yielding more than those that did not (Table 7.). There was no significant association of removing or incorporating previous crop residues in the data set, or whether cover crops have been used since the last cash crop. The cover crop data has only been collected since 2021 in this way and so the data set size remains small.

Table 6. Manure frequency.

Manuring frequency	Infrequent	regularly	No history	unknown
Number of crops analysed	23	19	27	34
Predicted mean yield	**3.72**	**4.45**	**3.25**	**3.74**

Table 7. Other establishment choices.

Establishment decision		**yes**	**no**	**unknown**
Was previous crop residue removed?	Number of crops analysed	24	24	36
	Predicted mean yield	3.80	3.38	3.98
Cover crops used since last cash crop?	Number of crops analysed	12	34	2
	Predicted mean yield	3.23	3.36	2.97
Manure use in rotation	**Number of crops analysed**	**42**	**29**	**32**
	Predicted mean yield	**4.03**	**3.28**	**3.65**

Relevance to..

Farmers

Most farmers within the network followed similar plough based cultivation strategies following a winter cereal crop with a good rotational break. More data needs to be collected on the impact of different sowing rates and use of cover crops, but a strong factor highlighted by the analysis was the use of organic materials within the rotation. The PGRO agronomy guide is the best source of information for establishment choices and seed rates etc.

And the broader scientific understanding & industry

Understanding what drives the association between organic matter use in the rotation (e.g nutrient availability, soil structure and water retention) and pea crop yield is of interest, as would be understanding the impact of different cultivation strategies over time on yield.

Crop development

One of the most beneficial aspects of the Pea YEN data collection is the data on crop development from many different fields and farms in different years. This helps to paint a picture of the average crop, although it should be noted that the majority of data is collected from the East of England. Sowing date may have been constrained to the 1st April in the earlier years of the Pea YEN due to the restrictions on the use of then available seed treatments. Generally however, we see negative associations of crop yield with sowing date, date of emergence, the start of flowering and the date of senescence. In other words, crops that are sown and reach these growth stages earlier in the season tend to be associated with higher yields (Table 8 and Figure 1.).

Table 8. Crop development. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Parameter	Years data present	Number of crops analysed	Association with yield	Lower group	Higher group
Sowing date	2019-2023	81	↓	04 April	29 March
Date of emergence	2019-2023	44	↓	28 April	20 April
Date of nodulation	2019-2023	33		19 May	08 May
Date of start of flowering	2019-2023	45	↓	15 June	22 May
Date of end flowering	2019-2023	37		06 July	29 June
Date of senescence	2019-2023	38	↓	24 July	18 July
Date of harvest	2019-2023	69		07 August	05 August
Length of foundation	2019-2023	33		38	44
Length of construction	2019-2023	31		32	28
Length of flowering	2019-2023	34		24	24
Length of production	2019-2023	42		53	69
Length of growing season	2019-2023	68		127	130

The size of the data sets for length of growing periods is smaller than for each individual growth stage as not every crop had every growth stage recorded. Rather than extending the length of the growing season as we have seen in beans in recent analyses, it seems that the earliness of growth stages has the strongest association with increased yield, perhaps linked to critical periods of flowering coinciding with higher and more stressful temperatures in lower yielding crops.

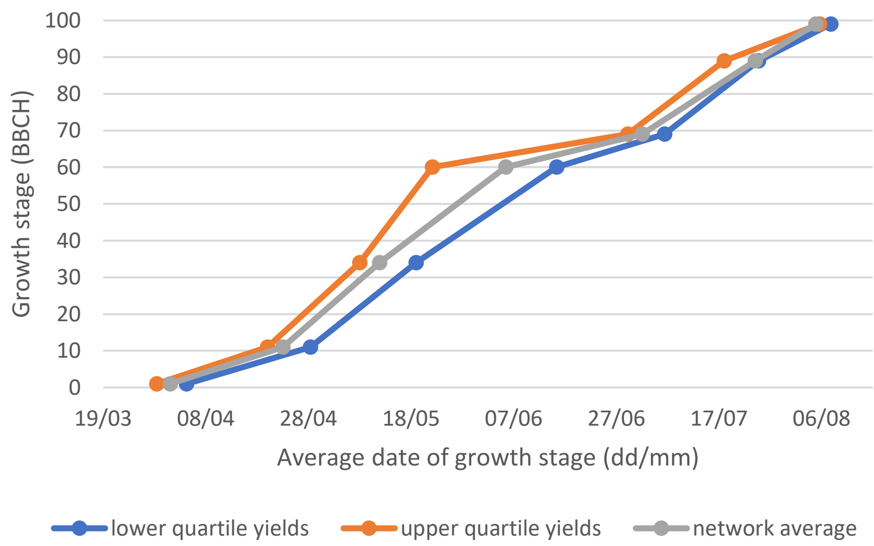

Figure 1. Average date of key growth stages of Pea YEN crops. Lower and upper quartile yields = the average dates of key growth stages for the lower and higher yielding 25% of crops respectively.

