



Artificial Intelligence and green
technologies for resilience

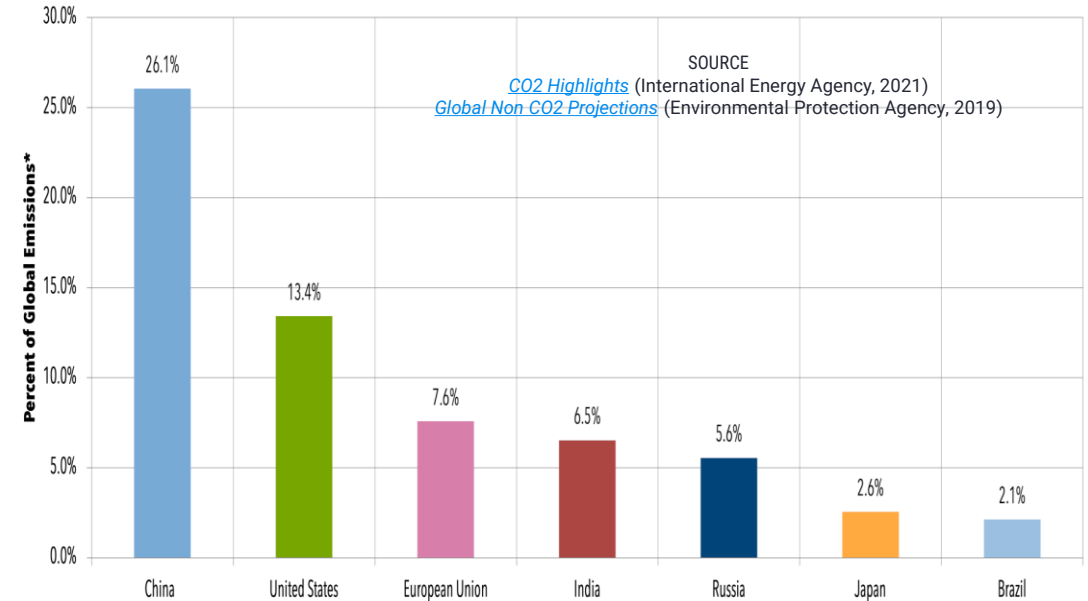
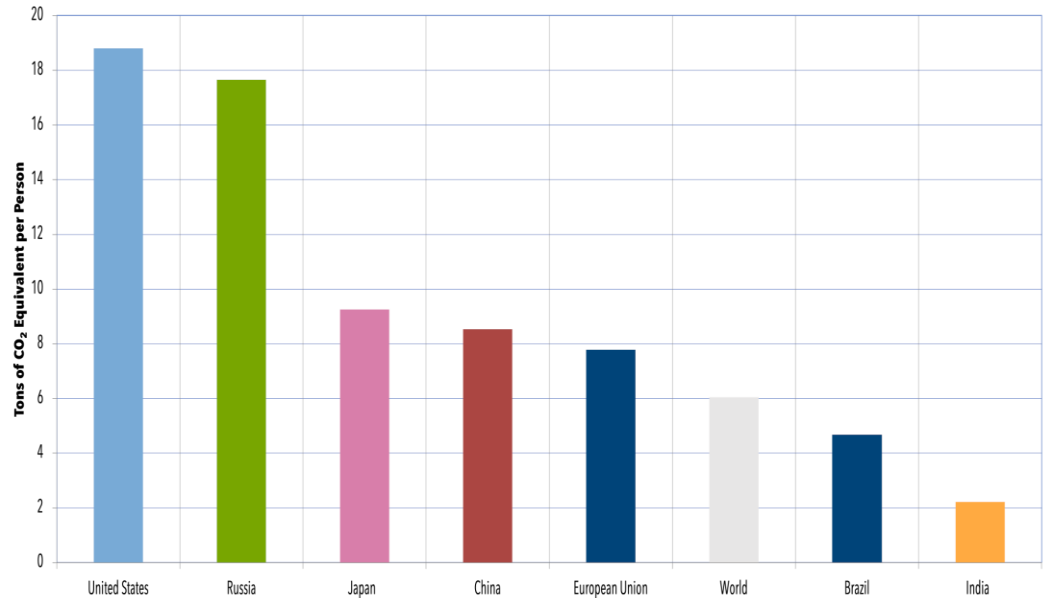
Centre for the 4th Industrial Revolution

