



Pea YEN Entry Protocol

Welcome to the Pea Yield Enhancement Network (YEN) 2021

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IMMEDIATE ACTIONS

- ☐ Collect and return your soil samples
- ☐ Complete your site details forms using the link emailed to you

PRE-HARVEST ACTIONS

- ☐ Take overhead crop photo at GS10 or complete 1 m² plant counts
- ☐ Complete and return the online forms throughout the season. Links will be emailed to you
- ☐ Record dates of crop growth stages
- ☐ Collect and send leaf tissue samples at GS34 and GS60
- ☐ Collect and send grab sample just before harvest

POST-HARVEST ACTIONS

- ☐ Collect and return seed samples at harvest
- ☐ Return Yield Entry Form
- ☐ Make sure all information is completed

DO-IT dates

... and the Final day

APRIL	Return Soil Samples and GS 10 overhead photos
APRIL/MAY	Return tissue sample GS34
MAY/JUNE	Return tissue sample GS60
SEPTEMBER	Return Grab and Grain samples
SEPTEMBER	Return Yield Entry Form

31 SEPTEMBER

31 SEPTEMBER

GENERAL INFORMATION

Welcome to Pea YEN 2021. We're excited to be broadening out the Pea YEN this season to include more growers. There may be some extra sampling available from commercial sponsors throughout the season which become available (any updates will be emailed to entrants)

SOIL SAMPLING KIT

HuttonSoils (based at the James Hutton Institute, Aberdeen campus) provides soil-nutrient assessments for registered entrants of the Pea- and Bean-YENs. Soils may also be analysed for rhizobium population analysis and other soil characteristics.



Soil samples after Mid-May are still encouraged but may incur a charge.

PGRO also analyse soil foot rot risk analysis as part of the Pea YEN until the end of April.

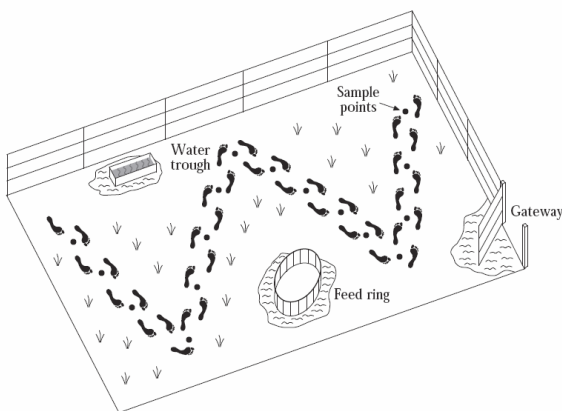
Once registered, JHI and PGRO soil-sampling kits will be sent to you and samples should be collected using the recommended protocol detailed below. Both soil samples can be collected at the same time.

Top Tips for sampling soils for the YEN

Where & how to sample

- Make sure you have a suitable soil-corer or auger for your sampling depth. The sampling depth should be 0-15 cm minimum and as deep 23 cm if the land has been ploughed in the last few years. The sampling depth should always be 0-23 cm if min- or no-till cultivations have been used.

Figure 1. Schematic diagram of 'W' (or 'M') field sampling pattern, showing sampling points ('●').



- To avoid cross contamination, ensure your soil auger and bucket is cleaned between sampling areas/fields.
- Soil sample should be taken to get representative range from the whole cropped area (field). Take 20-25 evenly spaced cores from sampling points along a 'W or M' pattern across the sample-area (Figure 1, opposite).
- Avoid taking samples from headlands, or in the surrounding areas which will not be included in the YEN-entered area.

Preparing & labelling your sample

- Please remove all roots, plant material, or accumulated surface organic matter in the sample.
- Ensure the pooled soils cores from all 20-25 positions are mixed very well, and in a clean container to form a fair and representative sample.

For the JHI sample kit:

- Fill the clear plastic bag with approx. 500 g soil. Seal and place this in the small cardboard tube. Label the small cardboard tube with the sticker provided by HuttonSoils with which the YEN ID and field name should be added. This completed sticker must accompany the sample returned.