Relevance to..

Farmers

This information may help more experienced pea growing farmers understand whether crop development is being impacted by conditions of the current year. It may also help farmers new to growing peas to estimate timing for field walks to monitor crops and key application timings.

Higher yields seem to be associated with earlier drilled crops, perhaps due to the avoidance of stressful conditions at key growth stages. Whilst actual drilling windows are often dependent on the weather, practices that may lend themselves to widening this window such as resilient and well drained soils to aid travelling could help.

And the broader scientific understanding & industry

The dates of these key growth stages are useful for sense checking growth models and considering the impact and mitigation of disruptive sowing conditions on pea productivity. Also, monitoring growth stages over time can aid in understanding the impact of a changing climate on development and can inform needed changes in genetics and best practices on farm.

Crop nutrition

Generally, Pea YEN growers are within target soil nutrient concentrations for P, K and Mg as well as pH as according to RB209 suggesting that the majority are following best practice (Table 9.). This may mean that the variation in the data set isn't picking up on associations due to large differences here. There were no associations between yield and the amount of inorganic fertiliser applied, however, it could be possible that some crops are having fertiliser applied at other stages of the rotation rather than before the pea crop.

Table 9. Soil and inorganic nutrient applications. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Parameter	Years data present	Number of crops analysed	Association with yield	Lower group	Higher group
K2O application	2019-2023	60		26.0	26.6
P205 application	2019-2023	59		17.9	23.6
SO3 application	2019-2023	56		6.3	13.6
Soil K concentration	2019, 20, 22, 23	55		207	180
Soil P concentration	2019-2023	68		27.3	27.3
Soil Mg concentration	2019, 20, 22, 23	56		95	106
Soil pH	2019-2023	68		7.6	7.7

The full results of the association of yield with seed nutrient concentration and offtake are not covered here as this is best considered alongside the information from crops available through YEN nutrition. Generally, yields were not associated with seed nutrient concentration, but were associated with total content (or offtake) (Table 10). Across the network lifetime, a subsection of the straw and pod walls from crop grab samples have been analysed for N content. This has allowed above ground N content and nitrogen harvest index to be calculated. Grain and straw & pod wall nitrogen concentration remains relatively independent of final yield, but total N offtake from both the grain and straw & pod walls were associated with yield. This highlights that higher yielding pea crops likely need to acquire more N throughout their development (through N fixation and/or direct N uptake). It could also mean that higher yielding pea crops could return more N to rotational systems from incorporating above ground crop residue. The contribution of biologically fixed N to this likely depends on the ratio of N fixation to direct N uptake in the pea crop as well as N turnover dynamics between the pea and following crop.

Table 10. Crop nitrogen content. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Parameter	Years data present	Number of crops analysed	Association with yield	Lower group	Higher group
Grain N	2017-2023	90		4.11	4.26
Grain N offtake	2017-2023	90	↑	85	185
N concentration in straw and chaff	2020-2022	44		1.05	1.05
N content in straw and chaff	2020-2022	38	↑	31.2	47.5
Nitrogen harvest index	2020-2022	38	↑	0.7	0.8

The Pea YEN has collected leaf tissue nutrition data at several growth stages. It is unclear how the start of flowering leaf tissue data is affected by remedial foliar nutrient sprays and so this is not shown here. Generally there were no associations with leaf nutrition at GS34 (nodulation) with yield apart from N content, which was positively associated with yield (Table 11). It would be interesting to understand whether this association is an indicator of early nodulation success in crops.

Table 11. Leaf nutrition at GS34. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Parameter	Years data present	Number of crops analysed	Association with yield	Lower group	Higher group
GS34 Leaf B	2019-2023	66		14.6	12.8
GS34 Leaf Ca	2019-2023	66		0.94	1.03
GS34 Leaf Cu	2019-2023	66		12.7	18.2
GS34 Leaf Fe	2019-2023	66		118.3	127.1
GS34 Leaf K	2019-2023	66		2.8	2.9
GS34 Leaf Mg	2019-2023	66		0.20	0.20
GS34 Leaf Mn	2019-2023	66		38.2	26.2
GS34 Leaf Mo	2019-2023	66		11.2	10.9
GS34 Leaf N	2019-2022	58	↑	5.04	5.68
GS34 Leaf P	2019-2023	66	↑	0.47	0.59

GS34 Leaf Zn	2019-2023	66		84.5	112.7

Relevance to..

