



PART 3

Read the text below and answer questions 27–40.

Vertical Farming: Growing Up for Sustainability

A

Vertical farming has become one of the most debated forms of controlled-environment agriculture (CEA), largely because it promises to relocate food production into the spaces where demand is concentrated. As cities grow and peri-urban land is converted to housing or industry, advocates argue that stacking crops in warehouses and multi-storey facilities can reduce the distance between farm and plate. Instead of treating a field as a single unit, indoor farms treat growing as an engineered process: water, nutrients, airflow, temperature, and light are calibrated to keep crops in a narrow “comfort zone”. The appeal is not simply novelty, but a claim about urban resilience—shorter supply chains, faster delivery, and fewer disruptions when extreme weather damages outdoor harvests.

B

The strongest practical advantage is control. By sealing production from wind, heavy rain, heatwaves, and unexpected frosts, vertical farms can maintain steady output across seasons. In theory, this stability reduces exposure to field pests and enables cleaner production, because operators can limit entry points for insects and pathogens and monitor conditions continuously. Proximity to consumers can also reduce spoilage: vegetables harvested hours before sale are less likely to wilt in transit, and retailers can plan around predictable deliveries rather than fluctuating yields. These benefits are often framed as “supply chain resilience”, particularly for dense cities that depend on long-distance logistics and face climate-driven shocks to rural production.

C

However, the same control that protects crops creates a major constraint: energy. Most vertical farms rely on artificial lighting as their dominant operating expense, because photosynthesis still requires a large and reliable flow of photons. LEDs have improved dramatically, yet lighting costs remain sensitive to electricity prices, and climate control adds further demand. The environmental argument can therefore invert. If the power comes from fossil fuels, the carbon footprint can overwhelm the savings from reduced transport, and a system marketed as “green” can become emissions-intensive. This is why investors and planners increasingly evaluate vertical farms not only by yield per square metre, but by the carbon intensity of the grid and the facility’s ability to secure low-emissions electricity contracts.



D

Energy economics also shapes what these farms actually grow. Commercial facilities overwhelmingly focus on leafy greens—lettuce, spinach, herbs, and microgreens—because these crops are fast-growing, relatively lightweight, and can be produced with lower light intensity than fruiting plants. They also command premium prices, which matters when rent, automation, and electricity bills are high. Staple crops like wheat or rice, by contrast, are calorie-dense but low-margin, slow to mature, and space-hungry. Even if it is technically possible to grow them indoors, the cost per calorie makes them a poor fit for current business models. For now, vertical farming is best understood as a specialised tool for certain perishable products, not an inexpensive factory for grains.

E

Running a vertical farm successfully also requires respect for biology. Even inside a controlled building, plants do not respond uniformly to the same settings. Operators develop “light recipes” by adjusting wavelength mixes, intensity, and photoperiod to influence growth rate, leaf thickness, and flavour. Nutrient dosing schedules likewise require experimentation: small shifts can change bitterness, texture, or colour. Dense stacking creates microclimates, so minor differences in humidity or airflow can increase disease pressure in one corner of a facility while another area remains healthy. As a result, strong performance is less about buying hardware and more about continuous trial, monitoring, and refinement.

F

Automation is often portrayed as the solution to labour and consistency, and it does reduce repetitive tasks. Robots can seed trays, move racks, and assist with harvesting, while sensors track temperature, CO₂, and nutrient concentrations. Yet automation does not eliminate people; it changes what people do. Indoor farms require skilled technicians to calibrate dosing systems, maintain pumps and lighting arrays, troubleshoot software, and interpret plant signals before stress becomes a yield problem. In many regions, this shift from field labour to technical roles is both a barrier and an opportunity: it can raise hiring costs and training requirements, but it can also create new urban jobs linked to engineering and horticultural science rather than seasonal manual work.

