



PART 1

Read the text below and answer questions 1–13.

Precision Agriculture: Farming with Data

Precision agriculture (PA), sometimes called smart farming, is transforming how farmers manage their land. Rather than treating a field as one uniform unit, PA recognises that crops, soil, and moisture can vary widely even within a few metres. This shift has encouraged farmers to make decisions based on measurement rather than habit, turning farms into sites where observation and geospatial data increasingly guide everyday choices.

At the heart of PA is the principle of matching action to need. Instead of applying the same amount of water, fertiliser, or pesticide everywhere, farmers aim to deliver the right treatment in the right amount, at the right time, and in the right place. This approach reflects agronomic reality: different parts of a field respond differently to the same input, so blanket treatment can be both wasteful and ineffective. When the field is treated as a set of micro-environments rather than a single surface, interventions can be adjusted to local conditions.

Many visible PA tools focus on precision in field operations. GPS-guided tractors can follow accurate lines across a field, while auto-steer systems reduce overlap and missed areas that occur when human drivers tire or visibility is poor. In practice, these improvements do more than save time: they make applications more consistent, reduce unnecessary repeat coverage, and can lower fuel use by avoiding extra passes. Over a season, even small reductions in overlap can translate into meaningful cost savings.

Variable-rate technology (VRT) extends precision from movement to dosage. Seeders and sprayers equipped with VRT can adjust application rates while moving, following digital prescription maps that assign different doses to different zones. A farmer might apply more fertiliser where yield potential is higher and less where soils are shallow or crop response is limited. Similarly, seeding rates can be increased in areas with good moisture-holding capacity and reduced in zones where plants compete for scarce water. The underlying idea is that resources should be distributed according to what each part of the field can use effectively, rather than assuming uniform response.

Remote sensing provides another layer of insight because it can reveal patterns not easily detected at ground level. Satellites and drones can capture multispectral images that highlight variations in crop condition across whole fields. These images can indicate stress before it becomes obvious to the eye, allowing earlier intervention. They may point to moisture stress, disease pressure, or a nutrient shortage, enabling farmers to respond



before yield losses become severe. Rather than replacing field checks, remote sensing guides them, helping farmers decide where to scout and what problems to investigate first.

Information also comes from below the surface. Soil sensors can measure moisture and nutrient status in real time, allowing irrigation schedules to be adjusted more precisely. Instead of watering on a fixed calendar, farmers can respond to actual soil conditions, reducing both over-irrigation and water stress. When sensor outputs are combined with weather records and past performance, the resulting picture supports better planning and improves long-term record-keeping. Over multiple seasons, these records can help identify persistent weak zones and evaluate whether interventions are genuinely improving outcomes.

Supporters argue that PA offers environmental and economic gains simultaneously. Applying fertiliser only where needed can reduce waste and lessen the leaching of excess nitrates and phosphates into waterways. More efficient machinery routes lower fuel consumption, and targeted spraying can cut pesticide application by treating only affected areas rather than whole fields. Although the technology requires investment, improved efficiency and yield potential can strengthen profitability over time, particularly where input costs are high or environmental regulations are tightening.

Despite these advantages, adoption remains uneven, especially among smallholder farmers. Equipment, software subscriptions, and reliable connectivity can be expensive, and training is often required to interpret the data and translate it into decisions. In some rural areas, unreliable broadband makes data transfer difficult, while poor compatibility between different manufacturers' systems can prevent tools from working smoothly together. These barriers mean that the benefits of PA are not distributed equally, and in some regions the technology remains more promise than everyday practice.

The future of PA is increasingly linked to artificial intelligence. Machine-learning models can combine sensor readings, imagery, and historical records to forecast pest outbreaks, estimate yield potential, or propose management actions under uncertainty. Researchers have also proposed digital twins—virtual versions of real fields that simulate the results of different decisions—so farmers can test strategies before applying them in the real world. If such simulations become practical and affordable, they could shift farm planning toward experimentation, where decisions are evaluated virtually before money, labour, and inputs are committed.

Questions 1–5

Select the correct answer.



1 What is the central idea behind precision agriculture?

- A** Applying the same inputs everywhere to simplify planning
- B** Using measurement to match treatments to local variation
- C** Replacing farm workers with fully autonomous machines
- D** Focusing only on organic methods to reduce chemicals

2 What do GPS guidance and auto-steer systems mainly help to reduce?

- A** Crop disease caused by fungi
- B** The need for digital maps in farming
- C** Overlap and missed areas during field work
- D** The cost of buying seeds and fertiliser

3 What is the key advantage of multispectral images mentioned in the passage?

- A** They can reveal crop stress not easily seen from the ground
- B** They eliminate the need for scouting in the field
- C** They only work when the weather is cloudy
- D** They measure soil nutrients more accurately than sensors

4 What is identified as a major barrier to adoption for some farmers?

- A** The lack of interest in improving yields
- B** The belief that GPS cannot work reliably outdoors
- C** The shortage of satellites and drones in most countries
- D** High costs and problems with connectivity or system compatibility

5 What future development is linked to artificial intelligence in the passage?

- A** The replacement of fertiliser with natural compost only
- B** Virtual field simulations to test decisions before applying them
- C** The end of irrigation because sensors remove the need for water
- D** A single global map that makes all farms identical

Questions 6–9

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

Monitoring Crops and Soil

Satellites and drones can capture **6** that reveal patterns in crop condition. These may point to moisture stress or a **7**, allowing earlier intervention. Another data source is soil sensors, which can measure moisture and nutrient status in **8**



When combined with **9** and historical performance, this information supports more accurate planning.

Questions 10–13

Choose **TRUE** if the statement agrees with the information given in the text, choose **FALSE** if the statement contradicts the information, or choose **NOT GIVEN** if there is no information on this.

10 Soil sensors can help farmers adjust irrigation schedules more precisely.

11 The passage suggests that targeted spraying completely removes the need for pesticides.

12 The passage suggests that the benefits of precision agriculture are distributed equally among farmers.

13 The passage states that digital twins will be cheaper to use than GPS-guided tractors.

Answer Key

1. B
2. C
3. A
4. D
5. B
6. multispectral images
7. nutrient shortage
8. real time
9. weather records
10. TRUE
11. FALSE
12. FALSE
13. NOT GIVEN