

# Digital Agriculture: Some perspectives on standardization

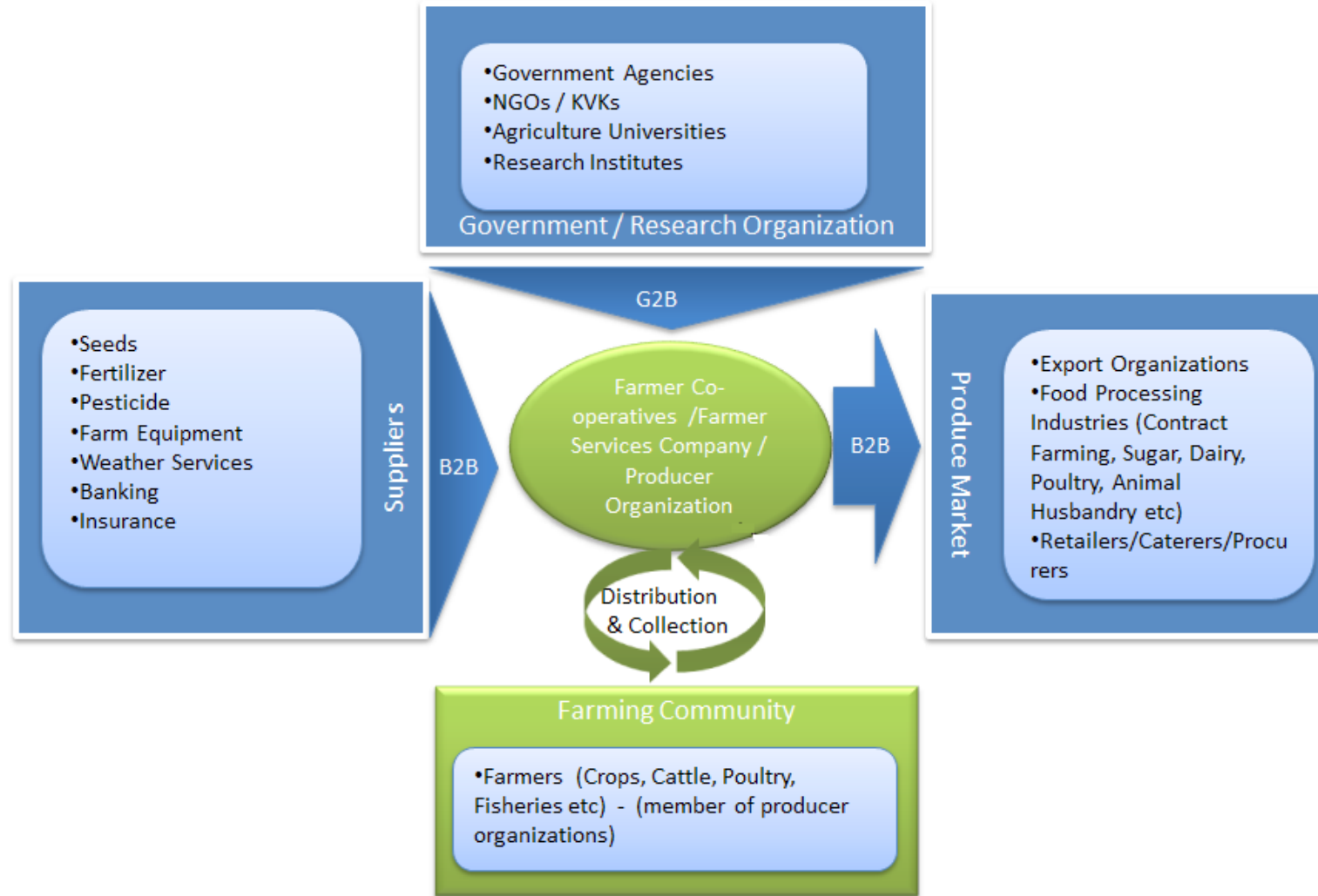
Dr. Sanat Sarangi  
Digital Food Initiatives, TCS

