Krishi Netra

Revolutionizing Indian Agriculture: Farmers Harness The Power Of Artificial Intelligence, Setting A Global Example

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Manuscript No: KN-V2-02/004

The present-day paradigm shift in agriculture is led by the vision of doubling farmers' incomes. We need to emphasize a new approach to science, technology, innovation, extension and education in the agricultural domain, which focuses on science for delivery in place of science for discovery

Artificial Intelligence (AI) in agriculture has been a transformative force, offering innovative solutions to various challenges faced by the farming community. Here's an overview of the key aspects of AI in agriculture:

1. Precision Farming:

- Remote Sensing and Imaging: Drones and satellites equipped with AI technology provide real-time data on crop health, soil conditions, and pest infestations.
- Sensor Technology: AI-powered sensors monitor environmental conditions, helping farmers optimize irrigation, fertilization, and pest control.

2. Crop Monitoring and Management:

Data Analytics: AI algorithms analyze large datasets to predict crop yields, monitor growth patterns, and identify potential issues.

Predictive Analytics: AI models use historical and real-time data to predict crop diseases, helping farmers take preventive measures.

3. Smart Irrigation Systems:

IoT and AI Integration: AI-driven systems analyze weather patterns, soil moisture levels, and crop requirements to optimize irrigation schedules, reducing water wastage.

4. Automated Machinery:

Robotics: AI-powered robots assist in various tasks such as planting, weeding, and harvesting, reducing the need for manual labor and increasing efficiency.

5. Supply Chain Optimization:

Blockchain Technology: AI and blockchain enhance traceability, transparency, and efficiency in the supply chain, reducing post-harvest losses.

6.Market Access and Pricing:

Digital Platforms: AI facilitates online marketplaces, connecting farmers directly with buyers and providing real-time pricing information.

7.Decision Support Systems:

Chatbots and Virtual Assistants: AI-driven chatbots offer real-time assistance to farmers, providing advice on crop management, pest control, and other agricultural practices.

8.Climate Prediction and Risk Management:

Machine Learning Models: AI analyzes climate data to predict weather patterns, enabling farmers to plan and mitigate risks associated with extreme weather events.

9.Crop Quality Enhancement:

Quality Testing: AI is used for quick and accurate assessment of crop quality, helping farmers meet the stringent standards set by traders and processors.

10.Financial Inclusion:

Fintech Solutions: AI facilitates financial services for farmers, including digital payments, loans, and insurance, promoting financial inclusion.

The integration of AI in agriculture has the potential to increase efficiency, reduce resource usage, and improve overall yields. However, challenges such as affordability, accessibility, and data privacy need to be addressed to ensure widespread adoption and benefit for farmers worldwide.

A Case of Struggles of Smallholding Farmers: Navigating Challenges and Seeking Sustainable Solutions in Telangana, India, and Beyond Krishna, a diligent smallholding farmer in Telangana, India, tends to his half-hectare plot daily, earning a modest 9600 per month to meet his family's basic needs. However, he grapples with myriad challenges such as unpredictable monsoons, frequent droughts, pest infestations, and diminishing yields. Climate change and soil health further compound his struggles. Lacking access to formal banking, Krishna resorts to local loan sharks, enduring exorbitant interest rates. Yet, the essential resources he purchases, including seeds, fertilizers, and pesticides, are not always readily available.

Post-harvest, Krishna faces a significant hurdle with 40% wastage in the supply chain. Challenges like logistics, warehousing, and accessing viable markets add complexities for farmers like him. Meeting stringent quality requirements set by traders and processors proves difficult. This perpetuates a cycle of subsistence farming, as low revenues leave little for investment in the next crop cycle.

While technologies like precision farming, digital market access, and drones exist, they remain elusive for most farmers like Krishna due to financial constraints, limited technology access, and time constraints. Fluctuating market dynamics exacerbate these challenges, causing farmers to lose out when prices drop or demand diminishes. Krishna's story resonates with approximately 125 million smallholding farmers in India facing similar daunting challenges, with some resorting to drastic measures like suicide due to financial desperation and weather-induced adversities.

