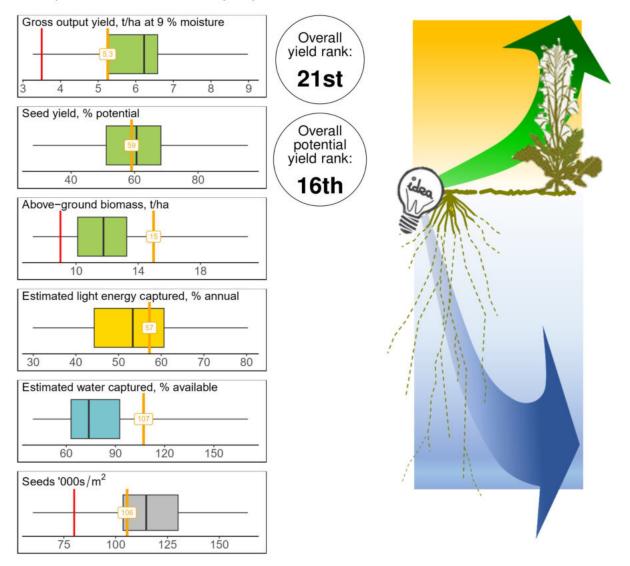


Entrant's Report

Harvest 2022



SUMMARY: YEN entries were completed from 40 oilseed crops this year of which 10 linseed entries are reported separately. Headline results for your entry are shown below. Your gross output of 5.3 t/ha ranked 21st. This represents 59% of its estimated yield potential of 8.9 t/ha.



CONTENTS

Our detailed analysis of your yield result is provided in the following pages, including comparisons with other YEN entries and with benchmarks taken from the AHDB Oilseed rape Guide and the AHDB Nutrient Management Guide (RB209). We hope that this helps you to identify aspects of your husbandry and growing conditions that offer possible routes to further yield enhancement.

Our approach in this report is to consider yield potentials and growing conditions for crops this season, then the conditions for and husbandry of your crop, its development, its basic resources (light energy, water and nutrients), its success in capturing these and in converting them to seed. Lastly, we use seed analysis to provide a post-mortem on your crop's limiting components and nutrition.

The benchmarking diagrams in this report only include the data set submitted by the YEN data submission deadline. Reports produced using data submitted after this deadline show an entrants value in comparison to this previously referenced data set.

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POTENTIAL YIELDS



"The YEN exists to help you to enhance your yields."

The key to high yields in YEN has been good crop growth. So the key to enhancing yields is to know what is limiting growth — solar radiation or water — and then to target improved green canopies or improved rooting accordingly.

To estimate potential yields we assume a theoretically 'perfect' oilseed rape crop grown with 'inspired' husbandry on your land with this season's weather, achieving either:

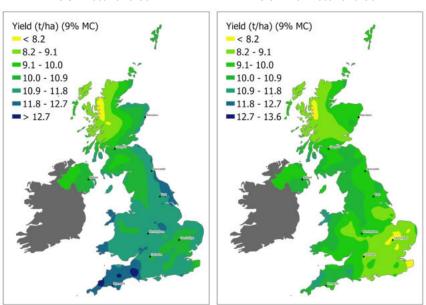
- (i) **80% capture of light energy** through the season, and its conversion to 1.4 tonnes of biomass per terajoule or seed biomass at 0.7 tonnes / terajoule of solar radiation OR
- (ii) Capture 100% of the available water held in the soil to 1.5 m depth (or less if to rock) plus all rainfall from March to July, and can convert each 18 mm into a tonne of plant biomass per hectare, or 26 mm into a tonne of seed biomass per hectare. Taking the lesser of these two biomass amounts we assume that a maximum of 45% of the total biomass can be used to form seed (this is the 'harvest index'). Our model of potential yield estimates potential growth on a daily basis; this identifies impacts of water limitation more precisely than the cruder monthly estimates we made in previous YEN reports. Note that we assume average temperatures for the UK, and no damage from waterlogging, frost, heat, or lodging.

The maps below show potential yields for soils with high and low available water-holding capacity (AWC) for this year. On low AWC soils, potential yields were often better in the west than in the east, which is primarily due to greater rainfall levels. Potential yields range from 8 to 9 t/ha in the majority of arable regions on low AWC soils. Whereas the majority of arable areas have a yield potential of 10 to 12 t/ha on high AWC soils.

Potential yields



OSR non retentive soil



We are using weather data from DTN[™] this year. Note we do not have long term met data from DTN so cannot show a map of long-term average yield potentials.

SEASONAL GROWING CONDITIONS

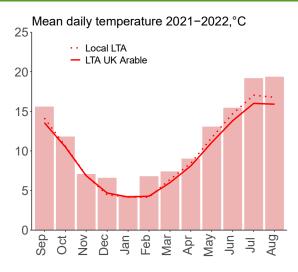
The adjacent graphs show the monthly temperatures, rainfall and solar radiation for your area in 2022 compared to your regional long-term average (LTA), and the average for all UK arable areas (1991-2020, from the Met Office).

