



Indonesia AI
AI for Everyone, AI for Indonesia

Paper Sharing Session

AI for Agriculture

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Indonesia AI

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Paper #1

Everything You Wanted to Know About Smart
Agriculture (2022)

Paper #2

Improving **Rice Productivity** in Indonesia with
Artificial Intelligence (2019)

Paper 1

Title: Everything You Wanted to Know About Smart Agriculture

Author: Alakananda Mitra, Sukrutha L. T. Vangipuram, Anand K. Bapatla, Venkata K. V. V. Bathalapalli, Saraju P. Mohanty, Elias Kougianos, Chittaranjan Ray*

Date: 13 Jan 2022 (submitted)

<https://arxiv.org/abs/2201.04754>

What will be discussed

- Present (technology) applications
- Technological trends
- Available datasets
- Networking options (?)
- Challenges
- Open problems

of smart agriculture

What's with agriculture?

- World population increase -> higher food demand
 - “Zero Hunger” goal
 - Malnutrition
- Urbanization -> changing food habits - consuming more animal protein
- Depleted natural resources (more farmland getting unsuitable) - water scarcity
- Deforestation by urban or farmland expansion - soil erosion by overfarming
- Rapid climate change (GGE doubled in the past 50 y)
- Food wastage (30-50%)

Why AI for agriculture?

- Need more **efficient**, sustainable, and *eco-friendly* smart agriculture
- Agriculture 4.0

Smart Agriculture Overview | Agriculture 4.0

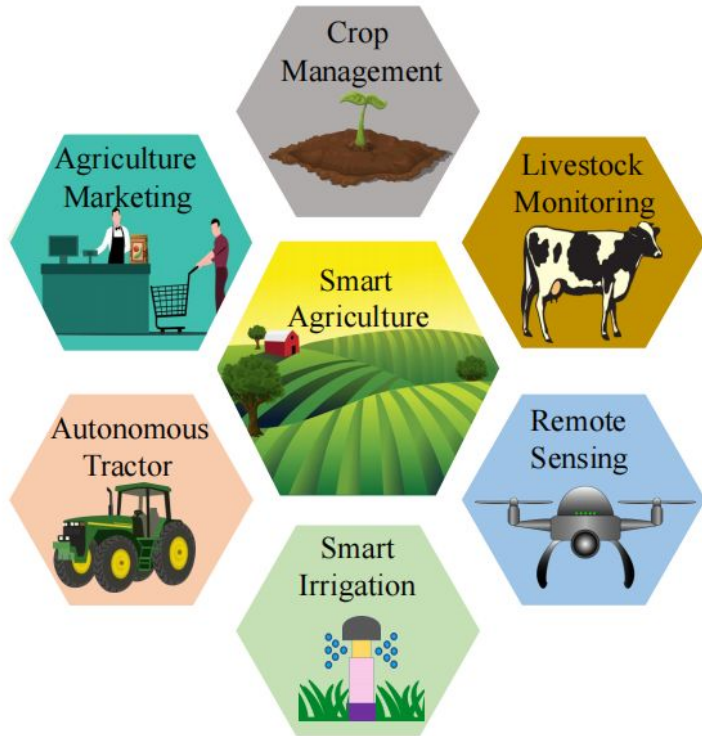


Figure 1: Smart Agriculture Overview.