- Place the small tube in the large tube and return this to HuttonSoils using the FreePost label provided which should be attached to the large tube. Visual instructions are provided below:

Kit Contents

The kit has five parts:

- Small sample tube – with label
- Large tube
- Freepost label (adhesive)
- Sampling Instructions
- Plastic bag



Step 1

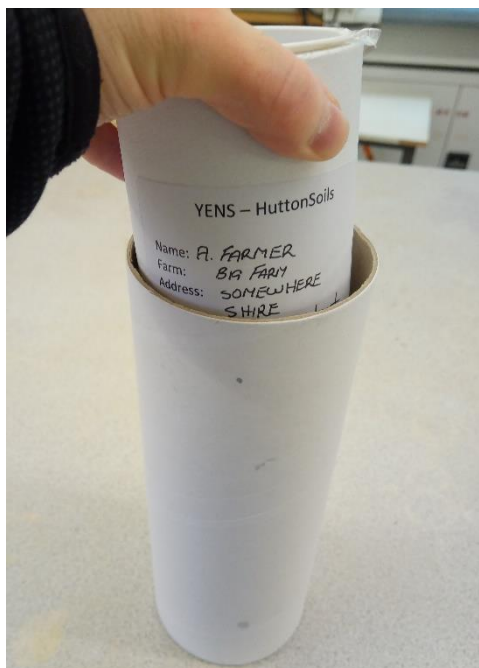
Take soil sample as instructed and fill plastic bag in the small sampling tube.

Step 2

Write your details on the label on the small sample tube.

Place both caps on the tube.





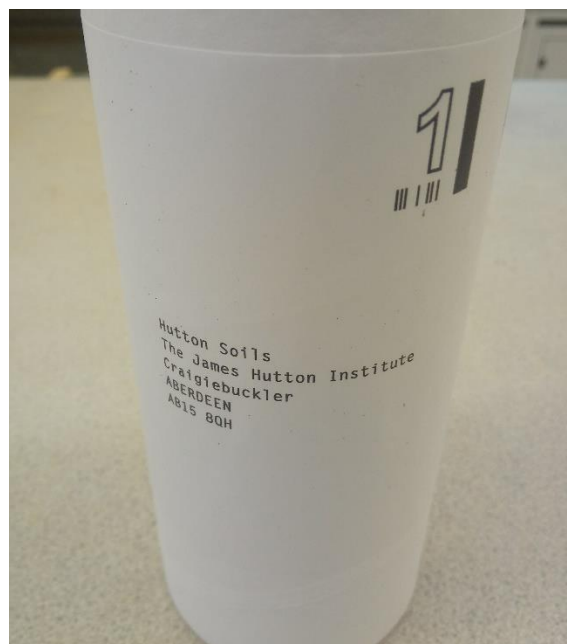
Step 3

Place small sample tube with soil sample and completed label within the large tube.

Step 4

Stick the adhesive Freepost label to the large tube containing the soil sample.

Ensure that the label covers your address details if kit has been posted to you.



Step 5

Post back to the James Hutton Institute using the Freepost label.

Note: If required the end caps on the large tubes might need secured with some sticky tape. Rolled up old newspaper can be used to stop the small sample tube sliding about within the large postal tube.

For the PGRO foot rot sample kit:

- Place approx. 500g processed soil into one of the ziplock bags, affix the Pea YEN entry code sticker (e.g PF000XX) to the outside of that bag and seal the bag. Next place all of this inside the second sample bag and seal the second bag.
- Use the pre-paid self-return sticker and envelope to return the soil sample to PGRO.

Visual Evaluation of Soil Structure (VESS)

The visual evaluation of soil structure is a quick assesment of soil structure. This test is a desired optional extra. If you have the time and are interested, please follow the links below and complete the assessment.

The SRUC webpage for information on VESS ad links to methods and videos click [here](#)

To download the pdf of the VESS score chart click [here](#)

PEA YEN ONLINE FORMS

We are developing the Pea YEN to be easier to engage with. Site information, crop observations, agronomy and yield measurements will be collected via online forms in 2021. Links to these forms will be made available throughout the season. You, or your sponsor will have already submitted the registration form. The next form will collect information on site details and field history and a link will have been emailed to you when registration was completed. If you have not received this or are receiving difficulties with any of the process please get in touch at peayen@adas.co.uk.

Site Visits and Crop Observations

This information allows us to understand how a pea crop develops in different situations, helping us understand constraints to yield. All the information you collect can be returned via the online form system and site visit dates are listed below (numbered 1 to 6). The progress of the online forms can be saved, so information can be entered throughout the season. Growth stage information can be found in Appendix 1.

As well as the actions listed under 1-6, there is an option to record further information at each site visit including:

- Score overall appearance of crop
- Score weeds, pests (birds and insects), diseases and viruses
- Control strategy or other notes, if applicable

The PGRO Pea and Bean Guide App

PGRO have developed a free agronomy app, which will be useful in the field. It can aid with pest and disease recognition and is capable of recording and submitting reports of pests and diseases. There is also a built in growth stage guide. The app is available for both Android and Apple devices.