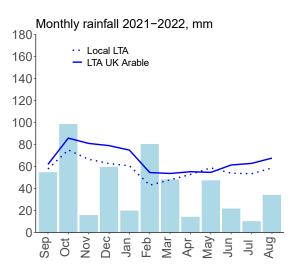
Oilseed Rape establishment in autumn 2021 was generally very good, and certainly much more successful than in 2018 or 2019! Adult Cabbage stem flea beetle (CSFB) levels were quite high in many places, but adequate soil moisture allowed establishing crops to grow away from any adult damage. The good drilling conditions and timely pre-emergence herbicide applications controlled most broad leaved weeds. Early drilled crops developed very forward canopies with some enormous crops entering winter, and these crops would have provided good competition against weeds.

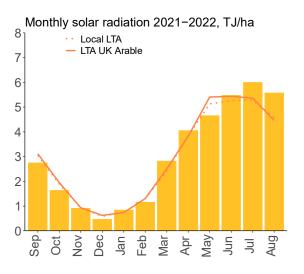
Analysis of historic weather patterns and OSR yields have revealed that high yielding seasons are associated with a warm October, dry December, warm minimum March temperatures, dry/sunny April and a wet/cool May. The 2021-22 season was characterised by a warm October, a dry December and winter, average March temperature, dry/sunny April and an average rainfall/warm May. The dry spring helped to restrict canopy growth which will have helped optimise canopy size at flowering for good seed set and reduce the risk of lodging. The sunny conditions in April will have helped crops to set many pods. Rainfall in May will have been particularly beneficial for crops suffering from the earlier dry spring conditions, but the dull conditions might have restricted the number of seeds set per pod. On the whole, conditions were conducive for setting high seed numbers.

Disease levels were low for phoma and sclerotinia and average for light leaf spot. Turnip Yellows Virus was present in quite a few crops. Severe verticillium infections did not occur, and any mealy cabbage aphid damage was unlikely to have yield impacts, except in very severe cases. Incidences of lodging were low.

The majority of seed filling took place in June which was i) sunnier than average - giving a high rate of photosynthesis helping seed filling and oil formation and ii) only slightly warmer than usual – which meant the period of seed filling wasn't shortened too much by high temperatures. Over the whole season, several factors have combined to enable OSR yields to be higher than average across the UK. In fact the provisional yield estimates of 3.7 t/ha for England (data for other regions not available yet) tell us that the 2022 yields were the 4th highest in England since 1999! It is likely that the high mid-late summer temperatures and lack of rain will have limited yield for some crops, so the yields could have been even greater!



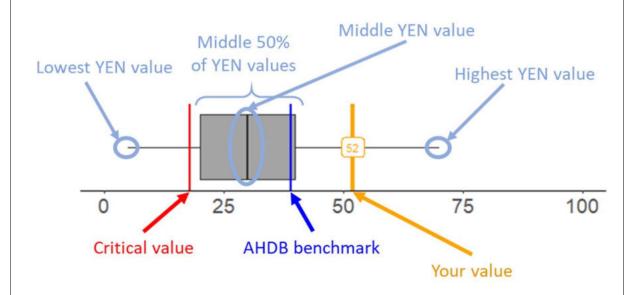




@ADAS2022

YEN Benchmarking charts – What do they mean?

YEN is much more than a competition – it provides a full set of metrics whereby you can gauge the performance of your crop against all other YEN crops. This has proved to provide the principal value of the YEN to most participants. We do this with benchmark-charts. These compare your value with everyone else's this year and with standard benchmarks and critical or "YEN-low" values, if available and appropriate. The key is as follows:



The 'whiskers' show the range of YEN values in this season and the box shows the middle half of YEN 2022 values, with a line for the mid-value. The orange line shows the value for this entry, and the red line is a limit beyond which yield may be adversely affected; crops with values beyond these merit further investigation. Blue dashed lines indicate benchmark values for a typical crop e.g from the AHDB's Growth Guides. Note that 'Dynamic Benchmarking' is available to all YEN members via the YEN website. This means you can compare your own yield or grain nutrient data with subsets of all other YEN crops selected by crop type, soil type, location or year back to 2013.

Soil description and nutrition analysis

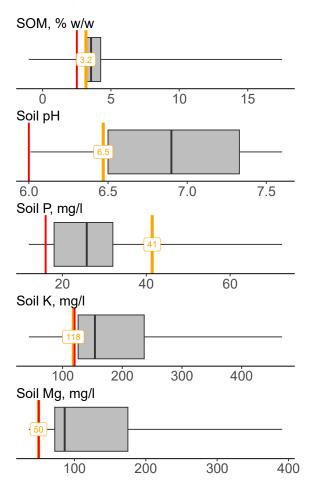


Your soil's capacity to hold available water is critical in determining your potential yields. We rely on entrants describing the soil where their YEN entry grew. We can use the UK Soil Observatory map viewer to check whether this complies with the surrounding land.