Precision Farming/Agriculture

goal: optimization, accuracy, customized solutions

Digital Farming

Precision F/A + technologies

Smart Agriculture Overview | Agriculture 4.0

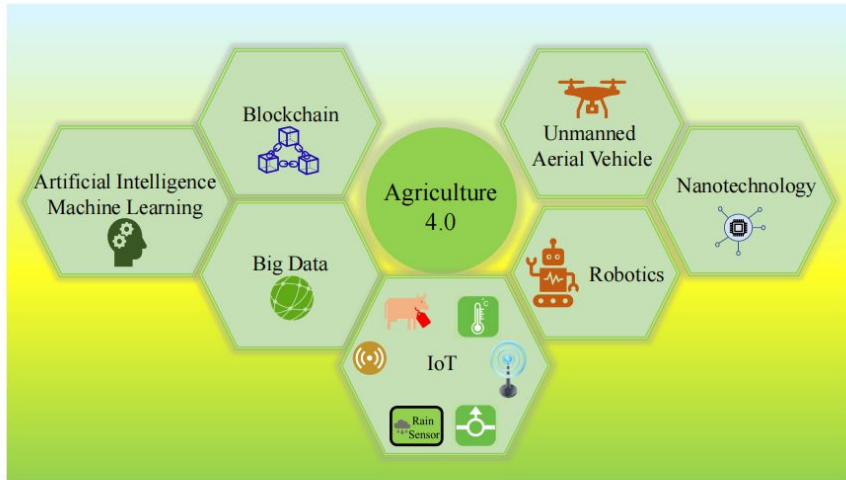
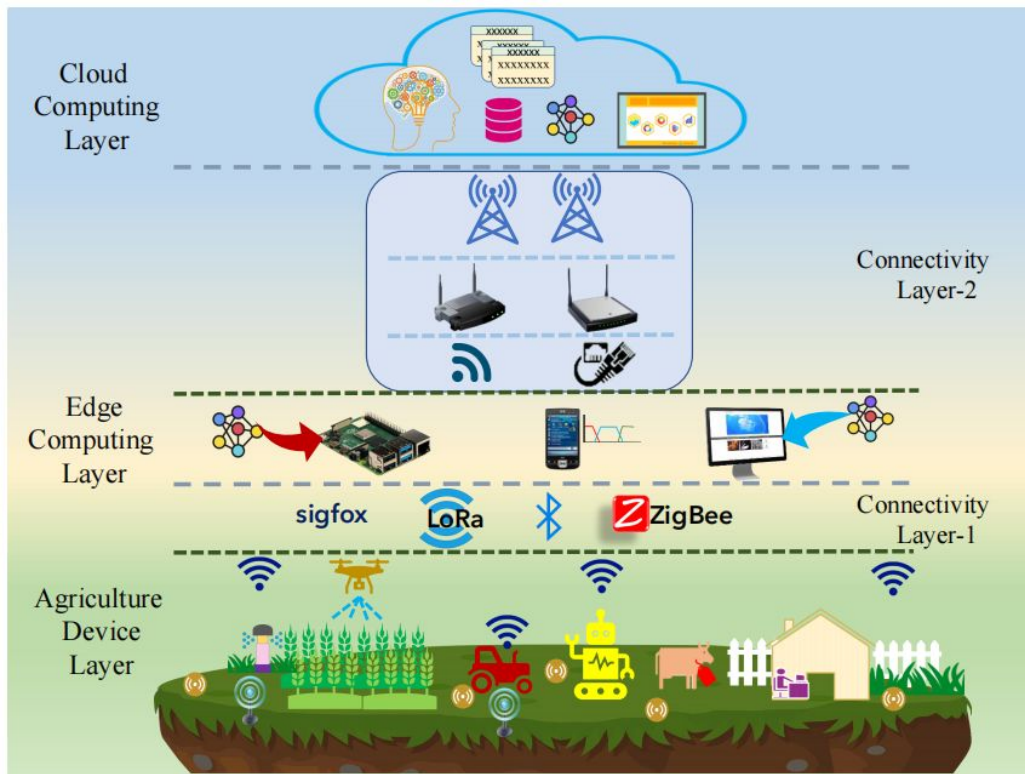


Figure 2: Elements of Agriculture 4.0.

- Water conservation.
- Optimization of the use of fertilizers and pesticides -> more toxin free and nutrient rich.
- Increased crop production efficiency.
- Reduction of operational costs.
- Opening up of unconventional farming area in cities, deserts.
- Lower greenhouse gas emissions.
- Reduced soil erosion.
- Real time data availability to farmers.

Smart Agriculture's Architecture Layers



Agriculture Device Layer

- sensor
- green houses
- tagged animals
- aerial vehicles
- robots
- automated fencing
- etc

Figure 4: Architecture of Smart Agriculture.