Climate Change Dimensions

Climate change directly or indirectly attributed to human activity, that alters the composition of the global atmosphere is one of the most complex issues facing us today and involves many different dimensions, including

- Economics- Disruption of Industries, Infrastructure Costs, Insurance and Financial Risks
- Society- Displacement, Food security, Health
- Politics- Geopolitical tensions and International Cooperation, Policy development
- Moral and ethical questions- Intergenerational equity, Global justice, Biodiversity eco-systems
- Science- Sea level rise, global warming, extreme weather events

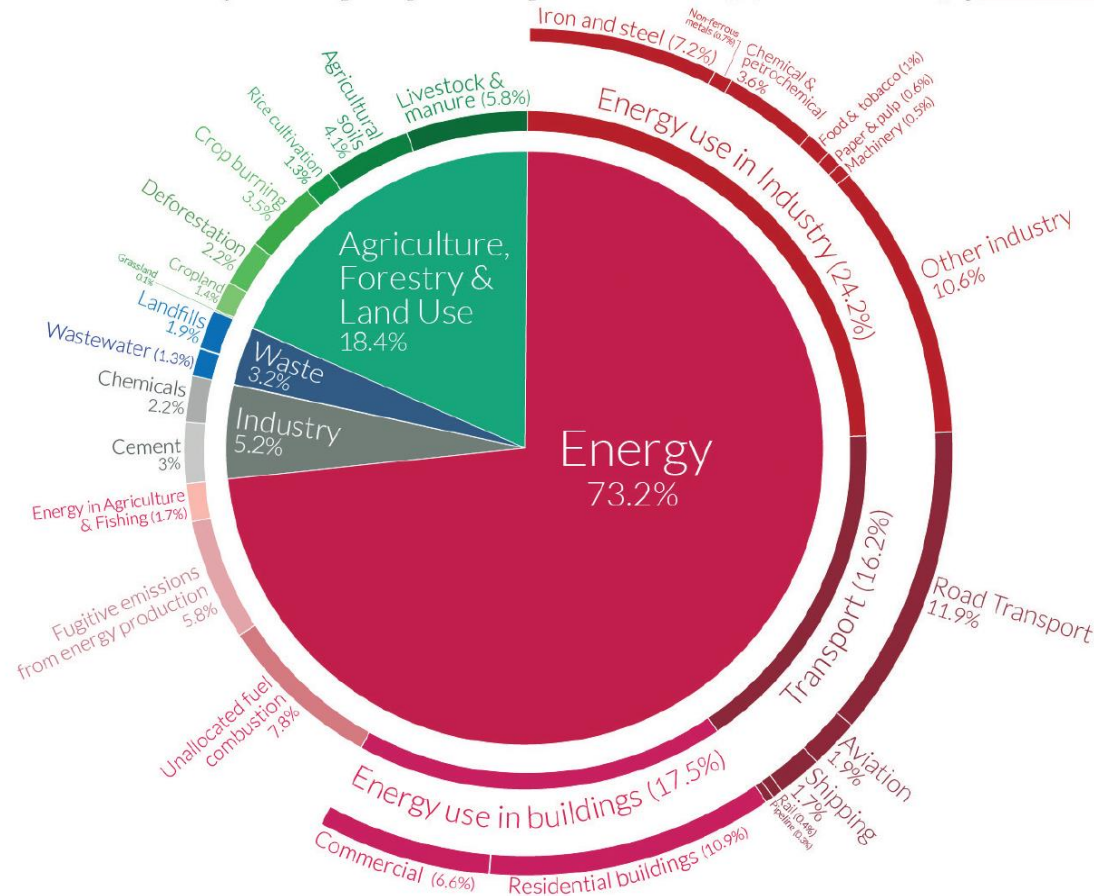
Greenhouse gas emissions



- US accounts for 25% of Global cumulative emissions and EU at 22% (India is ~3%, China is 12.7%)
- GHG yearly emissions – China accounts for 26.1 % and USA at 13.4%, India is 6.5%
- Per capita GHG Emissions- USA is 18 Tons, China and EU at 8 Tons vs India at 2 Tons