3/18/24

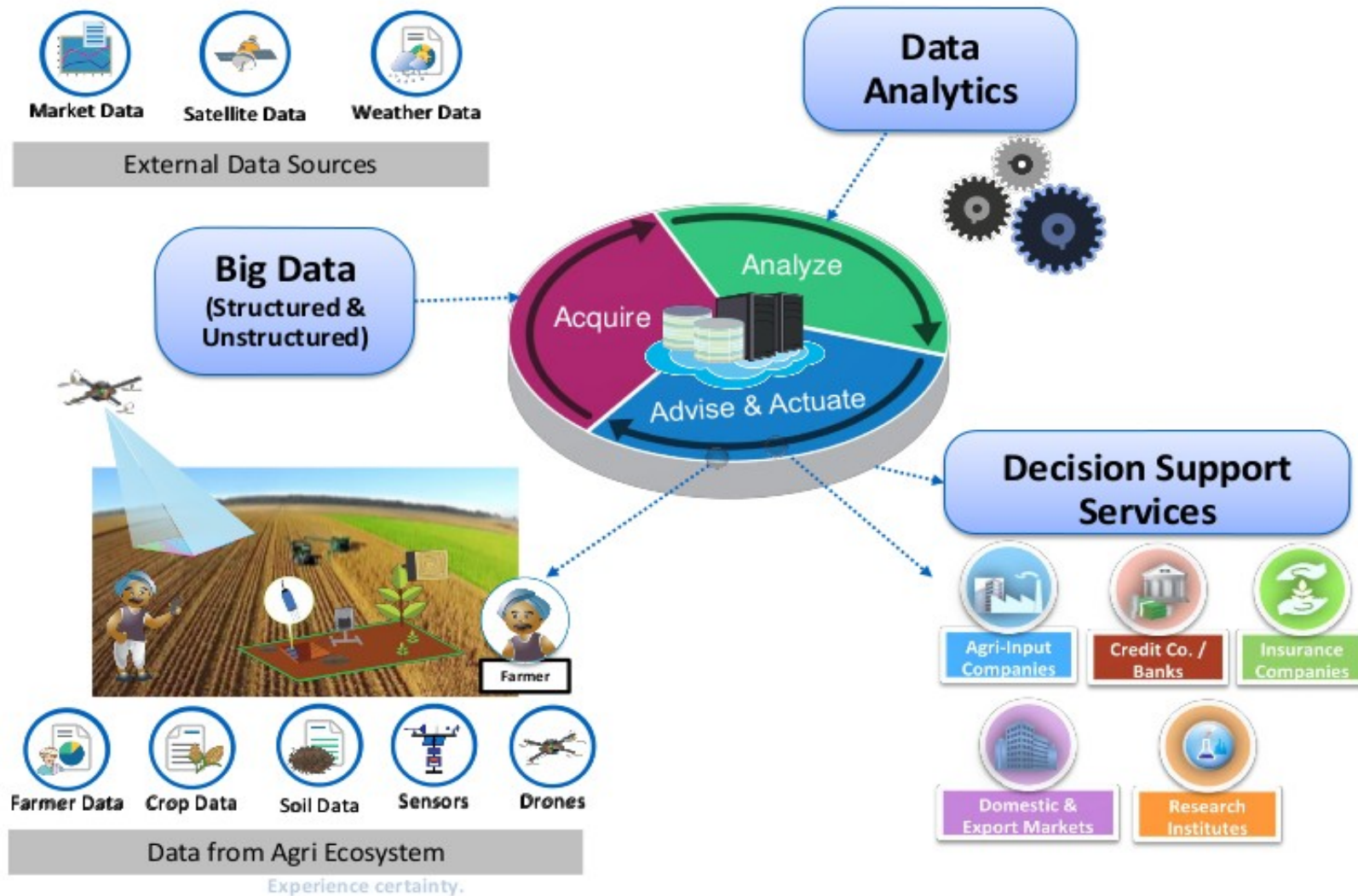
Building on belief