Smart Agriculture's Architecture Layers

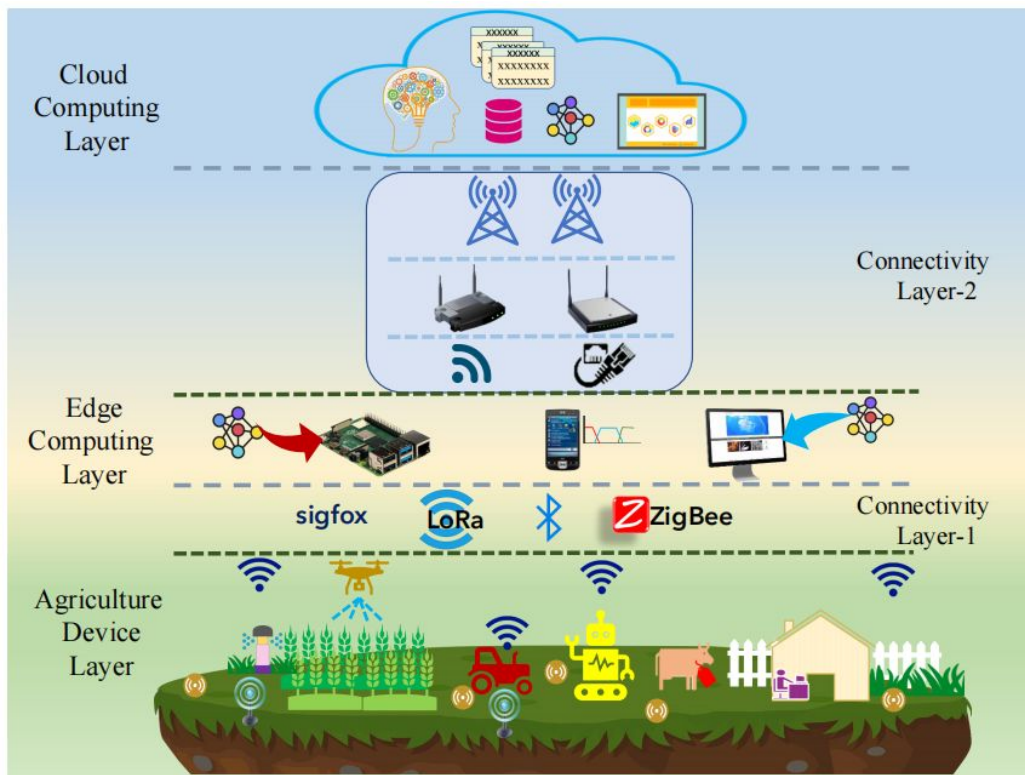


Figure 4: Architecture of Smart Agriculture.

Edge Computing Layer

- processing data
- data safety
- can have AI (Edge-AI, Tiny-ML)