Krishna's predicament extends beyond India; an estimated 500 million smallholder farms globally, supporting nearly 2 billion people, produce about 80% of the food consumed in Asia and sub-Saharan Africa. Effectively addressing the struggles faced by Krishna and his counterparts necessitates a comprehensive, scalable approach encompassing financial inclusion and climate resilience. Creating a more sustainable and equitable future for smallholding farmers worldwide requires collective efforts and innovative solutions.

Need of Artificial Intelligence in Agriculture

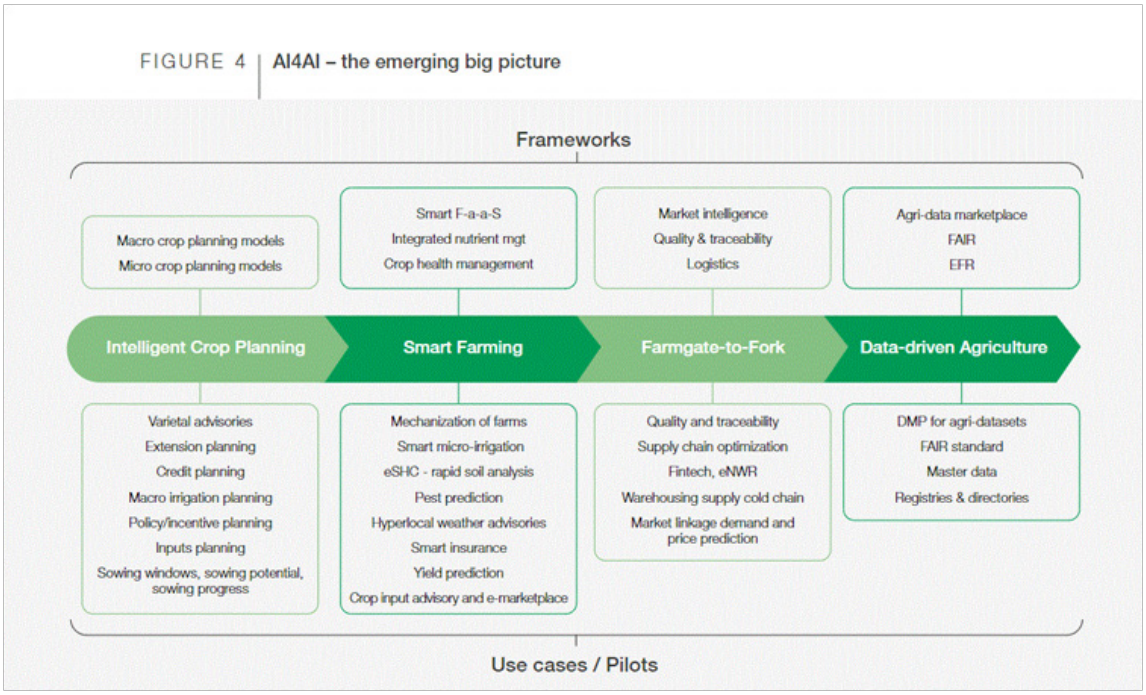
- Subsistence farmers in countries like India battle extreme weather and financial desperation to support their families.
- The AI for Agriculture Innovation initiative held workshops with farmers in India to find out how to help them access the AI tools they need to farm more efficiently and earn more.
- The initiative transformed the chili farming for many in Khammam district, India with bot advisory services, AI-based quality testing, and a digital platform to connect buyers and sellers. Participating farmers reported that they doubled their income.

