

Matthew Chlebek, Co-founder and Chief Agronomist, Harvest Farms Ltd – Written Evidence (LUE0053)

This a submission on behalf of Harvest Farms Ltd (Company number 10880642), a controlled environment agriculture company based in East London.

The company uses a technique, known as vertical farming, in which crops are grown indoors under LED lighting, with variables such as temperature and humidity optimised for plant growth cycles and quality.

Advantages of vertical farming include greatly reduced water use, the removal of the need for chemical pesticides, avoidance of agricultural runoff into waterways and reductions in carbon emissions from food transportation and storage (particularly when compared to imports).

Harvest London (its trading name) was incorporated in 2017 and currently operates a vertical farm which sells herbs, salads and leafy greens to food sector customers (primarily restaurants and food manufacturers). It has plans to open a 5,000m² vertical farm on the outskirts of London in 2023.

We have selected questions from the Call for Evidence, and answered specifically with vertical farming in mind.

Farming and land management

4. What impacts are changes to farming and agricultural practices, including food production, likely to have on land use in England? What is the role of new technology and changing standards of land management?

In the area of our direct experience, vertical farming, we would expect to see considerable growth in coming years. Harvest London currently operates a 150m² farm and has plans to open one 35 times the size next year. We are aware of at least three other companies who have announced they will be opening large vertical farms in the near future (in Gloucestershire, Norfolk and Kent).

These large farms are in a variety of settings, from rural, to science/industrial park to urban periphery. Due to vertical farming's nature as somewhere between farm and factory, we would expect farms in future to occupy both repurposed existing industrial buildings and new purpose-built structures.

Vertical farming takes different forms, with some companies selling farms in shipping containers (which can be either standalone or combined), but in terms of impact on land use, large scale farms (5,000m²+) will be most significant.

Of England's 4.8m hectares of croppable area, 2.7m are taken up by cereal crops, which are not well suited for vertical farming due to the growth cycles (vertical farming typically lends itself to salads, herbs, leafy greens and some fruits). 119,000 hectares are used for growing fruits and vegetables¹.

While vertical farming is far more productive than open fields per square metre, because of the crop mix in England, we would not expect that it could substitute for significant amounts of farmland, in the short term at least.

However, with the UK importing £11.4bn of fruit and vegetables in 2020 (exporting only £1.2bn), there is considerable scope for the vertical farming industry to grow as a substitute for imports, improving food security and reducing food miles.

One attraction of vertical farms is that they can be built almost anywhere, including in or around urban areas, or located next to energy generation, food processing/manufacturing, or logistics hubs. In terms of land use, government at all levels will want to think about how it encourages food production in or close to cities, or connected to energy/logistics infrastructure (in many cases local government will have a large role to play).

The technology can also be used by current farmers, who would be able to expand their range of crops to include those which do not grow year-round (or at all) in England. This could free up some farmland for other purposes, such as rewilding or other environmental goals - if the profits from vertical farming made it economically viable for the farmer to do so.

5. What impact are the forthcoming environmental land management schemes likely to have on agriculture, biodiversity and wellbeing? What do you see as their merits and disadvantages?

The Local Nature Recovery and the Landscape Recovery schemes could both in theory be combined with vertical farming - for example installing a vertical farm in buildings which are no longer occupied by other farming activities.

This could enable farmers to continue with the business of food production even as they carry out other activities. It is worth noting, however, that switching from livestock to growing vegetables in a vertical farm could be a significant shift for farmers. It is possible that the Lump Sum Exit Scheme might provide an incentive for some farmers to transfer their land to others who are interested in some combination of vertical

¹ Figures from Defra - <https://www.gov.uk/government/statistics/farming-statistics-final-crop-areas-yields-livestock-populations-and-agricultural-workforce-at-1-june-2021-uk>

farming and ELMS, but we are not clear how these different policies interact.

Other schemes have existed that could potentially help farmers to install vertical farms, to offset land lost to other purposes, such as the Farming Equipment and Technology Fund (which has now closed for applications, but could cover technology such as LED lights). Depending on the Government's assessment of how well the scheme works, they may wish to run further rounds of the fund.

Environment, climate change, energy and infrastructure

8. How will commitments such as the 25-year environment plan and the net zero target require changes to land use in England, and what other impacts might these changes have?

According to the Food and Agriculture Organization of the UN, food production accounts for 34% of global greenhouse gas emissions, with two-thirds of that coming from agriculture and land use changes². The FAO also highlights the growing role of refrigeration in transport, storage and retail in food system emissions.

Clearly, food production is essential to human life, but the food consumed and the manner in which it is farmed can help towards emissions reduction. While the Government has not chosen to explicitly guide the public towards lower meat consumption, a 2021 paper in *The Lancet* suggest this is a trend already occurring in the UK³, and it would seem sensible to prepare for it to continue, with the associated trend of growth in plant-based meat substitutes.

Given the greater productivity of vertical farming (10x that of the same field area, and perhaps 50x), a shift away from livestock would further increase demand for vertical farms, although as *The Lancet* paper notes, the trend is still gradual.

Food production has a range of environmental impacts beyond emissions, including waterway pollution from agricultural runoff and soil degradation. Vertical farming, by operating in a mostly closed system, not using soil, can help to meet the aims of the 25 year environment plan for cleaner rivers and recovering soil fertility.

This would require vertical farming at a significant scale, to reduce pressure on agricultural land, and an expansion of the range of crops viable in a vertical farming system.

The Government has funded R&D in this area through the Transforming Food Production scheme and Farming Innovation Programme, and will

² <https://www.fao.org/news/story/en/item/1379373/icode/>

³ [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00228-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00228-X/fulltext)

continue to need to fund research if the UK is to be a global leader in controlled environment agriculture (the industry is already taking off in the USA, Singapore and elsewhere).

Essential to the sustainability of vertical farming is the energy used to the run the farm's systems, including lighting and climate control, which we deal with in answer 9 below

9. How should land use pressures around energy and infrastructure be managed?

In order for vertical farming to have a net positive impact on carbon emissions, the reductions that come from shorter supply chains and import substitution (ie. reduced transport, refrigeration) must be matched with green sources of energy.

In Harvest London's current farm, electricity is supplied by a 100% renewable supplier, and the next, much larger farm is anticipated to have a private connection to a source of renewable generation.

Combining vertical farms with renewable generation, such as photovoltaic panels or onshore wind will be part of the solution, and the government should make sure the planning system is accomodative. The same is true of anaerobic digester installation, which can use plant waste from vertical farms. Harvest London has discussed taking excess heat, either from local heat networks or power plants, but our impression is that this option is still underdeveloped, and could benefit from more support from government.

Ultimately, some combination of location with renewable generation, and non-renewable generation being removed from the Grid in time to meet the net zero target, while reducing the carbon footprint of vertical farms.

Land use planning

10. What do you see as the advantages and disadvantages of the existing land use planning system and associated frameworks in England? How effectively does the system manage competing demands on land, including the Government's housing and development objectives? What would be the merits of introducing a formal spatial planning framework or frameworks, and how might it be implemented?

We are not qualified to comment on the land use planning system as a whole, but we would urge the government to consider future food production not merely relating to rural areas, but also how vertical farms can be integrated into urban fringes and to logistics hubs (which have seen significant growth in the Midlands, for example).

Vertical farming is a process which can be safely combined with residential or commercial developments, provided that requirements like water and sewage and loading/unloading are considered.

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