Good soil descriptions are vital in allowing us to estimate soil water holding capacity and, along with summer rainfall, the water available to your crop (see Benchmark charts in the section on 'Resources & their Capture').

Topsoil analyses provided by NRM also tell us about soil status for pH, P, K and Mg, as reported on the next page. A few sites show low values for soil pH, P, K or Mg. If these are unexpected, they may need further checks, either by repeating soil analysis and by checking both leaf and seed analyses later in this report. Previous YEN leaf and seed nutrient data have indicated that UK cereal crops often experience deficiencies in one or more nutrients, and sometimes this is despite soil levels being satisfactory. So, by combined use of soil, leaf and seed analysis, the YENs now help to diagnose whether nutrient shortfalls are arising from poor supply, or poor capture by the root system.

Soil analysis



SOM supports crop performance through better nutrient availability, soil aggregation, and water holding capacity. NRM determines SOM by 'loss on ignition'. Note: other methods can give lower values.

Soil pH <6 is acid. High pH soils may require that special attention is paid to phosphorus (P) and micro-nutrient levels in leaf and grain (see later).

Only a small difference separates P Index 0 (<=9) and 2 (>=16). High yields are possible at P index 1 but fresh P is also usually required. Use grain P to double-check if P was sufficient.

Soil potassium (K) analysis checks on whether K supplies are likely to have been deficient for average crops. However, high yielding crops require very large amounts of K.

Magnesiumis a key component of chlorophyll so deficient plants show inter-veinal yellowing. Temporary deficiencies often occur in dry conditions. Levels between 0-25 mg/l indicate a soil index of 0.

AGRONOMY

This section considers how your variety and husbandry decisions related to others entering the YEN this year. Analysis of Oilseed YEN data accumulated from 2017-2021 has shown that, although season has the largest effect on yields, the YEN is beginning to indicate husbandry practices that are associated with high yields.

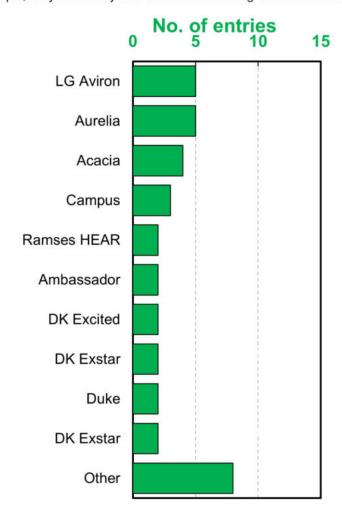
In summary, we are concluding that:

- i) Attention to detail is important:
- · seed rate is negatively associated with yield
- no. of PGR and fungicide applications are positively associated with yield
- ii) Other high yield associations include:
- Weather: dry, dull autumns and winters, bright springs and cool summers
- · High individual plant biomass with many seeds
- · Longer duration between the start of flowering and desiccation
- · Minimising nutrient deficiencies, with particular focus on P and Mg

Variety

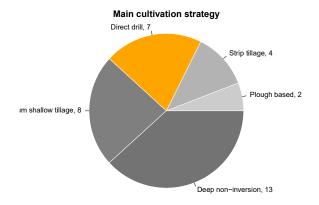
The most chosen varieties are compared in the figure below. There were at least 17 different varieties entered.

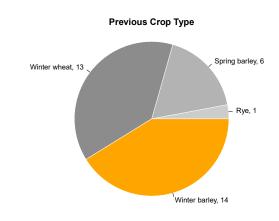
· Your variety was Duplo, a Hybrid variety with a medium flowering and medium maturity date.

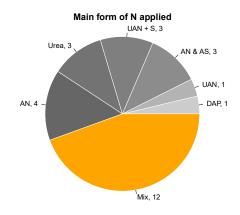


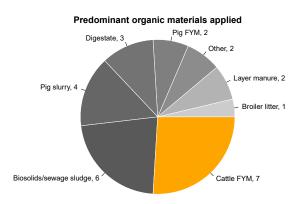
Husbandry

The following diagrams use orange segments or orange bars to indicate the agronomy of your crop, if known, so you can see how this relates to all other YEN entries.