Using AI for agriculture innovation

The Artificial Intelligence for Agriculture Innovation (AI4AI) initiative was launched in August 2020 by the World Economic Forum's Centre for the Fourth Industrial Revolution India, in active collaboration with the Government of Telangana and support from the Ministry of Agriculture, the National Institution for Transforming India (NITI) Aayog and the Ministry of Electronics and IT. The initiative now has 60-plus partners across the agriculture industry and emerging technology ecosystem, actively collaborating through weekly workshops from October 2020 to March 2021. The initiative's multi-stakeholder community partners have completed a comprehensive review of emerging technology use cases, mapping them against

a matrix of viability and impact, and classifying them as game changers, long-term interventions and easy winsReflecting the complexity of the challenge, organisations involved come from industry (agri-inputs, consumer, food processing, finance, insurance and technology firms), the startup ecosystem and farmer cooperatives.Over eight months starting June 2020, this endeavour held more than 45 workshops, to discuss the challenges smallholder farmers face and how 4th industrial Revolution could help. These discussions lead to a AI4AI plan that helps smallholder farmers by harnessing the power of new technologies including AI, drones and blockchain.

Image: AI4AI Community Paper, March 2021



AI for agriculture can support everything from planning to selling crops.

The AI Revolution in Agriculture: SaaguBaagu Transforms Chilli Farming in Telangana. In a collaborative effort between the World Economic Forum India's Centre for the Fourth Industrial Revolution, India's Union Ministry of Agriculture, and the state of Telangana, a groundbreaking initiative unfolded in the Khammam district. The AI4AI framework, tested among 7,000 farmers, leveraged partnerships with industry and start-ups, in conjunction with state-government data management tools like the agriculture data exchange and the agriculture data management framework.

Dubbed SaaguBaagu locally, this initiative ushered in a new era for chili farming in the Khammam district, integrating bot advisory services, soil testing technology, AI-based quality testing, and a digital platform connecting buyers and sellers. Over the 18-month pilot, spanning three crop cycles, remarkable outcomes emerged. Farmers reported a substantial increase in net income, soaring to $800 per acre in a single crop cycle—effectively doubling the average income. Digital advisory services played a pivotal role in achieving a noteworthy 21% boost in chili yield production per acre. Pesticide use witnessed a significant 9% reduction, fertilizers dropped by 5%, and quality improvements led to an 8% increase in unit prices.

SaaguBaagu not only succeeded in elevating the livelihoods of farmers but also aligned with the sustainability and efficiency goals set by AI4AI. As a testament to its success, in October 2023, the state government expanded SaaguBaagu to encompass 500,000 farmers, spanning five crops across 10 districts. This initiative serves as a beacon illustrating how AI interventions can profoundly impact agriculture, fostering economic growth and sustainability in the process.

Conclusion

The integration of artificial intelligence (AI) in agriculture presents a myriad of opportunities and benefits on a global scale. The potential applications of AI in agriculture are diverse, contributing to increased efficiency, precision, and sustainability throughout the entire agricultural ecosystem.AI technologies, such as machine learning algorithms and data analytics, empower farmers with valuable insights into crop health, soil conditions, and environmental factors. This precision farming approach allows for optimized resource utilization, including water, fertilizers, and pesticides, leading to enhanced productivity while minimizing environmental impact.

The use of AI in predictive analytics enables farmers to anticipate and manage potential challenges, such as crop diseases and pest infestations, fostering proactive and preventive measures. Additionally, AI-driven robotics and automation contribute to labor efficiency, reducing the manual workload and addressing issues related to labor shortages in the agricultural sector.Smart irrigation systems, powered by AI, help conserve water by tailoring irrigation schedules to specific crop needs, thereby promoting sustainable water usage. Furthermore, AI facilitates seamless connectivity between farmers and markets through digital platforms, ensuring efficient supply chain management and fair pricing.

While the global adoption of AI in agriculture is promising, challenges such as affordability, accessibility, and ethical considerations must be addressed. Collaborative efforts from governments, technology developers, and the agricultural community are crucial to ensuring that AI applications in agriculture benefit farmers of all scales, contributing to a more resilient, sustainable, and technologically advanced future for global agriculture.

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