Towards Year-round UK Strawberry Production

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The UK Strawberry Industry

- The UK strawberry growing season has increased from 6 weeks (June-July) in the 1980s to 9 months currently (March-November).
- Demand has rapidly increased for strawberries over the last 20 years (Table 1).

	2000	2018	% increase
Home Production Marketed (1000 t)	37.3	140.7	277
Imports (1000 t)	29.4	50.0	70
Value (£ million)	83.9	295.2	252

Table 1. UK strawberry statistics (2000-2018)[2].

- The UK per capita strawberry consumption is among the top 3 countries in Europe with a 3 kg per capita consumption compared to the European average of 1.64 kg[1].

Growing importance of out-of-season production

- Changing consumer demands and increased environmental awareness of global climate change are fuelling increased interest in extending the growing season.
- Consumers are increasingly demanding access to good value fresh, sustainable produce (Figure 1).

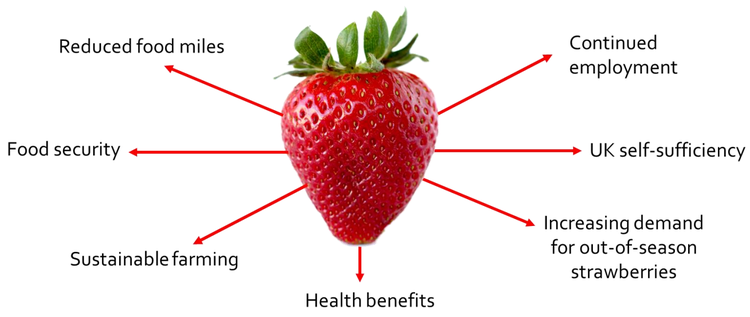

Figure 1. Benefits of increasing out-of-season strawberry production in the UK.

Research Aims

- To explore environmental and cultural growing factors for optimal winter glasshouse production (Figure 2).

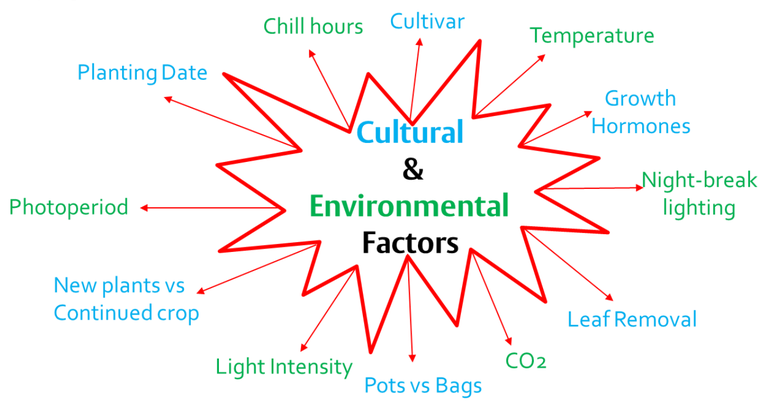

Figure 2. Cultural and environmental factors influencing strawberry production.

- To investigate new specialist low chill cultivars for out-of-season UK strawberry production.
- To develop optimal chilling models for Junebearers (JBs) and Everbearers (EBs).

General Methods

- Facilities: temperature controlled glasshouse compartments with photoperiod extension garages and LED lighting (Figure 3).
- Variables investigated so far:
  - Temperature: 16 & 22 °C *
  - Photoperiod: 16 & 22 hrs. *
  - Cultivars: Junebearer * & Everbearer
  - Night-break lighting: 7 weeks of 10 W/m^{-2} NBL for 15 minutes/hour (10pm-4am) vs no NBL
  - Gibberellic Acid: 50ppm GA_3 vs water control

Figure 3. Strawberry plants set up on a trolley with a photoperiod extension garage behind (left). Strawberry plants under LED lights with the temperature control system behind (right).

Results *

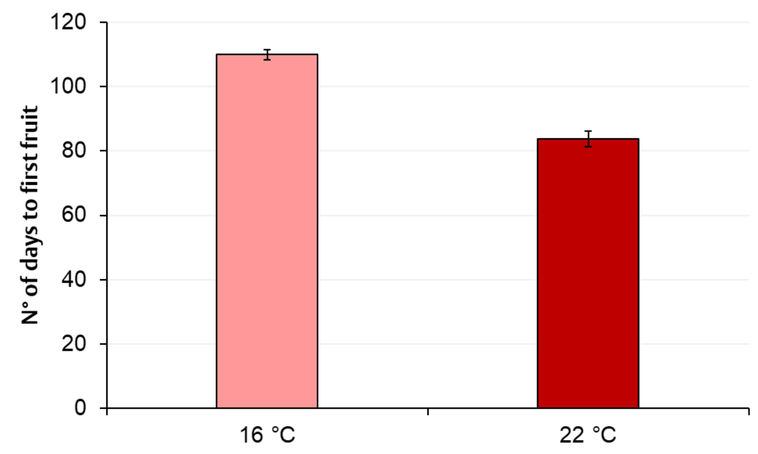

Figure 4. Effect of temperature on № of days for the JB to reach first fruit ($p<0.001$).