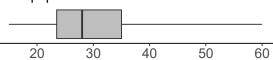


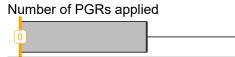




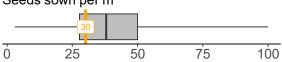
Husbandry factors continued

Plant population





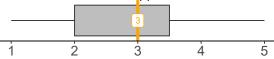
Seeds sown per m²





0.5

0.0

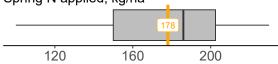


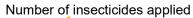
1.0

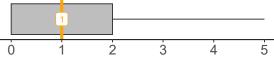
1.5

2.0

Spring N applied, kg/ha







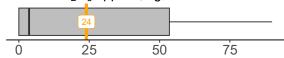
Number of N applications



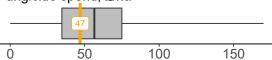
Number of fungicides applied



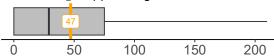
Fertiliser P₂O₅ applied, kg/ha



Fungicide spend, £/ha



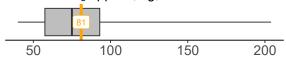
Fertiliser K₂O applied, kg/ha



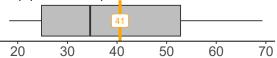
Crop protection spend, £/ha



Fertiliser SO₃ applied, kg/ha



Crop protection spend, £/tonne



CROP DEVELOPMENT

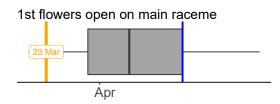
The following charts show how your entry developed through the season, compared to all other YEN entries and Benchmarks. The cardinal stages of emergence (GS10), start of stem extension (GS31), end of pod formation (GS79) and end of seed ripening (GS89) determine the length of each phase for growth:

- Foundation, GS10-GS31 leaf production and formation of main root axes
- Construction, GS31-GS79 stem extension, branching and pod formation
- Production, GS80-GS89 when seeds are filled with new assimilates

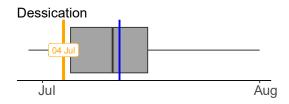
Sowing date: Winter

Aug Sep

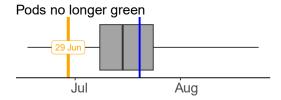
Sowing dates vary across the YEN, potentially due to CSFB avoidance strategies.



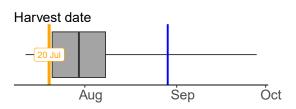
The blue line idicates the UK benchmark for the onset of flowering, 15th April. Duration and conditions at flowering are associated with the number of seeds set. It may be useful to compare this with the weather chart above.



The blue line idicates the UK benchmark for dessication, 12th July



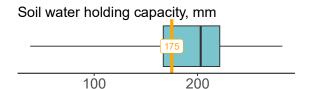
The blue line idicates the UK benchmark for pods no longer green, 20th July



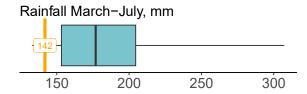
RESOURCES AND THEIR CAPTURE

Water capture

This page shows how weather this year affected the water available for your crop and other crops entered in the YEN. Water is supplied through the main growing period from concurrent rainfall and also from water stored in the soil. UK soils almost always refill with water over-winter. Water potentially available to each crop through the summer includes all this soil water plus the summer rainfall (March to July).

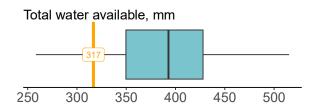


The soil water holding capacity described above assumes that crops could extract 100% of available water to a soil depth of 1.5 m (or to rock, if shallower). If sufficient roots didn't reach this depth, soil-available water would be accordingly less.

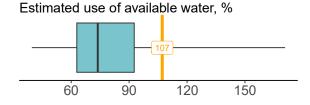


After winter drainage stops, spring and summer rainfall is held in the topsoil until it is evaporated or transpired by the crop's canopy.

Whilst we cannot yet measure water captured by YEN crops individually, by assuming your crop's conversion of water to total biomass was 'normal' (20 mm water for each t/ha biomass formed), we have made crude estimates below of the likely success of your crop's root system in capturing water. A high yielding crop, growing say 15 t/ha of biomass (so yielding 6 t/ha dry seed at 40% harvest index), would need to capture just over 300 mm water from soil plus rain in March - July.



Total water is the sum of your soil's water-holding capacity and your summer rainfall (both shown above).



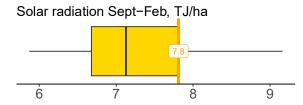
Small water use will sometimes have been due to less demand for canopy transpiration (e.g. because crop developed faster and matured earlier) or otherwise due to worse rooting.

If your estimated use of available water exceeds the total water available, this may be good news! It either suggests that your crop's roots were more efficient than normal, or that your soil description was overly pessimistic: i.e. your soil apparently managed to provide more water than we estimated was possible from your soil's texture, stone content and depth.

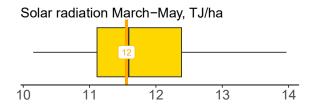
Energy capture

The benchmarking charts below show how the weather this year affected light energy available for this entry and other YEN crops. Solar radiation has been divided into periods that roughly equate to the three key phases of crop development reported above:

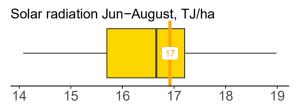
 Foundation – leaf production and formation of main root axes.



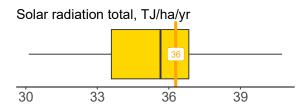
• Construction – stem extension, branching and pod formation,



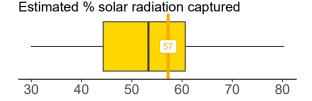
Production – when seeds are filled with new assimilates.



Whilst we cannot yet measure light capture by YEN crops individually, by assuming your crop's conversion of light energy was 'normal' (0.4 t/TJ up to the start of stem extension, 1.1 t/TJ between the start of stem extension and seed filling and 0.4 t/TJ during seed filling), we have made crude estimates below of the likely success of your crop's canopy in capturing light.



