

## Engineering the internal and external environment of leafy crops to enhance indoor growth and provide food for space exploration

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**Department/Institute:** Plant Sciences

**Industrial Partner:** Vertical Future Ltd

**Research area:** Plant and Crop Sciences

### Project outline:

Indoor growth, such as vertical farming can contribute to sustainability by providing locally produced, pesticide-free food to cities, and off-Earth habitation. However, energy costs, from lighting and cooling, can make indoor growth economically and environmentally expensive. In theory maximum productivity and reduced engineering costs can be achieved by growth in constant light. However, in practice most species do not grow well in constant light because there is a mismatch between the external environmental and the internal circadian oscillator (Dodd et al., 2005 Science 309, 630 – 633). Working with Dr Jen Bromley at Vertical Future (<https://www.verticalfuture.co.uk/>) we will investigate ways of improving the growth of crops in constant light. We do not know if growth in constant light affects plants due to constant photosynthesis or whether this is a result of the plant not having 24 h rhythms that are usual for plants growing in a light and dark cycle.

We will investigate whether growth in constant light can be improved by inducing 24 hour cycles of activity in the plant using non-light stimuli, such as changes in water content and nutrient supply, and by using oscillating light quality and intensity. We will investigate whether this improves growth of lettuce in conditions that promote constant photosynthesis. Similar experiments will be performed in Arabidopsis, both wild type and mutant lines to investigate the mechanistic basis by which constant light affects growth, and the mechanisms by which rhythmic agronomy can improve growth.

**BBSRC DTP main strategic theme:** Bioscience for sustainable agriculture and food