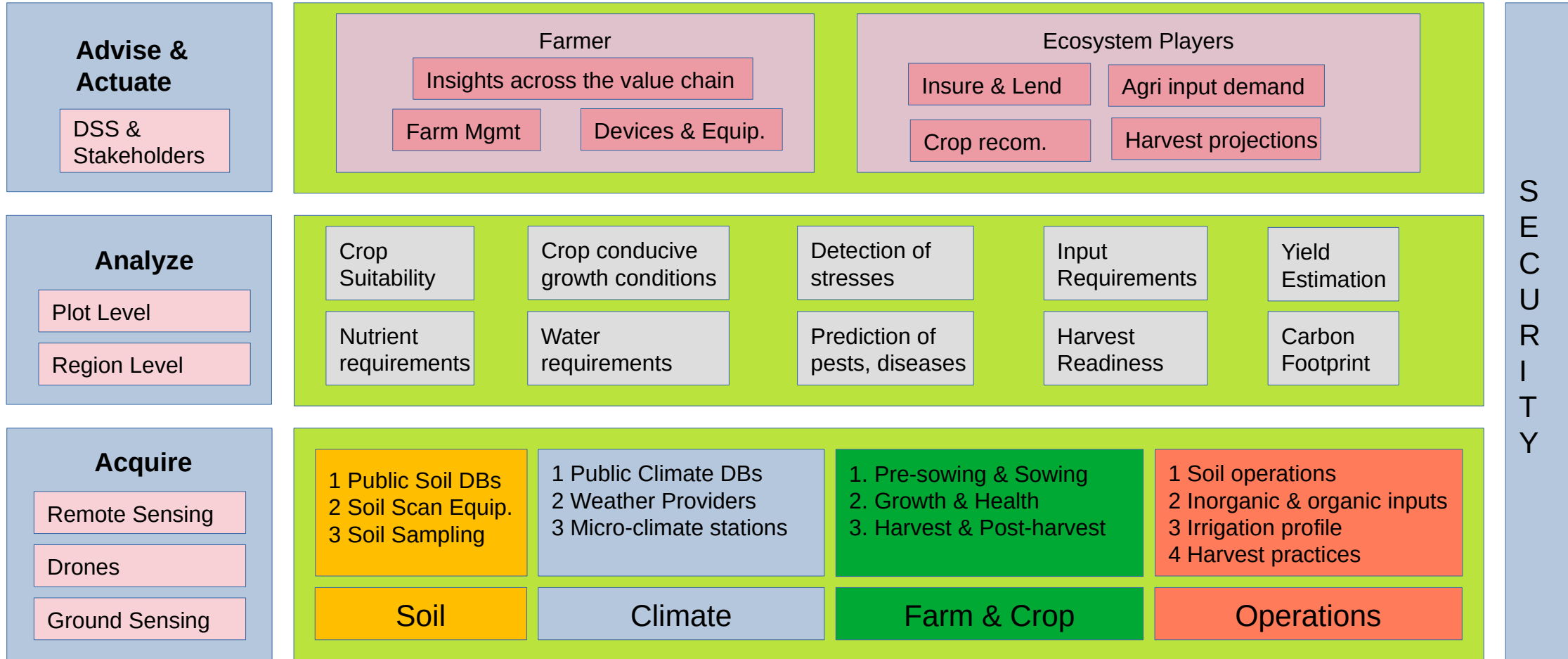
# Digital Food Initiatives (DFI) Value Chain



