

Harnessing Digital Technologies to Combat Climate Change in Agriculture

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Introduction:

Agriculture is both a victim and a contributor to climate change. On one hand, farming activities are significantly impacted by changing weather patterns, more frequent extreme events, and rising temperatures. On the other hand, agriculture is a major source of greenhouse gas emissions, contributing to deforestation, soil degradation, and loss of biodiversity. As the world seeks solutions to these pressing issues, digital technologies are emerging as powerful tools to help farmers adapt to and mitigate the impacts of climate change.



The Rise of Digital Agriculture

Digital agriculture involves the use of advanced technologies to enhance agricultural practices. These technologies range from data analytics and artificial intelligence (AI) to drones, satellite imaging, and mobile applications. They enable farmers to make data-driven decisions, optimize resource use, and improve productivity—all while reducing environmental impact. In the context of climate change, digital tools offer innovative ways to build resilience and sustainability into farming systems by the following ways.

1. Precision Farming: Doing More with Less

One of the most promising applications of digital technology in agriculture is precision farming. Precision farming uses data and technology to manage variability in fields more accurately and efficiently. By using GPS, sensors, and drones, farmers can monitor soil conditions, moisture levels, and crop health in real-time. Precision farming helps farmers apply water, fertilizers, and pesticides more efficiently, reducing waste and minimizing the release of harmful chemicals into the environment. By optimizing input use, it also lowers greenhouse gas emissions and conserves resources like water—a critical factor as climate change makes water scarcer in many regions. In India, precision farming technologies are being used to optimize irrigation in water-stressed areas. Drip irrigation systems, combined with soil moisture sensors, ensure that crops receive just the right amount of water, reducing both water usage and energy costs associated with pumping.

2. Smart Irrigation: Saving Water, Saving the Planet



Water scarcity is one of the most immediate threats posed by climate change to agriculture. Smart irrigation systems are designed to address this challenge by using data to deliver water more efficiently to crops. By reducing water usage, smart irrigation systems help conserve a vital resource that is increasingly under pressure from climate change. These systems also

reduce the energy required for irrigation, cutting down on greenhouse gas emissions associated with pumping and distributing water. In developed countries like California, farmers are using smart irrigation systems that rely on satellite data and weather forecasts to determine the optimal watering schedules for their crops. This approach not only conserves water but also improves crop yields, making farming more sustainable and resilient to climate variability.

3. Climate-Smart Advisory Services: Information at Farmers' Fingertips

Access to timely and accurate information is crucial for farmers trying to navigate the challenges of a changing climate. Digital platforms and mobile apps are now providing farmers with real-time weather forecasts, climate risk assessments, and crop management advice. These advisory services enable farmers to make informed decisions about when to plant, irrigate, or harvest their crops, reducing the risk of crop failure due to extreme weather events. By helping farmers adapt to changing conditions, these tools also contribute to long-term resilience in the agricultural sector.



4. Blockchain for Supply Chain Transparency: Greener and Cleaner

Blockchain technology, best known for its role in cryptocurrencies, is finding new applications in agriculture. By providing a transparent and secure way to track food products



from farm to table, blockchain can promote sustainable practices throughout the supply chain. Blockchain can help reduce food waste by improving traceability and accountability in the supply chain. It can also incentivize sustainable farming practices by ensuring that consumers are willing to pay a premium for sustainably produced goods.

5. Carbon Footprint Monitoring: Measuring and Managing Impact

Understanding and managing the carbon footprint of farming practices is key to mitigating climate change. Digital tools are making it easier for farmers to measure their greenhouse gas emissions and identify opportunities to reduce them. By tracking emissions and implementing carbon reduction strategies, farmers can contribute to global efforts to combat climate change. Some digital platforms even allow farmers to earn carbon credits for reducing their emissions, providing a financial incentive for sustainability.

Challenges and the Way Forward

While digital technologies offer immense potential for combating climate change in agriculture, several challenges remain. Access to these technologies can be limited, particularly for smallholder farmers in developing countries who may lack the necessary infrastructure or resources. Additionally, there is a need for capacity building to ensure that farmers can effectively use these tools. To fully realize the benefits of digital agriculture, it is essential to create supportive policies, invest in rural infrastructure, and promote public-private partnerships that can drive innovation and scale up successful initiatives.

Conclusion: A Digital Revolution for a Sustainable Future

As the world grapples with the twin challenges of feeding a growing population and combating climate change, digital technologies are poised to play a transformative role in agriculture. By enabling smarter, more efficient, and more sustainable farming practices, these technologies offer a pathway to a future where agriculture can thrive in harmony with the planet. As we continue to innovate and expand access to these tools, the promise of digital agriculture offers hope for a more resilient and climate-friendly food system.