- Arduino
- Raspberry Pi
- Intel Edison

Smart Agriculture's Architecture Layers

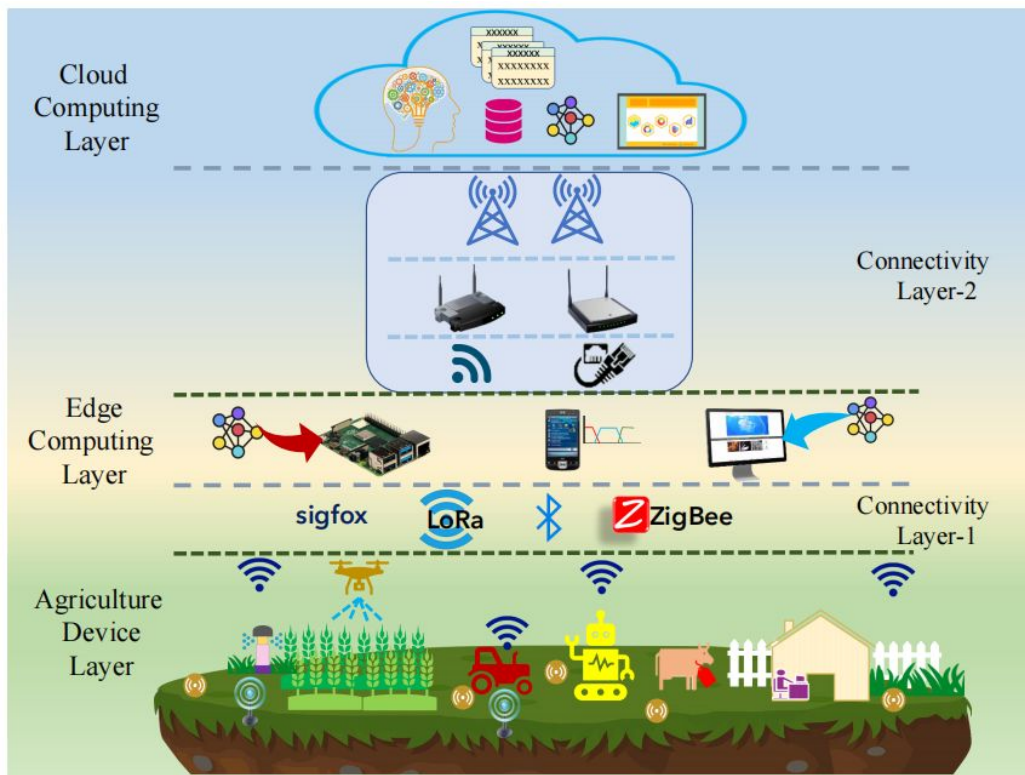


Figure 4: Architecture of Smart Agriculture.

Cloud Computing Layer

data can be accessed anywhere for

- processing
- analyzing
- saving

- (+) high power, performance
- (-) latency and bandwidth
- (-) security and privacy of data

Sensors

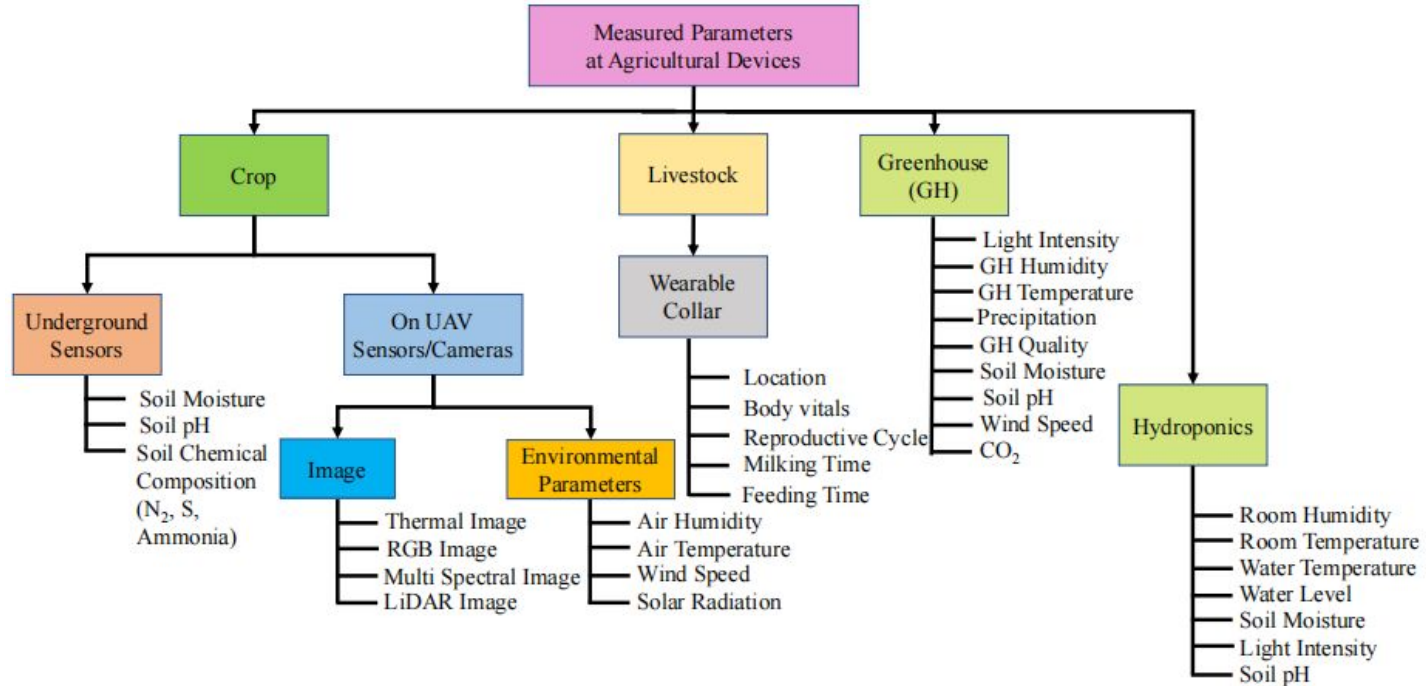


Figure 5: Sensor Parameters in Various Sectors of Smart Agriculture.

