



Plant Population

Key Points:

- ▶ It is critical that plant populations do not fall below the target **100,000** established plants/ha in any part of the field if recovered yields are to be maximised
- ▶ Planting too few seeds will leave your crop at risk of fewer than expected established plants caused by severe weather or pest attack
- ▶ Plant establishment is frequently lower on headlands and parts of fields where seedbeds are poor. Higher seed rates should be considered in these areas
- ▶ Drilling at **1.25 units/ha** will achieve the target plant population of 100,000 plants/ha where plant establishment is expected to be **80%**

Optimum plant populations

BBRO trials have confirmed that a target plant population for UK growing conditions to produce maximum yields is to establish **100,000 plants on every hectare sown**. Drilling at **1.25 units/ha** will achieve this where plant establishment is expected to be **80%**. Every effort should be taken to maximise establishment, and consideration of the impact of weeds, pests and diseases as well as soil condition and cultivation should be made.

The target of **100,000 established plants/ha** should be evenly distributed.

- With low-yielding sites there is a tendency for a more rapid fall-off in yields at lower populations than for higher yielding sites
- Identification of the cause of poor areas of establishment can help prevent problems occurring in the future
- For most crops, benefits of optimal populations come from improved leaf cover and radiation interception
- The average plant population can mask variability within the field
- There has been some indication from survey data that yields continue to increase at populations higher than the current target on fertile silt and peat soils
- Fertile silt and peat soils produce larger, lushier leaf canopies and the benefits of greater plant numbers are more likely to be due to changes in the proportions of dry matter partitioned to tops and roots and root dry matter to sugar



Factors affecting field populations

Plant population is a function of:

- Number of seeds sown
- % germination
- Losses during emergence and post-emergence up to the six-leaf stage when a plant is said to be established (i.e. likely to survive and produce a harvestable root)

In practice it is necessary to predict % establishment from a knowledge of existing and expected factors which affect germination and seedling growth:

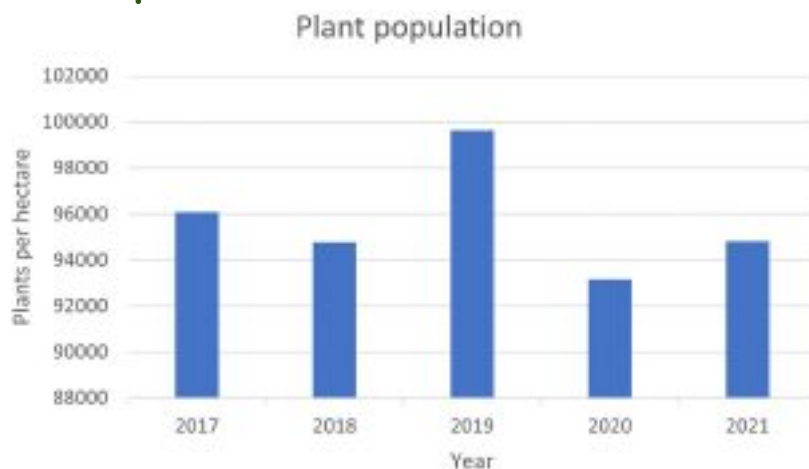
- Typically seed sold in the UK has around 95% laboratory germination
- Germination in the field depends on the quality, future temperature and soil moisture content of the seedbed
- Uncovered or shallowly drilled seed is at risk from predation by mice
- Soil capping or crusting might impede emergence. The better the seedbed structure the more easily it can cope with heavy rainfall
- Seedlings can be prone to pest and disease attack pre and post-emergence
- Birds and small mammals graze seedlings and sometimes remove the growing point
- Seedlings may be at risk from extreme weather events eg frost

Typically, commercial in-field establishment is between 70 to 80%

Good, even populations mean:

- More effective weed control – due to improved crop competition
- Better sugar %
- Lower impurities
- Efficient harvesting with less loss of large or small roots, lower breakages and optimised topping due to more uniform crown height

Current crop situation:



Plant Population

Field observations and seed rate decisions

The crop is referred to as established once it has reached the six-leaf stage.

Determine your final established plant populations by carrying out 10 or more plant counts at the six true leaves stage on several different areas of a field to obtain an average figure.

50cm row spacing (20 inch)

Measure or pace out a 20m row of sugar beet and count the number of plants in that 20m row, then carry out the following calculation:

Number of plants in a 20m row x 1000 = plant population (000's of plants/ha)

Repeat this 10 times per field in different areas to give you a representative average.

45cm row spacing (18 inch)

Measure or pace out a 22m row of sugar beet and count the number of plants in that 22m row, then carry out the following calculation:

Number of plants in a 22m row x 1000 = plant population (000's of plants/ha)

Repeat this 10 times per field in different areas to give you a representative average.

Plants/20m	50	60	70	80	90	100
Average plant population (Plants/ha x 1,000)						
50cm row	50	60	70	80	90	100
45cm row	56	67	78	89	100	111
Below optimum	Optimum			Above optimum		

Investigate the reason for poor establishment if the figure falls below 70%. Use this knowledge to help to make a better estimate of the seed rates required in future years.

Seed rates for optimum population

Row width: Most sugar beet is drilled using 50 or 45cm rows. Consider row width to fit in with equipment used in the field.

Seed spacing: Ideal spacing is 16cm but use your predicted establishment together with the tables (**below**) to choose the required seed spacing for your establishment conditions.

Establishment – 000's plant/ha based on 50cm row widths							
Seed spacing cm	14	15	16	17	18	19	20
Seed units/ha (one unit = 100,000 seeds)	1.43	1.33	1.25	1.18	1.11	1.05	1.00
90%	129	120	113	106	100	95	90
80%	114	107	100	94	89	84	80
70%	100	93	88	82	78	74	70
60%	86	80	75	71	67	63	60
50%	71	67	63	59	56	53	50
40%	57	53	50	47	44	42	40

Establishment – 000's plant/ha based on 45cm row widths								
Seed spacing cm	14	15	16	17	18	19	20	21
Seed units/ha (one unit = 100,000 seeds)	1.59	1.48	1.39	1.31	1.23	1.17	1.11	1.06
90%	143	133	125	118	110	105	100	95
80%	127	118	111	105	98	94	89	85
70%	111	104	97	92	86	82	78	74
60%	95	88	83	79	74	70	67	64
50%	79	74	69	65	61	58	55	53
40%	64	59	56	52	49	47	44	42

Plant populations above optimal requirements that can still produce maximum yields but not maximum profit.

Optimum plant populations (within 5% of 100,000 plants/ha).

Plant populations below optimal requirements that may not produce maximum yields.