Science & Technology · GS - I

Analyze the role of satellite-based technologies in achieving climate-smart agriculture and food security in India.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
15	~250 words

Answer Hint

Remote sensing, crop monitoring, weather forecasting, soil moisture, drought assessment, irrigation management, yield estimation, crop insurance, precision agriculture, climate resilience, food security

Model Answer

Satellite-based technologies can significantly strengthen climate-smart agriculture in India by improving the efficiency, resilience and sustainability of agricultural production. They provide spatial and temporal information that conventional ground-based systems cannot generate at comparable scales.

Remote sensing helps monitor crop health, vegetation stress, soil moisture and land-use changes. Satellite-derived data can identify drought-affected areas, estimate crop acreage and support timely assessment of agricultural losses. This improves crop forecasting and enables governments to plan procurement and food-security interventions.

Satellite-based weather and climate observations also support more accurate forecasts of rainfall, temperature and extreme events. Farmers can use such information for decisions regarding sowing, irrigation and harvesting. Satellite imagery can facilitate precision agriculture by identifying variations in field conditions and enabling targeted application of water, fertilisers and pesticides, thereby conserving resources.

These technologies also support crop insurance and disaster management by providing objective information for damage assessment. Applications through platforms such as ISRO's agricultural and earth-observation programmes can strengthen evidence-based agricultural planning.

However, challenges include limited access among small farmers, technological costs, inadequate digital literacy, cloud cover affecting optical imagery and the need to integrate satellite data with local observations.

Thus, combining satellite technology with extension services, digital infrastructure and farmer-oriented decision support can enhance climate resilience, resource efficiency and India's long-term food security.

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