

PRECISION FARMING

AI • IoT • SMART AGRICULTURE

CROP HEALTH ANALYTICS
78%

FIELD OVERVIEW
64%

WEATHER FORECAST
24°C

PREPARED FOR CORPORATE LEADERS & CLIMATE-TECH STAKEHOLDERS

Agriculture & Farming

Precision Farming

This section provides key inputs on Precision Farming Opportunities for corporate leaders.

Highlights

- Precision farming optimizes input use (water, fertilizers, pesticides, energy), improving yields while reducing costs and emissions
- Weather volatility, water stress, and rising input costs are pushing farmers and agri-companies toward data-driven decision-making
- IoT sensors, drones, satellite imagery, AI/ML, and farm management software are now deployable at scale, even for smallholders via service models
- Food processors, FMCG brands, and agri-exporters see precision farming as a pathway to Scope 3 reduction, traceability, and resilient supply

Key recommendations for corporate leaders include:

- Bundle advisory, analytics, and field execution to deliver yield gains, input savings, and resilience—not just data
- Work with agri-input companies, processors, FMCG brands, and FPOs to drive scale and trust
- Lower farmer adoption barriers through subscription, per-acre, or outcome-linked pricing

Opportunity Snapshot: Precision Farming

Use sensors, drones, and AI to optimize irrigation, fertilization, and crop monitoring at farms

Market Signals

- Rising adoption in high-value crops (horticulture, cotton, sugarcane)
- Increasing use of drones, IoT sensors, and satellite analytics
- Annual Market size by 2030: ₹ 6000 - 7000 Cr



What Makes or Breaks It?

- Affordable business models (subscription/pay-per-use via FPOs)
- Accurate data insights (crop health, yield prediction)
- Strong last-mile delivery via agri platforms/FPO networks

Why It Matters NOW?

- Input costs rising (fertilizer, water) hence need for efficiency (10–25% savings)
- Water scarcity driving precision irrigation adoption
- Increasing digitization of agriculture value chains



Well Aligned Opportunity for

- Agri-tech startups and SaaS platforms
- Software, IoT & drone companies
- Input companies (fertilizers, seeds) expanding services



Key Challenges

- High upfront cost for sensors/drones (₹50K–2L per farm setup)
- Low digital literacy among farmers
- Scaling challenges owing to small farm holdings



Business Models

- Offer precision services via FPOs and agri platforms
- Use of AI & SaaS tools for farm analytics and advisory

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Introduction and Business Case

Precision farming uses digital tools, IoT sensors, AI, drones and data analytics to optimise inputs — water, fertilisers, pesticides — and maximise crop yields. It reduces resource wastage, improves farm economics and enhances climate resilience.

For India, where agriculture supports 40% of livelihoods but faces water stress and productivity gaps, precision farming is a transformational lever for food security, farmer incomes and sustainable resource use.

As technology plays a dominant role in precision farming, this presents an early but fast growing opportunity segment for Indian businesses.

Market Potential for Precision Farming in India

Year	Market Size (₹ Cr)	Drivers
2025	3,000-4,000	Adoption of drip irrigation + fertigation, early drone pilots, agri-tech startups.
2030	6,000-7,000	Scale-up of IoT, remote sensing, AI-based crop monitoring; policy incentives.
2040	25,000-30,000	Mainstream use of precision agri platforms; deep integration of robotics and climate-smart farming.

Market Segments and Applications

Segment	Applications	Business Model	Key Drivers
Precision Machinery & Autosteer	Tractors, harvesters, sprayers	Equipment sales + software subscriptions	Labor shortages, productivity gains, operator consistency
GNSS & Positioning Systems	Guidance, machine control, field mapping	Hardware sales + accuracy/service subscriptions	Need for centimeter-level accuracy

Variable-Rate Technology (VRT)	Seeding, fertilization, crop protection	Hardware + per-acre software licensing	Input cost reduction, yield optimization
Digital Farm Management Platforms	Planning, recordkeeping, compliance	SaaS subscriptions + data services	Data-driven decision-making and traceability
Remote Sensing & Crop Monitoring	Satellites, drones, in-field sensors	Data subscriptions + analytics	Early detection of stress, scalable monitoring
Decision Support & Agronomic AI	Prescription maps, yield forecasting	Software + advisory integration	Complexity of agronomic decisions
Autonomous & Robotic Farming	Weeding, harvesting, spraying	Robot sales or Robotics-as-a-Service (RaaS)	Labor constraints and precision needs
Input Optimization & Digital Agronomy	Fertilizer, seed, crop protection planning	Bundled software + agronomy services	Margin pressure and sustainability goals
Data Interoperability & Farm OS	Cross-platform data integration	Platform licensing + ecosystem fees	Fragmented ag-tech landscape
Carbon & Sustainability Analytics	Emissions tracking, reporting	Data services + verification fees	ESG reporting and low-carbon farming demand