Greenhouse gas emissions

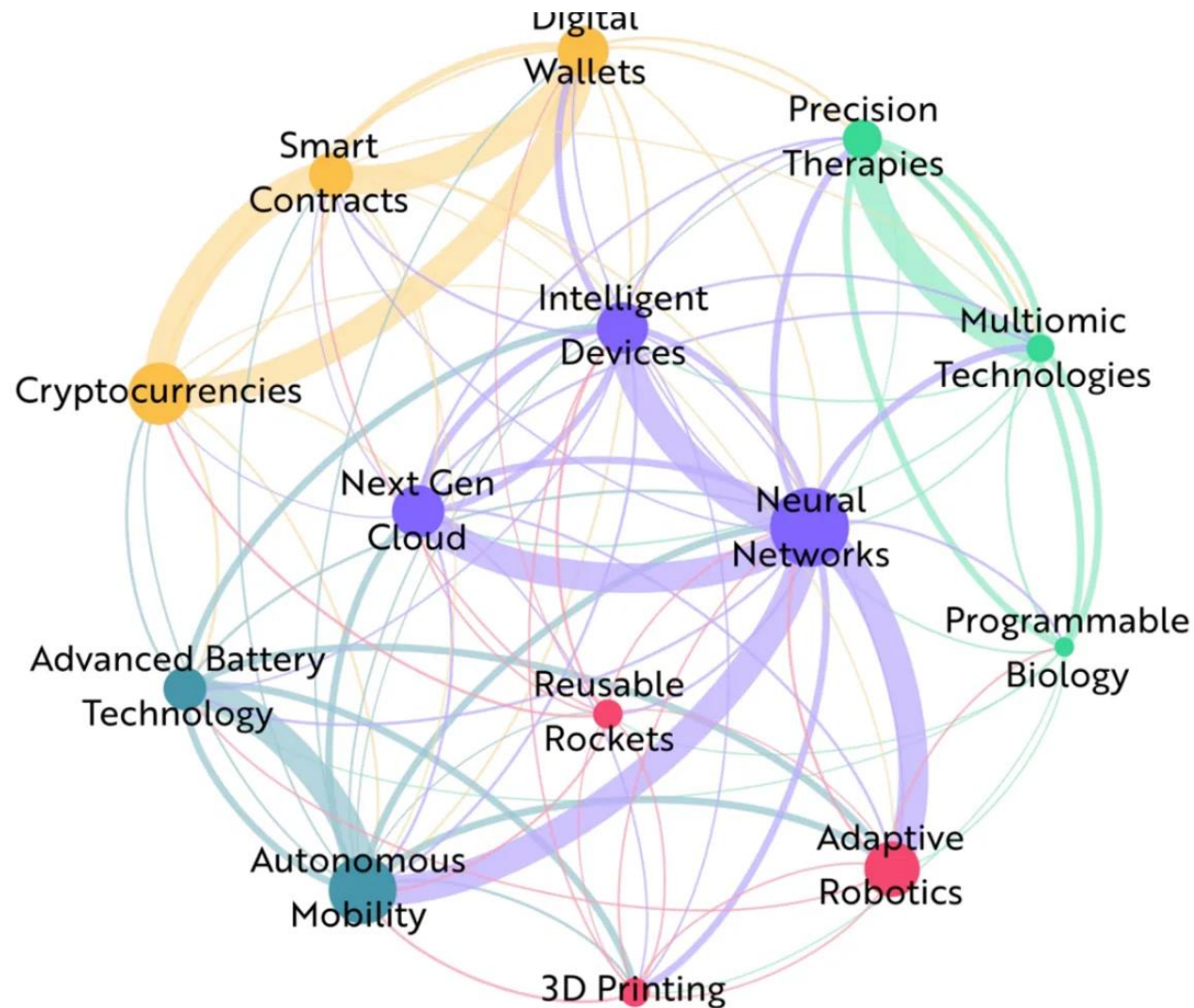
Global greenhouse gas emissions by sector Our World in Data
 This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.



- CO2 resulting from the burning of fossil fuels comprising the highest share – around two-thirds - of all GHGs.
- It is estimated that the annual monetary value of Biodiversity ecosystem (Soil, water, air and living things) services is around US\$125tn to US\$140tn more than 1.5 times the global GDP
- Technological innovation and moving from a linear to a circular economy has the potential to reduce the need for virgin resources

OurWorldinData.org – Research and data to make progress against the world's largest problems.
 Source: Climate Watch, the World Resources Institute (2020). Licensed under CC-BY by the author Hannah Ritchie (2020).