Connectivities

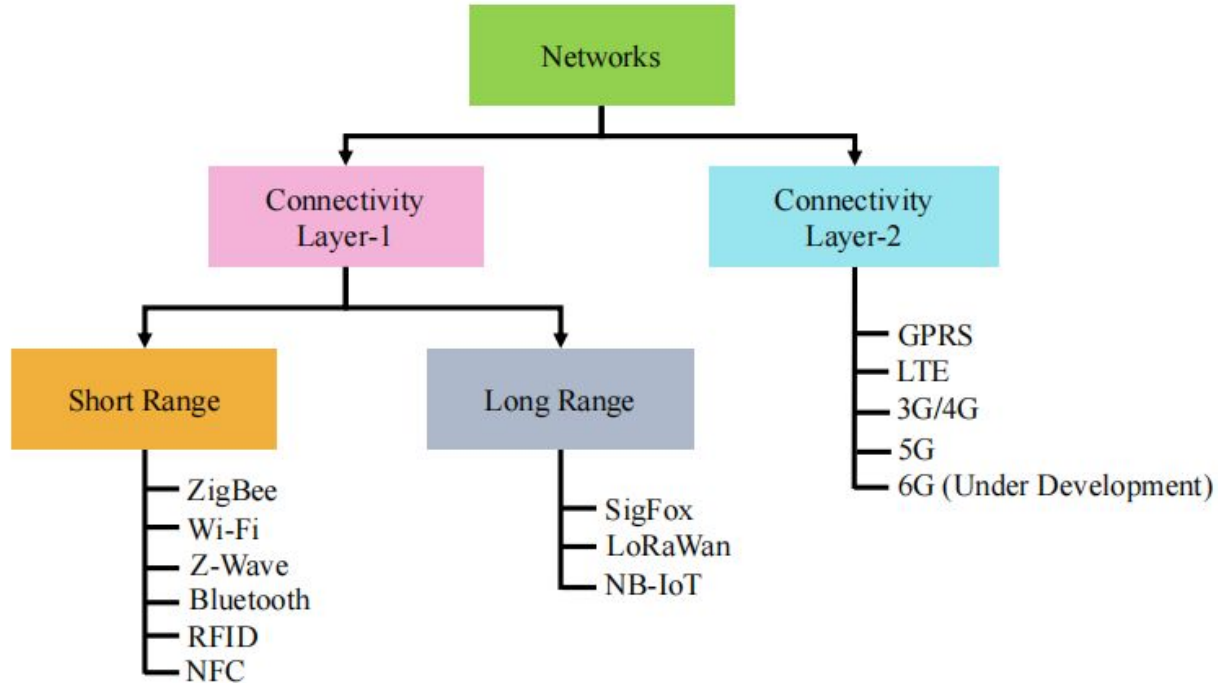


Figure 6: Various Networks for Smart Agriculture.