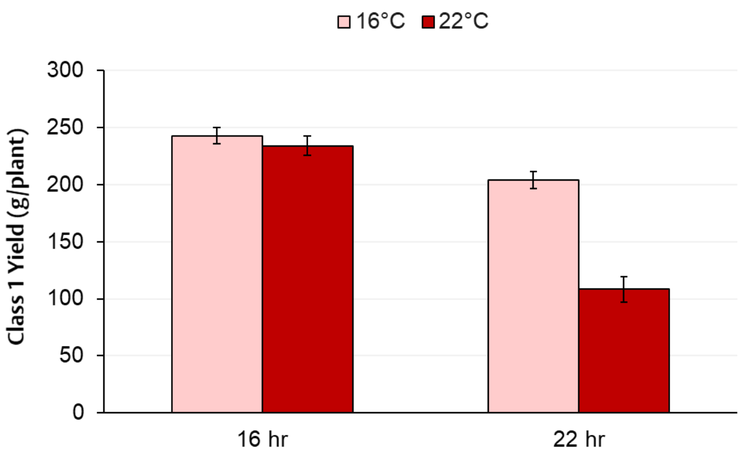

Figure 5. Effect of temperature and photoperiod on the Class 1 yield produced by the JB ($p<0.001$).

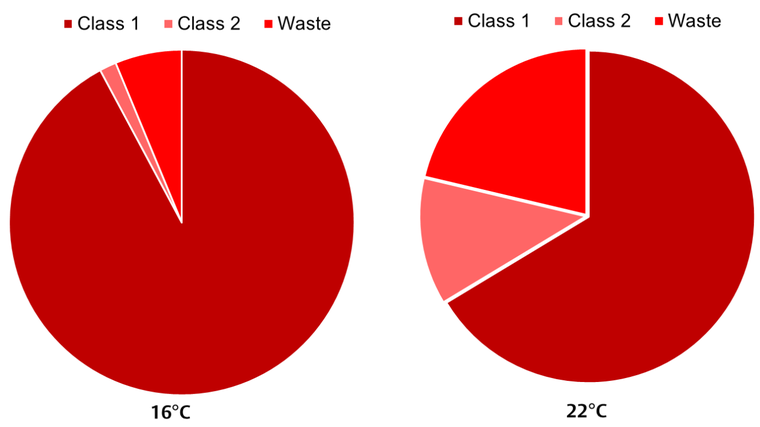

Figure 6. Effect of temperature on Class % ($p<0.001$).

Conclusion

- 22 °C reduced the time to first fruit allowing fruit to be picked earlier in the winter season (Figure 4).
- At 22 °C, the 22 hr photoperiod resulted in a significantly lower yield than at 16 °C (Figure 5).
- 22 °C resulted in a lower Class 1 % and a higher waste % (Figure 6).
- To achieve a balance between producing earlier fruit without compromising fruit yield and quality, 22 °C could be used initially to promote earliness and then dropped to 16 °C to promote higher yields pre-fruiting.

Future Work

- Investigation into factors to reduce the chill requirements of strawberry plants to enable earlier flowering and fruiting.
- Investigation into factors to further enhance berry yield and quality:
  - CO_2 concentration
  - Planting date
  - Light intensity
- Development of optimal economic and environmental models for sustainable out-of-season glasshouse production (Figure 7).

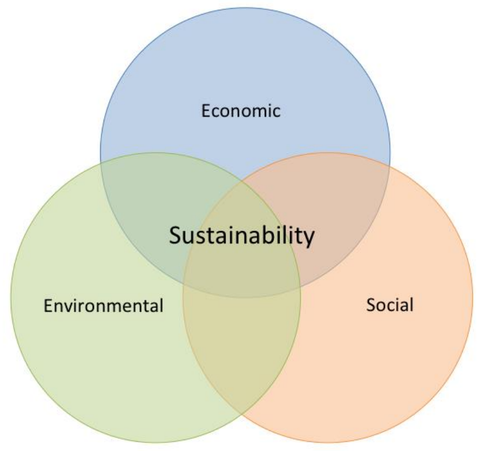

Figure 7. Factors influencing sustainable production.

References

1. CBI, 2019. *Exporting fresh strawberries to Europe | CBI.* [online] Available at: <https://www.cbi.eu/market-information/fresh-fruit-vegetables/fresh-strawberries> [Accessed 03 July 2021].
2. DEFRA, 2018. *Latest Horticultural Statistics.* [online] Available at: <https://www.gov.uk/government/statistics/latest-horticulture-statistics> [Accessed 03 July 2021].

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