AI and 4IR Technologies



- Unpredictability on time horizon for maturity of technology cycle
- Disrupting current eco-systems and mitigating transition impact
- Impact- Economical, Social, Technology, Political, Environmental
- Regulatory Governance challenges (Safety, Security, Intellectual rights, Standards and Interoperability, Accountability, Transparency)
- Ethical challenges (Privacy, Trust, Inclusivity, Biases)

4IR for Climate Mitigation and Adaptation



Renewable Energy

Smart Grids

Predictive Maintenance

AI-driven Weather

Predictions:

Autonomous Inspection

Drones

Digital Twins



Sustainable Agriculture

Precision Agriculture

AI driven digital advisories

IOT driven logistics and storage

Market connect platforms

Drone as a service



Green Transportation

Electric and Autonomous Vehicles:

Traffic optimization

EV Vehicles infrastructure

Connected vehicles

Shared Mobility and Fleet



Carbon Capture

AI in Enhanced Oil Recovery (EOR)

Creating digital twins of carbon capture plants

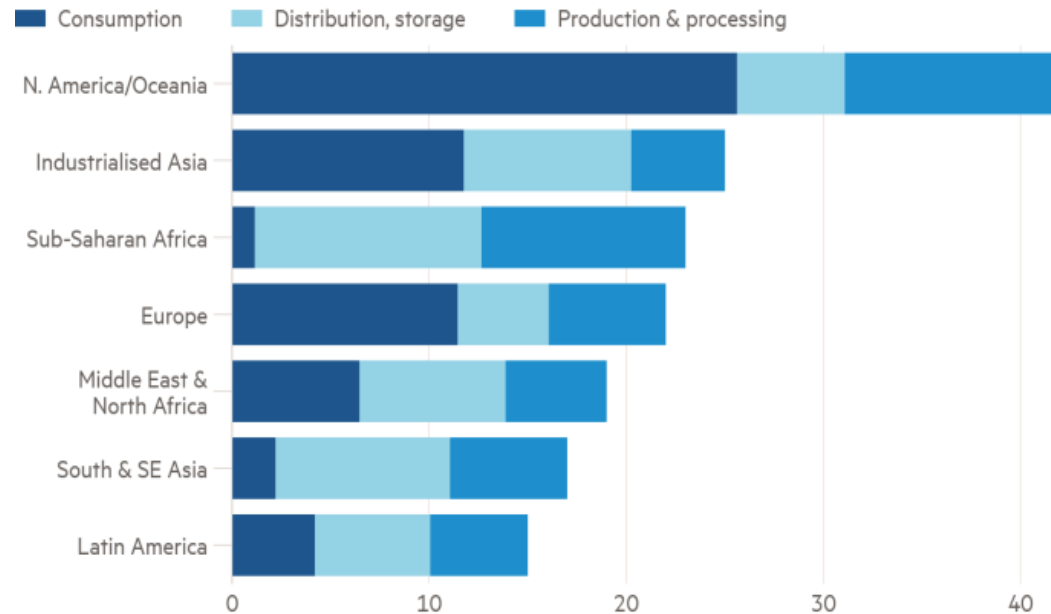
Blockchain transparency

AI-driven Carbon Footprint Management

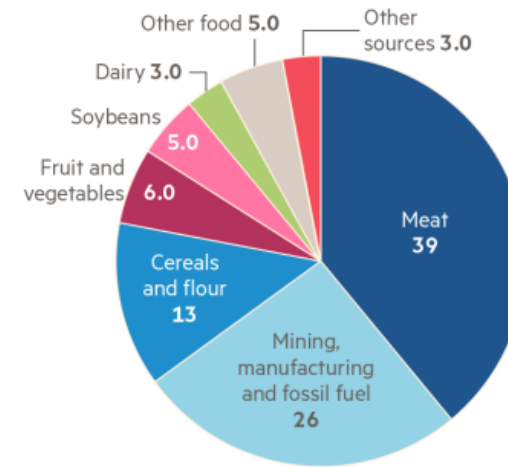
Case Study- Agriculture

Huge proportion of food is wasted, Patterns differ

% of calories lost & wasted, by stage of process



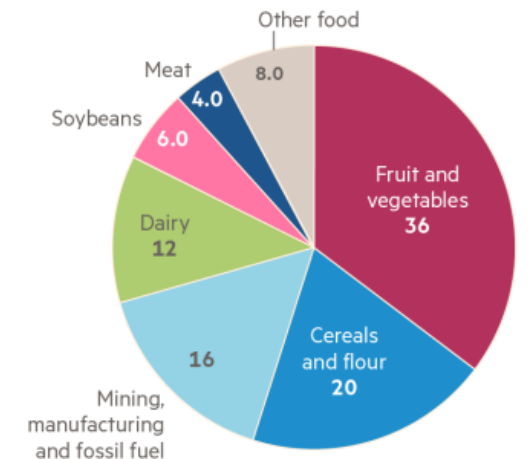
- A huge amount of food is wasted and so, in effect, are the land, water and other resources that went into production.
- In advanced countries, food is wasted predominantly by households while, in developing economies, most waste occurs due to inefficient production and distribution.



Source: Li et al, Nature Food © FT

Fruit and vegetables account for a low share of food production emissions...

Share of CO₂-equivalent emissions by source (total=7.1 gigatonnes)



...but they are the biggest contributor to food-miles emissions

