Smart Agricultural Machinery - Technologies and Solutions *(Indian Perspective)*

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Indian Agriculture

- **Agriculture 1.0** - manual labour with traditional tools (around 1900)
- **Agriculture 2.0** - manual, animal, power tiller and tractor operated tools, implements and machinery - helped farmers to produce more with less effort (1920 - 2010)
- **Agriculture 3.0** - precision agriculture (PA) with “5R” (2010 - 2015)
- **Agriculture 4.0** - Digital farming or Smart farming (2016 - 2025)
  - Internet of Things: Collecting information
  - Big Data: Analysis of massive data
  - Robotics and Artificial Intelligence (AI)
Cost effective solutions that drive down input costs and minimize cost of ownership but more importantly reduce drudgery of workers.

- Drive down cost of ownership and reduce downtime
  - Custom hiring or contract farming
  - After sale service and support
  - Logistic management tools

- Smart farm mechanization
  - Gender neutral farm implements and machinery
  - Whole tractor/system efficiency improvement
  - Supervised autonomy – push a button and it works
  - Full autonomy – long term
AgriTech themes are based on

- **Farming as a service (FAAS)** – app based farmer to farmer aggregation platform
- **Big data** – collection of data to help farmers take smart decisions
- **IoT** – GPS, sensors, automated hardware, robotics etc.
- **AI** – weeding, spraying and harvesting can be AI enabled – accuracy and higher productivity
Smart Farming Techniques

- **Data collection or field mapping** (sensor technology, GPS and GIS)
- **Data saving** (cloud-based, shareable for wider area analytics)
- **Tracking and monitoring** (technique might require cameras, drones, tags, etc.)
- **Predictive analytics** (Analytic software)
- **Warehousing** (solar-powered refrigerators)
- **Labor work** (automation, drones, and robotics are helpful)
- **Energy saving** (smart system to cut down energy consumption)
OEM & Startup Companies in Rental/CHC Business

Different Companies in India

- Mahindra Trringo
- EM 3 Services
- J Farm Services by TAFE
- ECS/Traxi
- Gold farm
- Oxen farm Solutions
- Farmart
- Ravgo
- Agrostar
- Zamindara Farming Solutions
Crop Health Monitoring

SPAD meter (2 licensee)

Hand-held device for disease identification

Uniform rate spraying system

Ultrasonic sensor based sprayer
Seeding, Planting and Fertilizer Applications

- Ground speed sensor based seed cum fertilizer drill
- Palletized rice seeder
- GPS based variable rate fertilizer applicator
- Robotic vegetable transplanter
Enhanced Water Use Efficiency

Automatic irrigation system for rice

Water stress indices using thermal imaging

Controlled level puddling (one licensee)

IoT based drip irrigation system
Harvesting

Yield mapping and monitoring

Yield estimation using DL

Robotic harvesting of apples
Remote Control Machinery/Power Units

Remote control power tiller

Unmanned rice transplanter

Real time monitoring system

Autonomous tractor
Automation in Post-harvest Agriculture

Automated packing line for horticultural produces

Radiography set up

Sensor for food-grains storage monitoring
Drones in Agriculture

Crop Health Scouting/Monitoring

Monitoring Field Conditions

Spray Application

Crop Counting

Crop Yield Potential

Irrigation Monitoring and Planning

Leak Detection

Security

Drone Pollination

https://www.croptracker.com/blog/drone-technology-in-agriculture.html
Benefits of Smart Agriculture

- **Improve machinery:** high-quality and energy efficient machinery
- **Precise data:** predictions or actions based on accurate data
- **Environmental friendly:** minimize pesticide use, enhance water use efficiency, manage waste efficiency
- **Efficient management and cost-effective:** management costs can be reduced or allocated to maintain the technology
- **Low risk:** predict any disaster that might happen to the farm whether it is viral diseases or climate change
Lessons Learned and Recommendations

➢ Numerous opportunities for adoption of Smart farm machinery are for:
  ▪ increasing productivity
  ▪ reducing cost of production
  ▪ improving inputs application and utilization efficiencies and
  ▪ reducing environmental pollution and soil degradation.

➢ Farmers are not presently equipped to adopt smart agriculture technologies - need support from Government and private sector at initial stage.
Lessons Learned and Recommendations

- Need to be selective in adoption of precision farming in India
- Reliability of equipment/technology and effective coordination - Vital
- In future, agriculture will be dominated by precision and cloud data with cost effective technologies like smart tractors, unmanned aerial vehicles and wireless technology.
Thank You

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