Farmers

Farmers within the network are likely performing good practice for maintaining soil nutrient indices. Associations between yield and above ground N offtake suggest that healthy N fixation is important for pea crops to achieve higher yields.

And the broader scientific understanding & industry

Crop nutrient offtakes could contribute to refining nutrient balances for crop rotations. The relationship between GS34 leaf nutrition and nodulation success would be interesting further research, and understanding how pea yield and N provision to the following crop relate could help refine the use of N within crop rotations.

Ag-chems and pests & diseases

When discussing ag-chem applications it's important to once again highlight that the analysis carried out is an association analysis rather than directly looking at cause and effect. It could therefore be possible that farmers within the network were willing to apply more inputs to well developing crops. Higher yielding crops were associated with more insecticide and herbicide applications, and generally Pea YEN entrants applied between 1 and 2 fungicides. Generally, indexes of the pathogens responsible for the foot rot complex were low within the network suggesting that farmers are maintaining good practice in reducing foot rot risk. There was a significant negative association with Didymella index and yield however.

Table 12. Crop protection inputs & foot rot risk. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Parameter	Years data present	Number of crops analysed	Association with yield	Lower group	Higher group
Number of fungicide applications	2019-2023	68		1.4	1.5
Fungicide spend (£/ha)	2019-2023	41		26.1	20.1
Number of herbicide applications	2019-2023	68	↑	1.6	2.3
Number of insecticide applications	2019-2023	67	↑	1.8	2.3
Total crop protection spend (£/ha)	2019-2022	31		127	181
Aphanomyces Index	2020-2023	49		0.44	0.18
Didymella Index	2020-2023	49	↓	0.05	0.01
Fusarium index	2020-2023	49		0.28	0.14

Out of the 38 growers who responded to whether pod stick was used at harvest 7 responded yes. There was no significant difference in yield between the two groups (Table 13.), although the conditions preceding harvest for these different crops wasn't accounted for.

Table 13 pod stick.

Podstick used at harvest	yes	no
Number of crops analysed	7	31
Predicted mean yield	3.88	3.88

Crop physiology

Seed set and the final number of seeds per m^2 of the crop are strongly associated with final yields in peas (Lake et al., 2021). Much of this work on understanding the physiology of pea crops and what aspects of crop growth and development limit yield are taken from studies carried out in different countries and climates, ranging from Europe, South America and Australia over a number of years. The Pea YEN data is valuable in sense checking whether we can extend these findings to modern UK crops. Understanding crop physiological components is important for understanding what has limited yields and in turn allows us to make changes to practice to try and overcome these limitations.

We recognize that there are inherent differences in crop physiology between the pea variety types, especially the more robustly structured but often lower yielding marrowfat type compared to large blues, maples and whites. We've carried out the yield component analyses below on a split data set into marrowfats and large blues to be sure of the findings.

Within the different variety types yield was indeed positively associated with seeds per m^2 at harvest (a measure of seed set). There was no association with the number of shoots per plant, so it seems as though the higher number of seeds set in higher yielding crops arose from taller and higher biomass plants with more pods per shoot rather than more branching per plant. The number of data points for plants and shoots per m^2 remains quite low and so needs further work to build understanding. Interestingly, yield was also associated with TSW (a measure of seed filling), suggesting that the ability to fill the seeds set differed between crops in the network (Table 14 & 15).

Table 14. Crop Physiology - Marrowfat pea types. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Factor or parameter	Years where data was present	Number of pea crops analysed	Direction of association with yield	Lower group	Higher group
TSW	2019-2023	31	↑	349	394
Crop height	2019-2023	22	↑	56	92
Shoots per plant	2019-2023	28	↓	1.04	1.03
Harvest index	2019-2023	29		47	50
Plants per m2	2020-2023	19		77	72
Pods per shoot	2019-2023	28	↑	7.0	8.9
Seed set (seeds/m2)	2019-2023	31	↑	474	1157
Seeds per pod	2019-2023	28		2.5	2.7
Shoots per m2	2020-2023	16		78	75
Straw DM yield	2019-2023	29	↑	2.9	5.7
Total shoot biomass	2019-2023	29	↑	4.4	9.6

Table 15. Crop Physiology - Large blues. Lower group = mean of the lower yielding 25% of crops. Higher group = mean of the higher yielding 25% of crops.