Share of CO₂-equivalent emissions by source (total=3 gigatonnes)

Leveraging AI for Agriculture Innovation- (Impact case study)

Driving Chilli value chain transformation through agritech in Khamman (Saagu Naagu)

Climate Change Impact

- Reducing Yield
- Pest Infestation
- Droughts and Floods
- Food Security and Livelihood

Approach to Value Chain Transformation

- Integrating agritech in a crop value chain based on the challenges identified through value chain studies
- Create ease of agritech services delivery to the end customer through administrative and policy support
- Facilitate industry consultations to align government and private sector interest and expectations to drive the transformation

AI4AI Impact Case Study	
Farmer Metrics	Incremental Impact
Yield	+21%
Fertilizer	-5%
Pesticide	-9%
Increased Income	\$850/ Acre



Crop advisory using AV/Chatbot



AI based soil testing; result in 20-30 mins



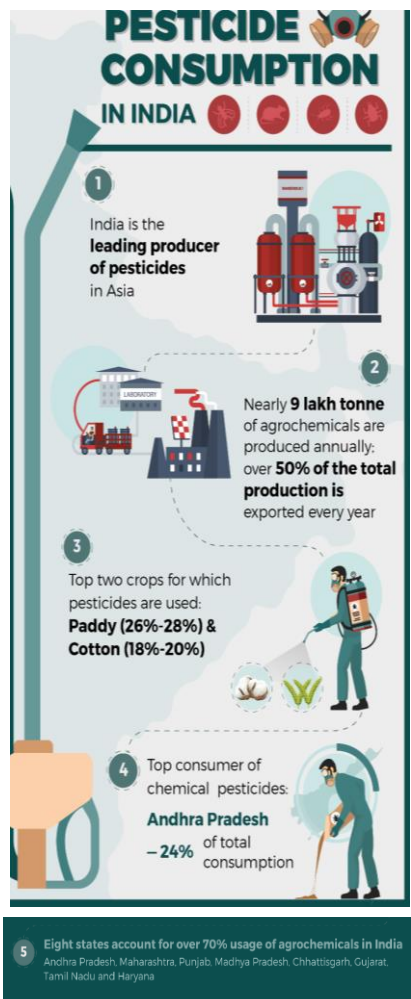
AI based quality testing and certification



Connecting FPOs to market using e-commerce

‘Buoyed with the Artificial Intelligence for Agriculture Innovation (AI4AI) initiative under which 7,000 chilli farmers have access to agritech services- AI-based advisories, soil testing, produce quality testing and e-commerce , the Telangana State government is planning to scale up agritech services to 100 thousand chilli and groundnut farmers in three districts in Phase II by 2025’

Pesticides Impact - Leveraging AI



- Environmental impact

- Only 2% of sprayed pesticide impact target species
- Impact on aquatic system- Rivers, streams and ground water
- Deleterious effects of pesticides on soil microorganisms

- Overuse of Pesticides- Hazardous to life

- 30% of pesticides used are hazardous, Pesticide residues in food system
- Approx. 8000 deaths annual, Diseases- Cancer, Birth defects, Endocrine sys