The Process

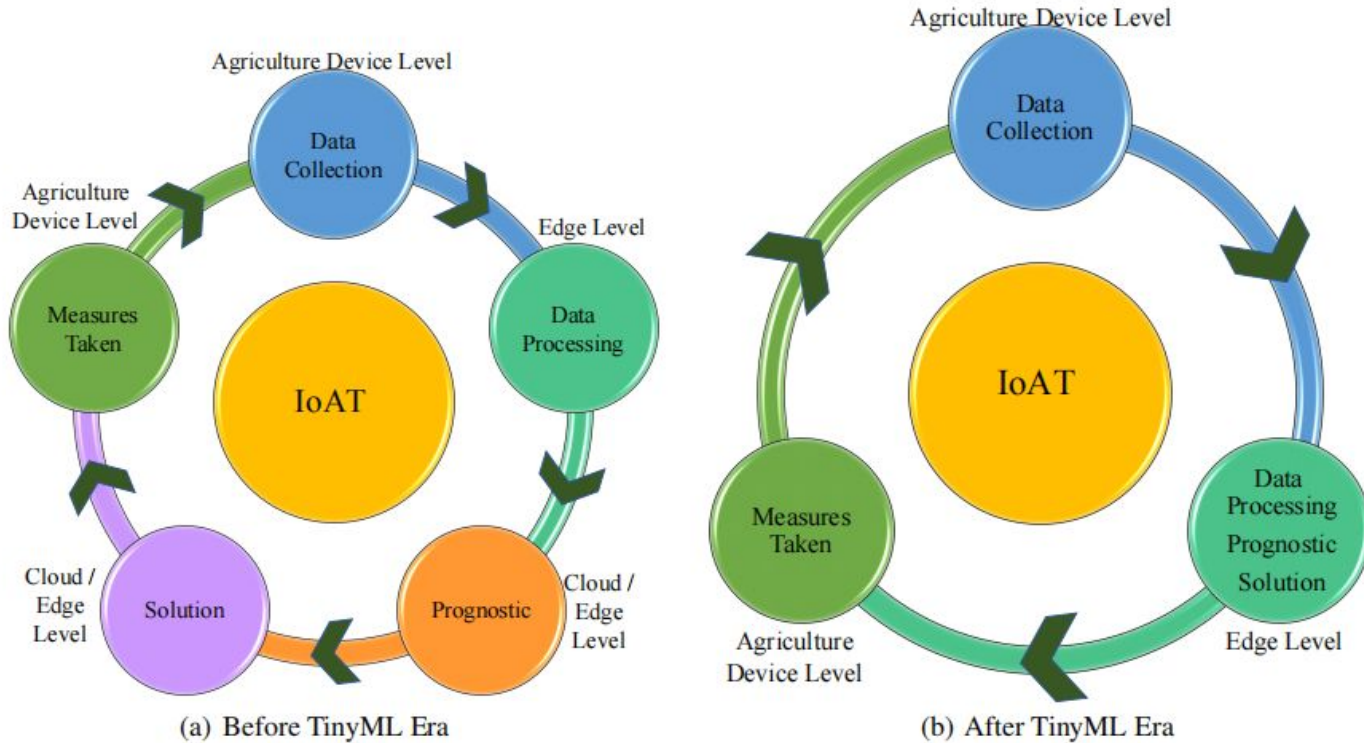


Figure 7: IoT Based Smart Agriculture Cycle.