Typical Project Capacities & Investments Required in India

Project Type	Typical Scale	CapEx (₹ Cr)	Notes
Smart Irrigation (drip + sensors + automation)	200-2,000 acres	₹12k-35k/acre	Includes soil moisture probes, valves, fertigation; 20-40% water saving.
FPO-led Precision Kits (soil testing + advisory)	1,000-10,000 farmer network	₹25-150 lakh (capex + lab setup)	Portable soil labs, sampling gear, kits; subscription advisory.
Drone Spraying/Seeding Services	5,000-20,000 acres/month	₹15-40 lakh/drone unit	BVLOS-ready fleets; pay-per-acre model.
Greenhouse/Net-ho use with IoT	1-10 acres/site	₹25-80 lakh/acre	Climate control, fertigation, pest monitoring; high-value crops.
On-farm Weather + Telemetry Network	50-200 stations/district	₹5-20 lakh/station	Mesonet feeding advisories, disease/pest models.

Variable Rate Application (VRA) for Large Farms	500-5,000 acres	₹8k-20k/acre	GPS-enabled spreaders, NDVI-guided fertiliser and lime.
Cold-chain + Quality Sensors (PHM)	2-10 collection centres	₹40-150 lakh/centre	Grading, ripening, cold rooms, loggers, ethylene control.

Underlying Technologies & Processes

Element	Options	Key Traits
Sensors & IoT	Soil moisture, nutrient, weather stations	Data-driven input use; improves yields.
GIS & Remote Sensing	Satellite imagery, drone mapping	Crop health monitoring, pest/disease prediction.
Farm equipment	GPS tractors, VRT spreaders, smart sprayers	Precision input delivery; reduces costs.
Decision platforms	AI/ML analytics, mobile advisory apps	Provides real-time, farmer-friendly recommendations.
Irrigation & fertigation	Drip systems, automated pumps, fertigation units	Saves water, improves fertiliser use efficiency.
Robotics & automation	Drones, robotic weeders/harvesters	Reduces labour dependency; improves efficiency.

Key Challenges

Challenge Area	Key Issues	Business Impact	India Specific	Strategic Implications
Smallholder Farm Structure & Adoption Barriers	Fragmented landholdings limit scalability of advanced technologies	Slower market penetration and higher deployment costs	Majority of farms <2 hectares; low mechanization levels	Develop shared-service models and low-cost, scalable solutions
ROI Perception & Financing Constraints	Farmers hesitant to invest in sensors, drones, or digital tools without immediate yield gains	Longer sales cycles and slower revenue growth	Price-sensitive farming ecosystem; limited agri-financing for technology	Outcome-based pricing and pay-per-use models needed

Digital Infrastructure & Data Challenges	Limited connectivity, data quality issues, and low digital literacy	Reduced effectiveness of AI-driven precision solutions	Rural broadband variability; fragmented farm data ecosystems	Offline-capable solutions and simplified interfaces essential
Supply Chain Integration & Offtaker Alignment	Precision farming benefits depend on alignment with buyers and supply chains	Limits value realization beyond farm productivity	Lack of integrated farm-to-market data platforms	Partnerships with agri-processors, exporters, and FPOs required
Regional Agro-Climatic Diversity & Localization Needs	Technologies must be tailored to different crops, climates, and soil conditions	Increased development complexity and cost	India's diverse agro-ecological zones	Localized agronomy models and regional deployment strategies important

Prominent Players in the Indian Market

Company / Entity	Focus Areas
Mahindra & Mahindra (Crop Care, Agri Solutions)	Precision irrigation, soil mapping, mechanisation.
Jain Irrigation Systems	Drip irrigation, fertigation, precision irrigation platforms.
Trimble / John Deere India	Farm machinery, precision tractors, variable-rate tech.
Fasal (Agri-tech startup)	AI + IoT-based farm advisory and crop monitoring.
CropIn	Satellite & AI-driven precision agriculture platforms.
Stellapps	IoT for dairy and farm productivity.