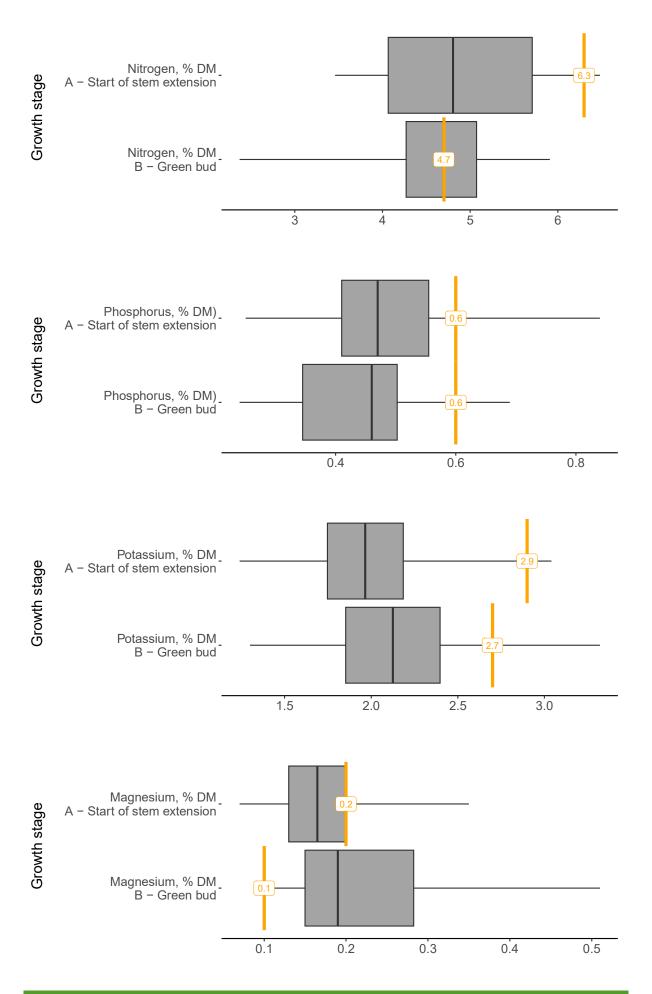
Total solar radiation across YEN entries is generally less in the north and more in the south.