- High crop losses in India due to pest attacks

- Average 14% crop value losses due to pests
- Overuse causing insecticide resistance and pests revival

- Higher input costs to farmers

- Excessive usage due to fear of pests and recovery of at least the input cost
- Indebtedness and Farmer suicides

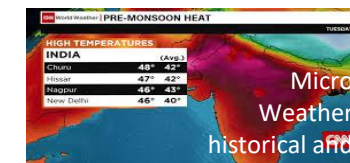
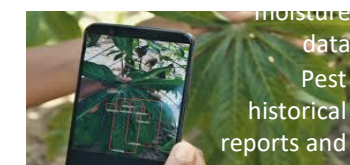
- Lacking Agriculture Inputs advisory services

- Dependence on input dealers for advisories
- Human and AI based agriculture input services required

Solution

Artificial Intelligence based Early warning system to provide smart farm-based advisories for Pest

- Calculate Pest density on Pest trap images
- Economic threshold Limit of Pest
- Recommended advisory on application- Timing, Type and Quantity of Pesticide



25% Higher Income, 17% Better Yield- 17000 Farmers in Maharashtra, Telangana, Karnataka

Smart Irrigation- Leveraging AI

- Agriculture accounts for 70% freshwater withdrawals
- 53 % of cultivated land is monsoon dependent.
- India's Irrigation Efficiency- 38%
- Micro irrigation deployment -12%

- Resource Visibility
 - Total water availability from surface, ground and soil moisture
 - Short and long-range forecasts
- Water Budgeting Village level
 - Currently command area efficiency is up to 80%
 - Total water demand analysis, Surplus & deficit regions and balancing budget
 - Water not received as allocated due to losses (ET, Percolation), Conjunctive use of ground water , Ensuring equitable distribution of water
- Real Time Crop stress identification
 - Identify crop stress based on water supply, forecast and crop phenology,
 - Crop stress monitoring, Uneven rainfall distribution both spatially and temporally, Fragmented visibility, Forecast vs stress, irrigation advisories,
- Water Supply Monitoring
 - Monitor water supply from source till farm to ensure crop stress mitigation
 - Monitoring releases, Monitoring canal performance, Monitoring release vs offtake points till tail end, Command Area Irrigation Schedule
- Lacking Smart Irrigation Infrastructure and Practices
 - Lacking smart irrigation adoption, Lack of conservation infrastructure, Over exploitation of groundwater
 - Crop diversification for climate resiliency

Solutions

Remote Sensing

Remote sensing data clubbed with deep-tech AI to monitor crop sown area and crop water stress

AI based Weather Forecasts

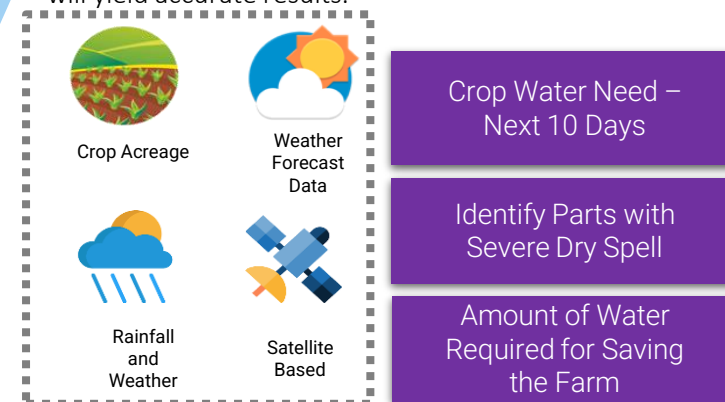
Ensemble forecast with micro level grids to ensure data granularity for true to ground data

IOT & Crowdsourcing

Soil moisture and piezometer sensors and mobile app data integrations with ML models

Drone Water Shed Planning

Higher resolution of Drone survey Digital elevation model will yield accurate results.



The timely advisories that was raised, led to savings of 25,796 ha of Groundnut Crop in AP- 2018-19

THANK YOU

Centre for the Fourth Industrial Revolution India

Reliance Corporate IT Park Ltd (Building 1)

5 TTC Industrial Area,

Thane Belapur Road

Ghansoli, Navi Mumbai, 400701, India