Innovation Perspectives

Innovation	Business Opportunity	For Senior Management
Farm Operating Systems (Farm OS)	Own the farmer's digital backbone	High switching costs and recurring platform revenue
Autonomy as a Service	Robot fleets sold as a service	Converts capex-heavy

		equipment into predictable annuity
AI-Driven Agronomic Intelligence	Sell yield and cost outcomes, not tools	Differentiation shifts from hardware to intelligence
Interoperability & Data Brokerage	Become the “neutral layer” of ag data	Captures value in fragmented ecosystems
Input Optimization Platforms	Performance-linked pricing with input savings	Aligns vendor revenue with farmer ROI
Digital Compliance & Sustainability Stack	ESG-ready farm data products	Turns regulation into monetizable service
Edge Computing on Farm Equipment	Low-latency, offline AI advantage	Reduces cloud dependency and improves reliability
Smallholder Precision at Scale	Emerging-market platform dominance	Accesses massive under-digitized acreage
Data-Enabled Financing & Insurance	Embedded finance via precision insights	New revenue streams beyond farming tools
Outcome-Based Pricing Models	Pay-for-performance contracts	Builds trust and accelerates adoption

Concentric & Satellite Opportunities

- Smart irrigation and fertigation integrators: Turnkey providers bundling drip, soil sensors and remote valves into outcome-linked water and input savings contracts.
- Drone analytics and crop-health services: Fleet operators offering spraying, imaging and NDVI diagnostics-as-a-service for FPOs and insurers.
- Agri IoT device and data platform manufacturers: Concentric OEMs producing soil, weather and nutrient sensors integrated with open APIs and cloud dashboards.
- Digital agronomy marketplaces: Platforms combining precision input recommendations, financing and offtake channels under one farmer app.
- Carbon & soil-health credit developers: Ventures quantifying input reduction and regenerative practices to monetise carbon and biodiversity credits.
- Agri-fintech and insurance enablers: Credit and coverage products tied to verified sensor/dataset evidence of productivity and climate resilience.
- Cold-chain & grading innovations: Satellite integration of IoT-linked ripening, traceability and quality-linked procurement for precision-grown produce.

Key Takeaway for Senior Management

Takeaway	Details
Precision farming is becoming core agricultural operating infrastructure, not an agri-tech add-on	<ul style="list-style-type: none"> • It directly drives productivity, cost efficiency, and resilience—critical under climate volatility • Examples: variable-rate fertilization, precision irrigation, site-specific pest control • Recommended innovation focus: integrated decision-to-execution systems • Competitive advantage: measurable yield gains and cost savings competitors relying on advisory-only tools can't match
Outcomes matter more than tools	<ul style="list-style-type: none"> • Farmers and value-chain partners pay for results, not data • Sub-components: input optimization, yield forecasting, crop health alerts, execution workflows • Recommended innovation focus: outcome-led solution design with field-level execution
Data integration across the stack is the real moat	<ul style="list-style-type: none"> • Value emerges when multiple data sources are fused • Examples: satellite imagery + soil sensors + weather models + farm records • Competitive advantage: superior recommendations and scalability versus point solutions
Value-chain anchoring accelerates scale and trust	<ul style="list-style-type: none"> • Adoption scales faster when embedded in procurement and input ecosystems • Examples: FMCG-led sourcing programs, processor-linked advisory, FPO partnerships • Competitive advantage: guaranteed demand, faster scale-up, and defensible distribution
Precision farming is a gateway to monetization beyond yield	<ul style="list-style-type: none"> • Field-level data enables traceability, carbon accounting, and sustainability claims • Examples: MRV for regenerative practices, input emissions reduction, quality assurance • Recommended innovation focus: data reuse for ESG and carbon markets • Competitive advantage: additional revenue streams and strategic relevance to corporates

Next Steps for Corporate Leaders

Precision farming is becoming a strategic lever for agricultural productivity, resource efficiency, and Scope 3 emissions reduction across food, FMCG, retail, and textile value chains. Digital agronomy, remote sensing, IoT sensors, variable rate application, soil analytics, and data-driven advisory are enabling input optimization and yield enhancements with reduced water, fertilizer, and pesticide intensity. As traceability, climate resilience, and regenerative sourcing commitments expand, precision agriculture is shifting from tech-first pilots to integrated supply chain programs that link growers, processors, and corporates.

This could be an attractive climate tech opportunity for industries and firms in specific sectors and industries keen on catering to this market.

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