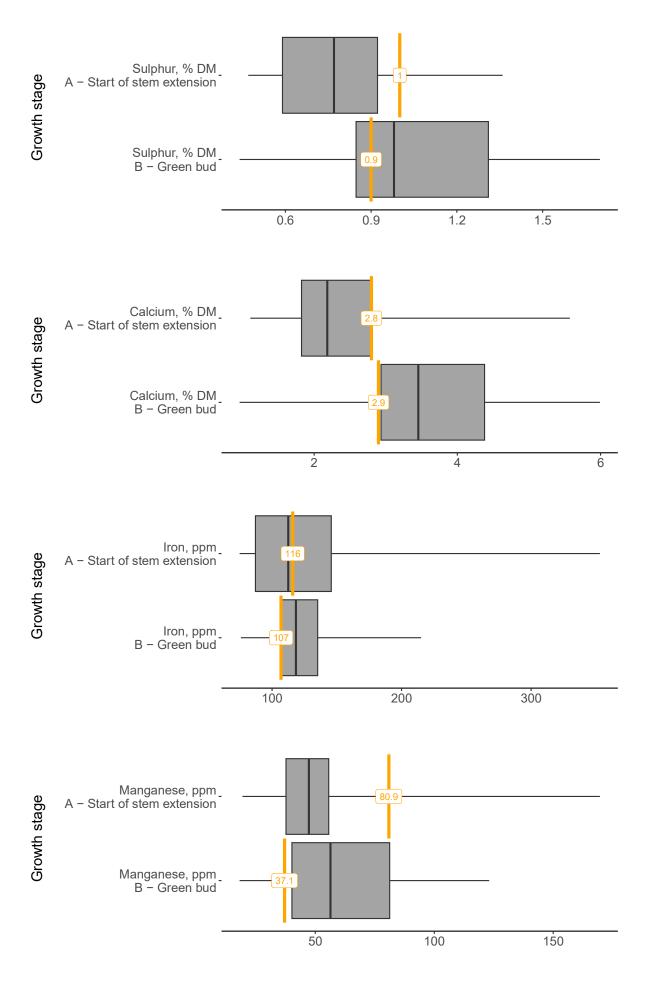


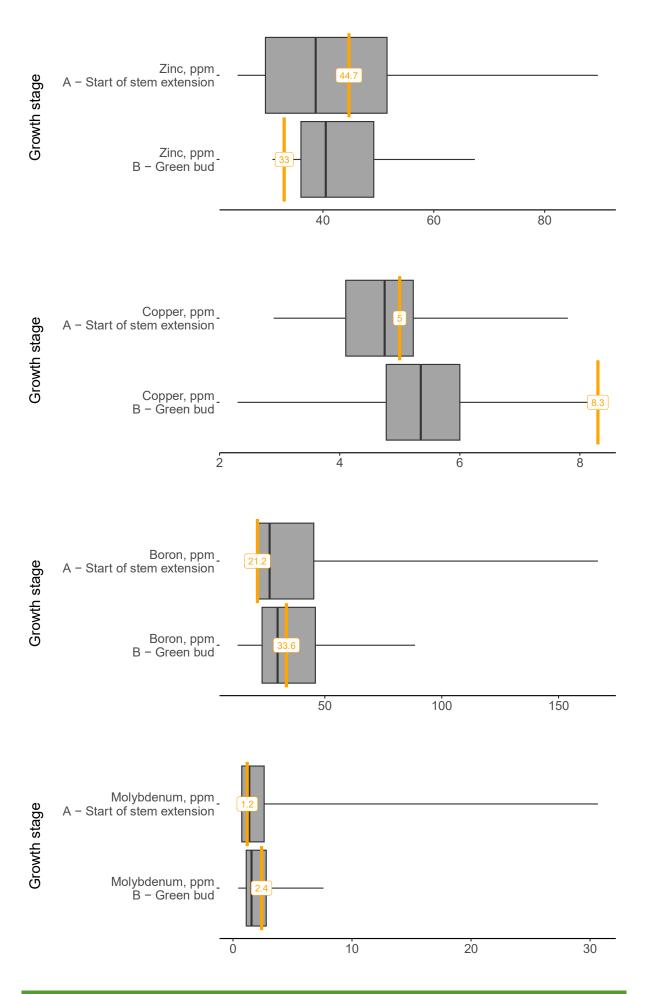
We estimate that the biophysical limit for annual light capture is 80%.

Nutrient capture

Whether nutrient capture was sufficient to support full conversion of light and water is best deduced from nutrient concentrations in crop tissues – both leaves (next three pages) and seeds (later section). No critical thresholds or benchmarks are shown for leaf analyses because these change through a crop's life and are still uncertain. However, the benchmarking diagrams should enable you to compare your crop's levels with all other YEN entries this year, analysed at the same time. Lancrop Laboratories provide leaf analyses for YEN. Samples are of the newest fully expanded leaf.







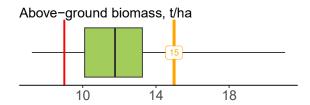
YIELD ANALYSIS

Yield formation

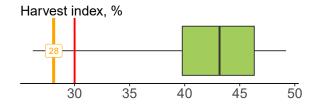
The graphs below show the yield components, and quality parameters for your crop, determined from the samples that you provided. These tell us about the history of your crop because the key yield components are determined sequentially. These 'components of yield' help to indicate the stage(s) through the season at which your crop deviated from normal (represented by the benchmark value).

- Seeds/m²: This is determined during a 2-3 week period starting from mid-late flowering. More seeds are set when the rate of canopy photosynthesis is high.
- Thousand seed weight: Seed filling depends mainly on photosynthesis after pod development and is therefore reliant on canopy health and longevity. Relatively few sugars stored in the stem from before flowering are relocated to the seed.
- Oil content: The majority of oil is accumulated during the second half of seed filling. Therefore, prolonged healthy canopy duration and greater rate of photosynthesis during this period are important for high oil content.

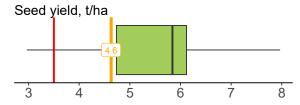
Your seed yield is converted to Gross output, accounting for oil content, and is expressed as t/ha and % of potential).



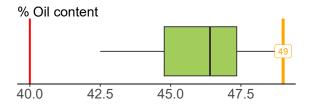
We have found that high yielding crops often have a high individual plant biomass.



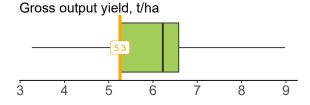
Harvest index is the percentage of total biomass that was harvestable as seed.



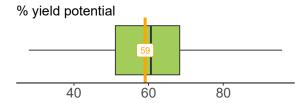
Yields below 3.3t/ha are less than the UK long-term average.



Most oil accumulates during the second half of seed filling.



Gross output figures, are calculated from the seed yield, with an adjustment to take account of oil content.

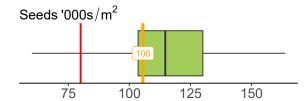


Seed number is a critical yield component. At least 100,000 seeds/m² are often required to achieve a yield of 5 t/ha. Photosynthesis during a 19–25-day

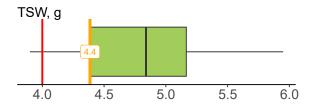
period after mid-flowering determines seed set

YEN yield potential reflects light energy and water

available at your site this year, expressed in t/ha.



Warmth, drought, disease or early desiccation all curtail the seed-filling period. Estimates suggest a yield reduction of 1–2% for each day of seed filling lost.