G

Because costs are high, many vertical farm proposals are tied to urban planning. Cities with vacant industrial stock can repurpose abandoned buildings, reducing construction cost and bringing production to neighbourhoods with limited access to fresh produce. Some planners also consider integration with district energy systems, using waste heat from nearby facilities to stabilise temperatures, or installing on-site renewables to buffer



electricity price volatility. The logic is not merely agricultural; it is infrastructural. A vertical farm is a building-scale machine that benefits from supportive zoning, reliable power, and partnerships that reduce risk for operators and investors.

H

The most credible projections treat vertical farming as complementary, not revolutionary in the sense of total replacement. Open-field agriculture remains unmatched for grains and other staples produced cheaply at scale, while indoor farms can supply a narrow set of high-value, fast-turnover crops with fewer transport miles and greater reliability. In that role, vertical farming functions as an insurance layer for cities—an additional source of fresh produce when droughts, floods, or supply-chain breakdowns disrupt rural inputs. Its significance therefore depends on whether operators can reduce energy demand, secure low-carbon electricity, and keep costs low enough that “local” does not remain synonymous with “luxury”.

Questions 27–31

Choose **YES** if the statement agrees with the claims of the writer, choose **NO** if the statement contradicts the claims of the writer, or choose **NOT GIVEN** if it is impossible to say what the writer thinks about this.

27 The passage presents vertical farming as a viable method to produce food closer to urban consumers.

28 The writer suggests that indoor farming systems can function effectively regardless of external weather patterns.

29 Vertical farming is currently expanding faster in Asia than in Europe.

30 The passage states that vertical farming is currently a cost-effective solution for producing staple crops like grains.

31 The writer argues that vertical farming will be most valuable as a complement to, rather than a substitute for, open-field agriculture.

Questions 32–35

Complete the notes below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

Operational Challenges and Characteristics

- One of the primary economic hurdles for vertical farms is their reliance on **32**, which frequently accounts for the highest operational expense.



- Consequently, production is currently dominated by **33**, as these crops command high prices and require less light intensity.
- From an environmental perspective, the theoretical benefits can be negated if the electricity required is generated from **34**
- To improve viability, city planners often suggest repurposing **35** or industrial sites for these agricultural projects.

Questions 36–40

Select the correct answer.

36 What is identified as the main threat to the environmental argument for vertical farming?

- A** The inability to strictly control humidity levels indoors.
- B** The lack of consumer demand for locally grown produce.
- C** A high carbon footprint if the power source relies on fossil fuels.
- D** The technical impossibility of using LED technology efficiently.

37 What does Paragraph E suggest about running a vertical farm successfully?

- A** Once equipment is installed, plant performance is largely predictable.
- B** Farms must test conditions because plants respond differently to settings.
- C** Disease pressure is lower only when plants are spaced far apart.
- D** Taste and texture are unaffected by airflow or humidity.

38 In Paragraph F, the writer indicates that automation mainly changes farming by

- A** shifting labour towards more technical roles.
- B** removing the need for human oversight entirely.
- C** reducing the need for sensors and calibration.
- D** replacing the requirement for skilled staff with volunteers.

39 Which of the following is mentioned as a policy or planning support for vertical farming?

- A** Mandatory replacement of field farms.
- B** Limits on consumer access to imported food.
- C** Subsidies tied only to staple grain production.
- D** Reusing vacant urban sites and abandoned buildings.

40 The writer concludes that vertical farming will most likely



- A** become the primary source of global staple crops.
- B** act as an insurance layer that strengthens urban resilience.
- C** remain purely experimental with no commercial future.
- D** succeed only if it produces grains and tubers profitably.

Answer Key

- 27. YES
- 28. YES
- 29. NOT GIVEN
- 30. NO
- 31. YES
- 32. artificial lighting
- 33. leafy greens
- 34. fossil fuels
- 35. abandoned buildings
- 36. C
- 37. B
- 38. A
- 39. D
- 40. B