Factor or parameter	Years where data was present	Number of pea crops analysed	Direction of association with yield	Lower group	Higher group
TSW	2019-2023	42	↑	264	266
Crop height	2019-2023	30	↑	60	86
Shoots per plant	2019-2023	39		1.04	1.03
Harvest index	2019-2023	39	↑	0.56	0.56
Plants per m2	2020-2023	22		75	88
Pods per shoot	2019-2023	39	↑	7.9	9.0
Seed set (seeds/m2)	2019-2023	42	↑	1400	1943
Seeds per pod	2019-2023	39		3.9	4.0
Shoots per m2	2020-2023	22		74	93
Straw DM yield	2019-2023	39	↑	3.38	4.48
Total shoot biomass	2019-2023	39	↑	6.45	8.85

The period between the start of flowering and start of seed filling is defined as the critical period for field peas (Lake et al., 2021). Seed number is determined between flowering and seed filling in field pea crops, although it should be noted that there can be considerable overlap between the stages of growth along the stem which can widen the period of time that seed number is determined for the whole plant. Water stress and high temperatures at the start of pod development can limit the final number of seeds per pod. Water deficit can lead to the abortion of flowers and seed embryos too (Lake et al., 2021). When considered alongside both the association of weather conditions and crop development timing with yield, the Pea YEN physiology data supports that summer conditions are likely large drivers in final yields for UK pea crops too through the impact on seed set and filling.

Relevance to..

Farmers

Pea crop yields are likely limited by the number of seeds they set. The critical period for determining this within the pea plant is around flowering, so setting the crop up to be robust, supplied with N from the nodules and deep rooted before flowering is important. Earlier developing crops may also avoid hotter temperatures at this critical period. Developing benchmarks for crop physiology and particularly seed set success as in oilseed rape could help monitor success. Similar to oilseed rape, the ability to fill the seeds sufficiently is likely to be important too.

And the broader scientific understanding & industry

The data from the Pea YEN supports evidence from other agro-climates that seed set is critical in UK pea crops. Research into maximizing seed setting potential and mitigating stress around the flowering period is likely to be beneficial to final pea yields.

Quality

Similar to crop physiological components, investigating the association of quality and final yield can tell us about the conditions that a crop may have faced approaching harvest. Admixture, waste and bleaching of seeds were all negatively associated with final yield (Table 16). This could suggest that there were difficulties at harvest (e.g admixture of stones etc within the sample could indicate that crops had to be harvested close to the ground), or increased waste (e.g split peas) could indicate higher harvest losses.

Table 16. Quality parameters – across variety and type.

Factor or parameter	Years where data was present	Number of pea crops analysed	Direction of association with yield
Admixture %	2017-2023	96	↓
Bleach %	2017-2023	96	↓
Insect damage %	2018-2023	74	
Stain %	2017-2023	94	
Waste %	2017-2023	96	↓
Cook score (1-5)	2019-2023	77	

The suitability of pea crops for end market use plays a large factor in final gross margin of a pea crop. The Pea YEN is unique in its history of market quality being measured by the same seed processor for the network's lifetime. This provides us with a unique opportunity to look at the impact of cropping factors on quality as well as yield. Counterintuitively, the proportion of bleached and stained peas in the seed samples were negatively associated with summer temperatures meaning these quality levels were better in years with warmer summers (Table 17). Moist conditions and subsequent drying could lead to pod walls becoming translucent allowing bleaching or this trend could potentially be a reflection of the timeliness of harvest rather than the direct impact of weather. Associations between lower seed set and seed fill with June temperatures support that June (flowering for most crops) is a critical period for seed development.

Table 17. Summer temperatures, quality and seed development.

Factor or parameter	Number of pea crops analysed	Association with May temperature	Association with June temperature	Association with July temperature	Association with August temperature
Admixture %	80				
Bleach %	76		↓	↓	
Insect damage %	68			↑	
Stain %	79			↓	↓
Waste %	80				
Cook	77		↑		
Seeds set per m2	83		↓		
Seed TSW	83		↓		

Relevance to...

Farmers

Final yield and quality are linked, although the mechanism behind this relationship is unclear. However, success and timeliness of harvest is likely to influence both yield and quality and therefore have combined impact on gross margin if quality parameters are being targeted.

And the broader scientific understanding & industry

The relationship between weather conditions (and therefore potential climate change effects), yield and quality are not straight forward e.g., drier summers may lead to reduced yield & wetter summers may lead to reduced quality.

What's next for the Pea YEN learning journey?

Continued data collection will allow the network to become more confident in the associations we see, and also look at more complex relationships between different parameters within the data set to help us learn and develop ideas for how on farm practice might influence them. As the network continues we will also try to continue investigating metrics in addition to yield, such as CO_2e, quality and profitability within rotations.

Data collection in the Pea YEN is part of the participatory network approach and further confidence and translation to on farm testing will help test the cause and effects of on farm choices and develop strategies to get to the type of crops we think will be most productive. The NCS project is an opportunity for pulse growers to get involved to run their own trials on their topics of interest and be supported financially and scientifically through the Pulse Pioneer initiative. The Pulse Pioneers are supported through the British On Farm Innovation Network (BOFIN). Get in touch with info@bofin.org.uk to find out more.

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