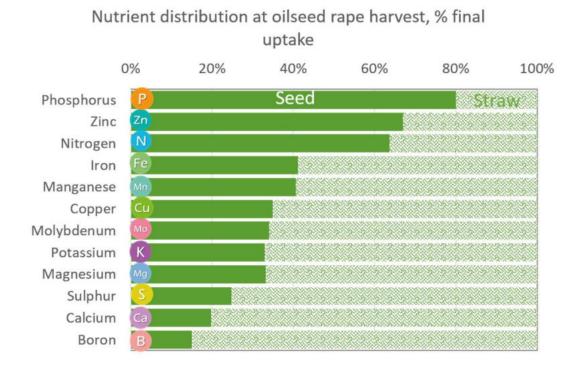


CROP NUTRITION POST-MORTEM

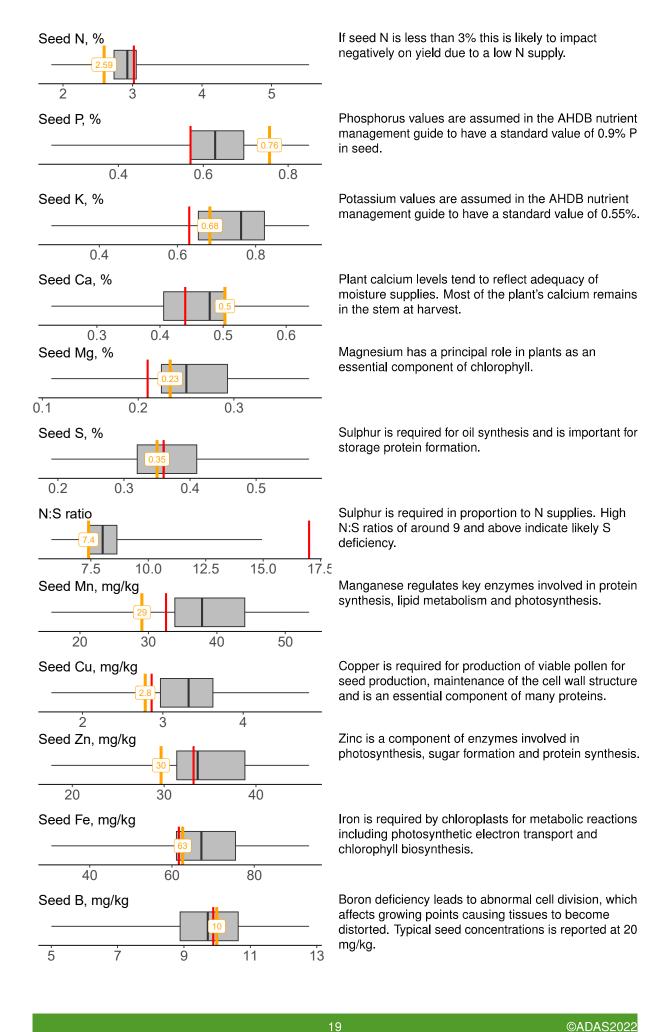
Seed Analyses

The YEN has trail-blazed use of grain analysis to provide an overall post-mortem on each crop's nutrition.

- Results from ~250 YEN OSR samples analysed suggest that the nutrients harvested in the seed for many crops is on the low side, and many crops could be deficient.
- YEN Nutrition was therefore launched in 2020 to provide an opportunity for the sharing of grain/seed analysis, yield, nutrient input data, to further our understanding – further details and registration are available here
- Crop nutrients differ in how they are shared between grain and straw at harvest. The graph below shows how OSR store most of their N and P in the grain but most of their K in the straw (as estimated from analyses of feed materials).



- This year we are using YEN-low values (i.e. lower quartiles from all past YEN data the boundary between the bottom quarter and top three-quarters of all YEN values since 2013) as comparators for all nutrients in all crops. We find YEN-low values to be very similar to known critical thresholds of N, P, S and Mn in wheat, as well as to less certain critical values of K, Mg, S and Zn, so we assume they can be applied for all nutrients in all crops.
- As there is uncertainty around the critical level of each nutrient in the seed which indicates a deficiency, the following benchmarking-charts provide the best means of identifying the nutrient(s) most likely to have limited your crop compare your value with the mid-half of all the other YEN entries.
- The following benchmarking-charts and YEN-low values provide the best means of identifying the nutrient(s) most likely to have limited your crop.



SUMMARY

The 2021-22 competition:

- Congratulations and thank you for providing the information necessary to complete this report; the collective effort of all YEN contributors serves to maximise the value of the results that can be reported and deductions made. We call this approach 'share-to-learn', and believe that the whole industry would benefit by making this approach their normal practice.
- This year, oilseed YEN consisted of 45 oilseed rape (OSR) crops (of which 30 completed and submitted their yields) and 10 linseed crops. The more participants we have, the more robust and confident we can be in the conclusions and comparisons that we make, both at the individual 'benchmarking' level, and when analysing the whole set of data.
- This years marks the 10th year of YENs, and the 6th year for Oilseed YEN. As each year passes and as more YENs develop, we are increasingly struck by the farm to farm differences, some farms are consistently achieving high yields, and several farms have achieved YEN Awards over several seasons. It is evident that a 'farm factor' is playing a big part in governing yield levels. This gives real value to being a YEN participant through having an opportunity to compare with and learn from others.
- The winning yield (gross output) in 2022 was a staggering 8.97t/ha (in Lincolnshire), an amazing achievement. The winning % of potential yield was a crop grown in Oxfordshire which achieved 96% of the potential yield of 7.0t/ha.
- The average gross-output yield for OSR crops in Oilseed YEN in 2022 was 6.0t/ha, which was considerably higher than the 2021 average of 4.4t/ha. Provisional DEFRA yields for 2022 (England only) have increased from 3.2t/ha in 2021 to 3.7t/ha, highlighting that yields for OSR in 2022 were the 4th highest in England since 1999.
- In 2022, Crops generally established well, with adequate moisture minimising CSFB damage. Dry conditions in spring would have restricted canopies becoming too large, although conditions may have hampered N uptake in some crops. Sunny April conditions along with rainfall in May were conducive for setting high seed numbers. The majority of seed filling took place in June which was sunnier and only slightly warmer than than average giving a high rate of photosynthesis helping seed filling and oil formation. On the whole, crops were characterised by a high number of seeds, with good thousand seed weights and high oil contents.

Comments on the next page are generated automatically from your data, with the aim of high-lighting features of your crop which may point out routes to yield-enhancement on your land.

SPECIFIC COMMENTS ON THIS ENTRY

Resource capture, growth & yield:

- High YEN yields have generally been associated with large plants with many seeds. Your yield arose from a high biomass and a low harvest index.
- Your crop is estimated to have had a TSW of 4.4 g, which is a normal TSW. TSW can be small either because of low storage capacity or poor conditions for filling.
- Your is crop estimated to have contained 105540 seeds/m2 at harvest, which is a high number of seeds/m2. Crops with less than 80,000 seeds/m2 may limit yield.

Crop Nutrition:

- Your grain is estimated to have had 2.59% N. Less than 3.05% indicates a need for further checks on N nutrition.
- The calculated seed N offtake for your crop was 102 Kg/ha. This seed N offtake is unlikely to have constrained yield
- Your soil K was 117.85 mg/l. Levels below 120 mg/l can indicate deficiency.
- Your soil Mg was 49.8 mg/l. Levels below 50 mg/l can indicate deficiency: check your grain Mg to see if Mg was sufficient.
- Your seed is estimated to have had 0.35% S. Less than 0.36% indicates a need for further checks on S nutrition.
- Your seed is estimated to have had 0.23mg/kg Mn. Less than 32.6 mg/kg indicates a need for further checks on Mn nutrition.

THE YIELD ENHANCEMENT NETWORK

Short review of Cereal YEN 2021-22

Cereal YEN saw completed entries from 252 crops in the 2022 harvest season, including 41 barley and 11 oat crops. The average wheat yield was 11.3 t/ha. The winning field yields in 2022 were 18.0 t/ha for wheat and 16.2t/ha for barley (both in Lincolnshire); both are new YEN records! Yield potentials were 22% lower this season than previously ranging between 9 and 22 t/ha. Wheat entries achieved 76% of potential on average. Winter cereals established well in most instances, and the whole season was warm so crops developed ahead of normal. After a wet February, spring and summer were both dry so nutrient uptake was inhibited and final nutrient capture was reduced. However, summer was bright which resulted in good grain filling and good yields, with some exceptional yields on retentive soils. The low summer rainfall was the biggest constraint on yields, especially on light or shallow soils.



Update on Wheat Quality Competition

The YEN Wheat Quality Award, sponsored by UK Flour Millers, took place again ir 2022. All Group 1 wheat entries which provided a large grain sample have been entered and the best will be short-listed. Following breadmaking analysis and assessment, the winners will be announced during the Awards Dinner evening on Tuesday 24th January 2023. Please click here to look out for more information and register your place.



YEN Nutrition

YEN Nutrition was initiated in 2020 because YEN data have indicated that the majority (>80%) of crops have inadequate nutrition, one way or another. This new YEN connects anyone – farmers, advisors, suppliers and academics in the UK or abroad – seeking to improve nutrition of any grain crop – cereal, oilseed or pulse. Membership begins with grain analysis and grain nutrient benchmarking on six or more fields. Further details are available here.



'YEN is ten!!' Conference and Awards dinner

If you haven't done so already, please register and come to the YEN's tenth birthday conference at East of England Arena, Peterborough on 24th January 2023. You can Register for the YEN Conference here.

CONTACTS

Please send any comments, observations or queries to the contacts below.

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Or email yen@adas.co.uk for general enquiries.



YEN SPONSORS

The YEN was initiated by industry and is entirely industry funded. We are most grateful to all our sponsors. They not only provide funding but they are fundamentally involved in management of the YEN and in supporting individual farms in making their YEN entries. The YEN would not exist without them!































Visit www.yen.adas.co.uk for sponsors' details, news updates and to register for 2023.