1. Full emergence GS 10 (March /April)

- Record the date of full emergence (**GS 10**). If this is missed please record the growth stage on the date you visit.
- Carry out plant counts.

- In at least five locations, using a meter stick or quadrat count the number of plants in a 1 m² area. If it's easier, use a 0.25 m² quadrat to count the number of plants and multiply that number by 4 to get the number of plants in 1 square metre. Please record the count in each individual location.
- **Alternatively**, plant counts can be calculated from photographs. Take images at three locations from within the 2ha area entered in the YEN. Take the photo from above the crop looking vertically down, showing as wide an area as possible and including an A4 piece of paper flat on the ground for scale. See examples in Figure 1. Photos can be uploaded using the online forms.



Figure 1. Example photographs for plant population estimate

2. Start of nodulation, Fourth Node (April/May)

- Record date of 4th node - start of nodulation (**GS 34**)
- Collect a representative **leaf tissue sample**, following the method described below.

Leaf Tissue sampling

As part of Pea YEN Lancrop/YARA provide free leaf tissue testing for YEN entrants. Once you have registered you will be sent sampling kits. To speed up collection at GS34 we have amended the sampling protocol for **GS34**.



At each sampling timing:

- Sample and send Monday to Wednesday to avoid the sample in the post over the weekend.
- Within your YEN area walk up 2 to 4 representative tramlines and sample tissue at regular intervals from between 5 - 20 points along the sampling path.
 - **At GS34** at each sampling site select several plants at the same stage of development and cut/break off the top **two nodes (4 leaves) with the stems** until you have about 200g of material. Avoid leaves showing pest, disease or other damage.
 - **At GS60** at each sampling site select several plants at the same stage of development and sample the youngest mature compound leaf (see diagram below) until you have about 200g of material. **Take leaves only, not stems**. Avoid leaves showing pest, disease or other damage.



Diagram of pea plant indicating with the arrow, the youngest mature compound leaf, which is to be sampled for tissue testing **at GS60**

- At both timepoints: mix the leaves thoroughly, if wet blot the leaves dry with a paper towel and place into a sample bag, squeezing out the excess air and sealing.
- Fill in the order form including crop and growth stage. **Include your email to ensure you get the results.**
- Place the sample bag and the order form into a Lancrop/Yara pre-paid envelope and post. **Do not put the order form inside the bag with the sample as it may get wet.**

3. First florets visible (May/June)

- Record date when the first florets are visible outside the flower bud (**GS 51**)

4. First flower and full flower (May/June)

- Record date of 1st flower seen sporadically within the crop (**GS 60**). Collect a representative **leaf tissue sample**, as described above.
- Assess levels of foot rot, using the method described below

Foot rot assessment

Please carry out an evaluation of foot rot infection using above ground symptoms. Symptoms may appear from early flowering onwards. Areas may be defined or scattered across the field and plants develop a pale discolouration which may later become a more distinct yellowing. The base of the plant can be brown or black at soil level and the stem may develop a strangled appearance. Patches of infection may be associated with compaction or waterlogging.

The assessment should be done at several places in the field and scored using the following method:

Assess at least 5 areas of approximately 1 square metre.

Assess for stem and leaf infection using the following key (also see images, below each bullet):

- 0 = Healthy stem and foliage, no discolouration (no image given)
- 1 = Up to 20% stem base/ foliage discoloured



- 2 = 20-40% stem base/ foliage discoloured



- 3 = 40-60% stem base/ foliage discoloured



- 4 = 60-80% stem base/ foliage discoloured, stunting of plant



- 5 = Complete discolouration, dead plant



Please record the results in the crop observations and actions form.

- Record date of full flower, first 1 inch pod not on the headland (**GS 65**)

5. End of flowering & Senescence (July/ August)

- Record date when crop is out of flower (**GS 69**).
- Record date of seed senescence (**GS 89**)
- Take a **Grab sample** of 25 plants. The representative sample should be taken from inside the 2 ha area ensuring that all stems and any branches are collected from 5 plants in 5 locations. The plants should be placed into the large sack provided as part of the harvest pack, and posted to ADAS Gleadthorpe with the address sticker provided.