Applications

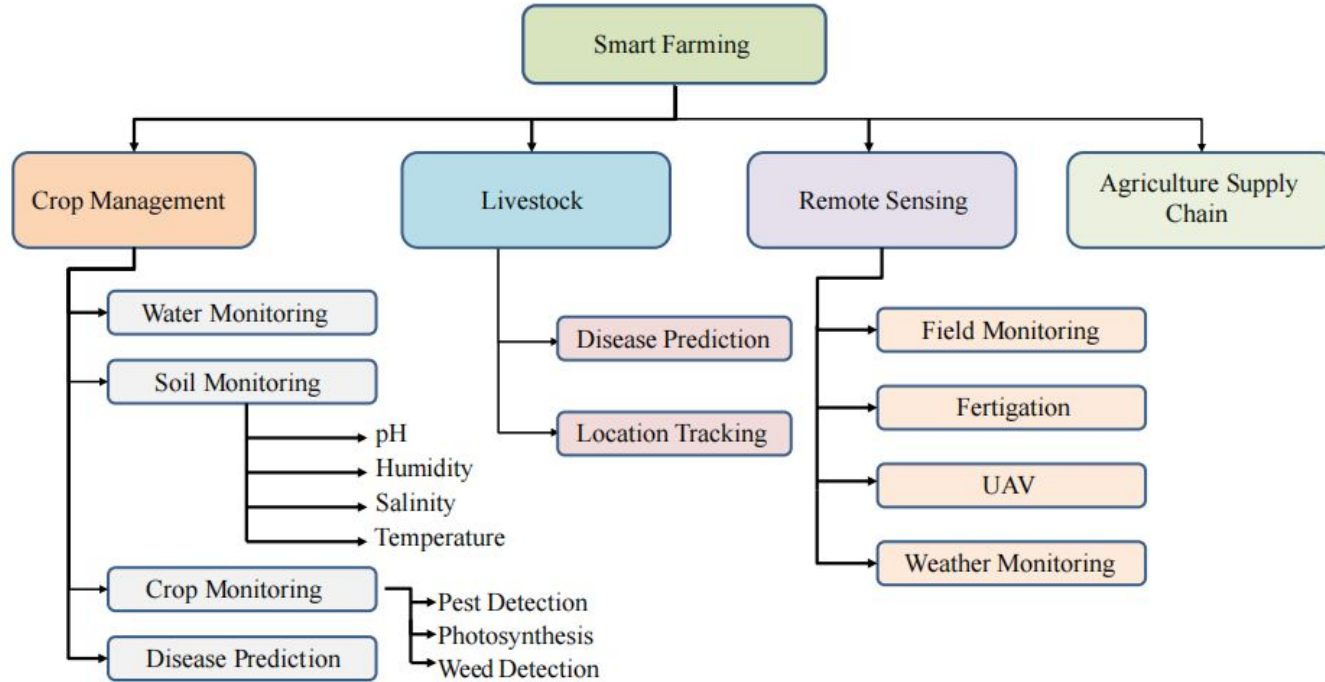


Figure 9: Applications of Smart Agriculture.

Challenges



Figure 12: Major Challenges in Smart Agriculture.

Work Flow

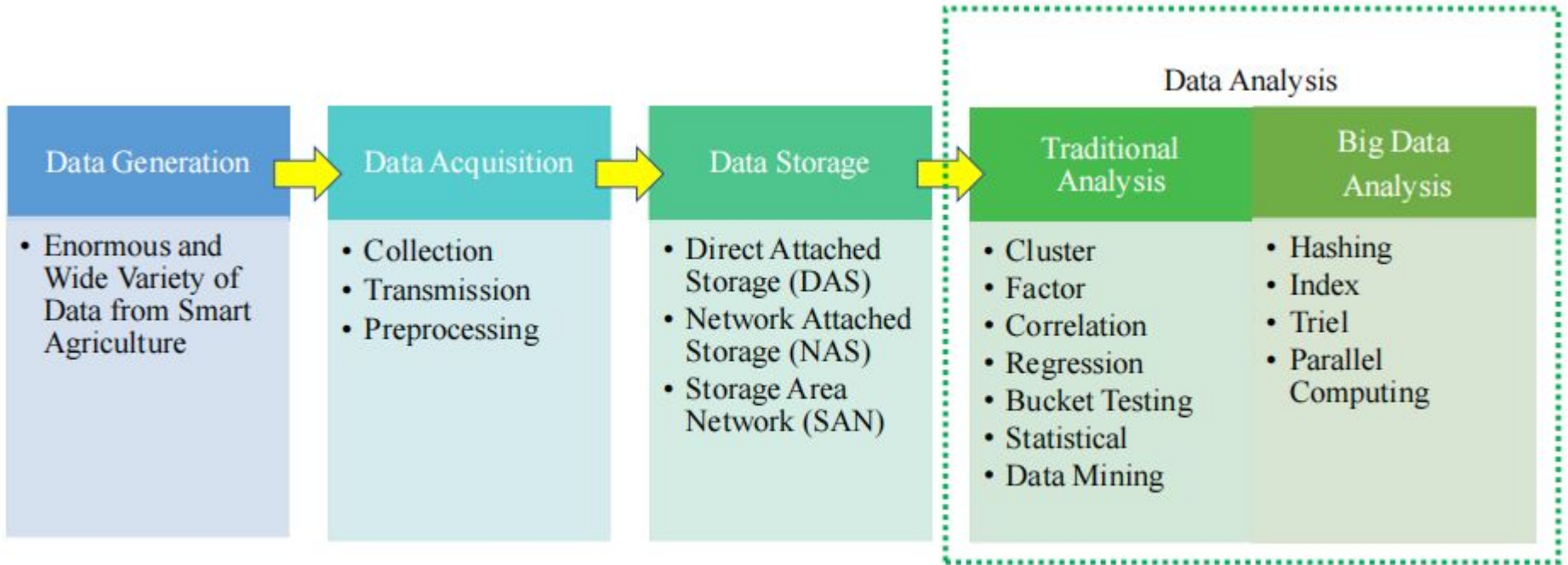


Figure 13: Big Data Work Flow in Context of Smart Agriculture.

Challenges

- Lack of connection between agricultur industry and AI research
- No well-established policies and regulations (AI is still new)
- Lack of (proper) data
- Remote rural areas may be lack of mobile networks
 - Edge AI



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Thanks!

more here

<https://fiddien.notion.site/Indonesia-AI-Community-RnD-Agriculture-0dafd21a0e4c4d069ad6eccda0488779>