6. Harvest (July/August)

- Record date when crop is first ripe for harvest, Full senescence (**GS 97**).
- Record actual harvest date (**GS 99**).
- Mark out 2 ha area if not already in place.
- Record moisture content of harvested load.

- Collect accurate yield information via
 - a. Whole field of known area with total weights from weighbridge tickets or calibrated combine yield monitor
 - b. A selected area with minimum size of 2ha, marked out and measured, with total weights from weighbridge or calibrated yield monitor
 - c. Area of a yield map (calibrated yield monitor) ensuring data from cuts of full header width only.
- Record harvest losses.
- Retain a combine samples in the bags provided (the **seed sample**) and forward to the appropriate laboratories for analysis as detailed in the harvest pack provided.


PEA YEN HARVEST PACK

Prior to harvest you will receive the Harvest Pack, sent to the address indicated upon registration.

The Harvest Pack will contain:

1. Further guidance on collecting grab and grain samples
2. One pre-labelled potato sack per entry, for the grab sample just before harvest.
3. Pre-labelled polythene bags, for the grain samples at harvest.

CONTACTS

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Or email peayen@adas.co.uk for general enquiries.		 @adasYEN

Further information can be found at www.yen.adas.co.uk



Appendix 1- Growth stages key

Pea Weber and Bleiholder, 1990; Feller et al. , 1995 b

Phenological growth stages and BBCH-identification keys of pea

(*Pisum sativum* L.)

Code Description

Principal growth stage 0: Germination

00	Dry seed
01	Beginning of seed imbibition
03	Seed imbibition complete
05	Radicle emerged from seed
07	Shoot breaking through seed coat
08	Shoot growing towards soil surface; hypocotyl arch visible
09	Emergence: shoot breaks through soil surface ("cracking stage")

Principal growth stage 1: Leaf development

10	Pair of scale leaves visible
11	First true leaf (with stipules) unfolded or first tendril developed
12	2 leaves (with stipules) unfolded or 2 tendrils developed
13	3 leaves (with stipules) unfolded or 3 tendrils developed
1....	Stages continuous till . . .
19	9 or more leaves (with stipules) unfolded or 9 or more tendrils developed

Principal growth stage 3: Stem elongation (Main shoot)

30	Beginning of stem elongation
31	1 visibly extended internode ¹
32	2 visibly extended internodes ¹
33	3 visibly extended internodes ¹
3....	Stages continuous till . . .
39	9 or more visibly extended internodes ¹

Principal growth stage 5: Inflorescence emergence

51	First flower buds visible outside leaves
55	First separated flower buds visible outside leaves but still closed
59	First petals visible, flowers still closed

¹ The first internode extends from the scale leaf node to the first true leaf node

Principal growth stage 6: Flowering

60	First flowers open (sporadically within the population)
61	Beginning of flowering: 10% of flowers open
62	20% of flowers open
63	30% of flowers open
64	40% of flowers open
65	Full flowering: 50% of flowers open
67	Flowering declining
69	End of flowering

(*Pisum sativum* L.)

Code Description

Principal growth stage 7: Development of fruit

71	10% of pods have reached typical length; juice exudes if pressed
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- 72 20% of pods have reached typical length; juice exudes if pressed
- 73 30% of pods have reached typical length;
juice exudes if pressed. Tenderometer value: 80 TE
- 74 40% of pods have reached typical length;
juice exudes if pressed. Tenderometer value: 95 TE
- 75 50% of pods have reached typical length;
juice exudes if pressed. Tenderometer value: 105 TE
- 76 60% of pods have reached typical length;
juice exudes if pressed. Tenderometer value: 115 TE
- 77 70% of pods have reached typical length.
Tenderometer value: 130 TE
- 79 Pods have reached typical size (green ripe); peas fully formed

Principal growth stage 8: Ripening of fruit and seed

- 81 10% of pods ripe, seeds final colour, dry and hard
- 82 20% of pods ripe, seeds final colour, dry and hard
- 83 30% of pods ripe, seeds final colour, dry and hard
- 84 40% of pods ripe, seeds final colour, dry and hard
- 85 50% of pods ripe, seeds final colour, dry and hard
- 86 60% of pods ripe, seeds final colour, dry and hard
- 87 70% of pods ripe, seeds final colour, dry and hard
- 88 80% of pods ripe, seeds final colour, dry and hard
- 89 Fully ripe: all pods dry and brown. Seeds dry and hard (dry ripe)

Principal growth stage 9: Senescence

- 97 Plants dead and dry
- 99 Harvested product

Phenological growth stages of pea