# DFI Platform Capabilities



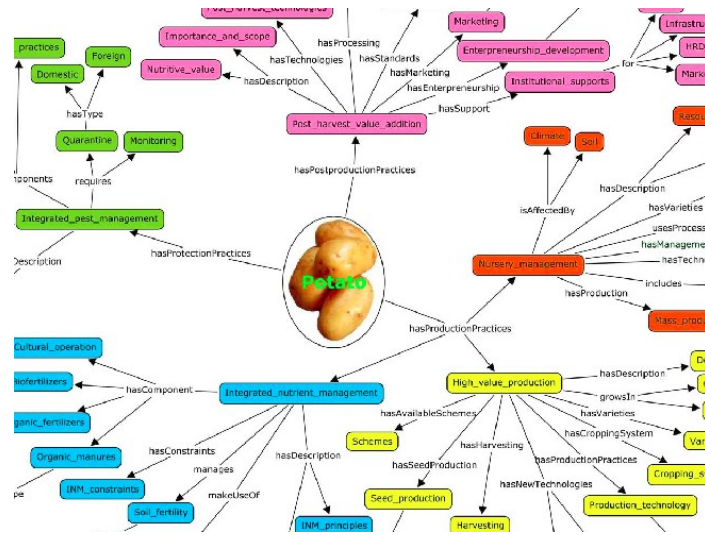
# Agriculture Stack – Crop Ecosystem





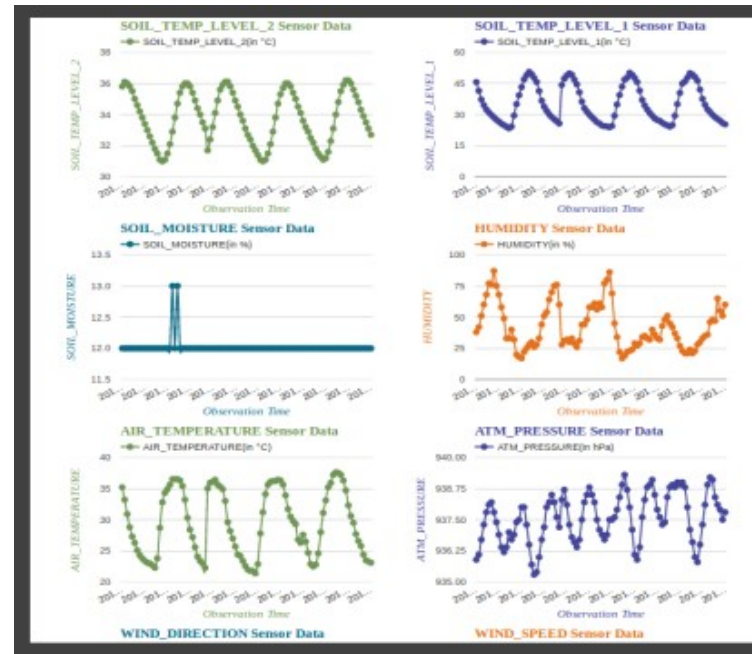
# Ag Data – Representation and Harmonization

Structuring Crop Knowledge?



[courtesy]  
<http://agropedia.iitk.ac.in/>

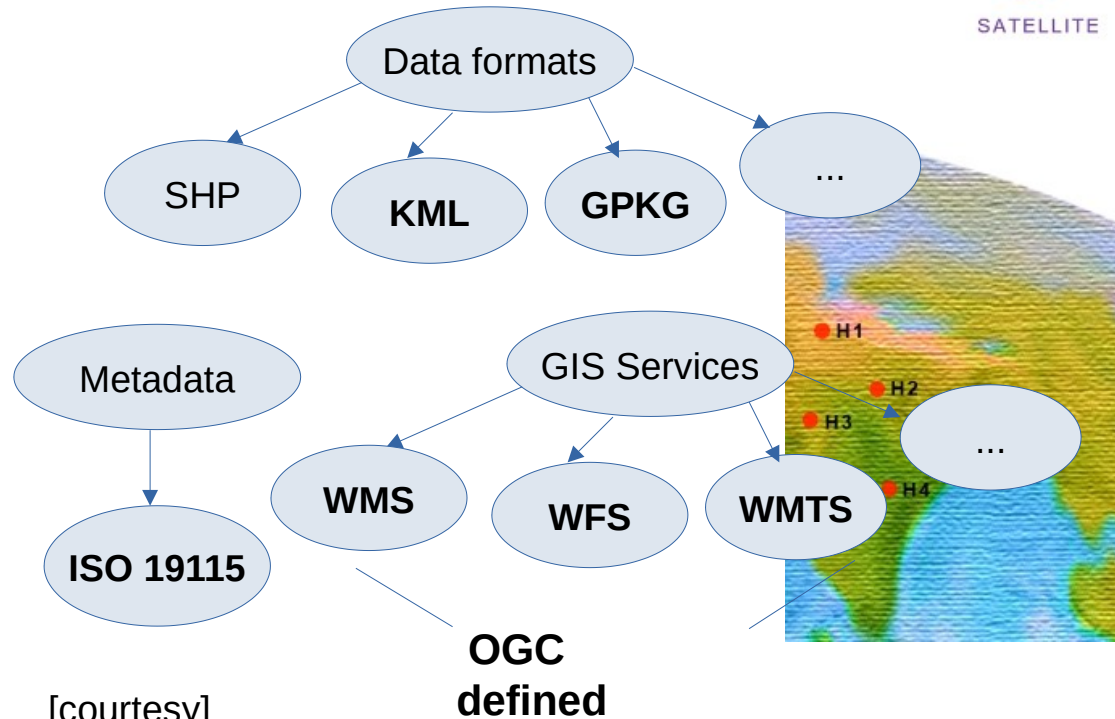
Standardizing Climate Parameters?



A. Mittal, S. Sarangi et al. "IoT-based Precision Monitoring of Horticultural Crops – A Case-study on Cabbage and Capsicum", IEEE GHTC 2018 [DOI: 10.1109/GHTC.2018.8601908]

# Data Capture Modalities and Role of Standards

## Remote Sensing & GIS Standards



[courtesy]  
<https://www.gistandards.eu/gis-standards/>

## Can drone based agricultural surveillance benefit from more standardization?



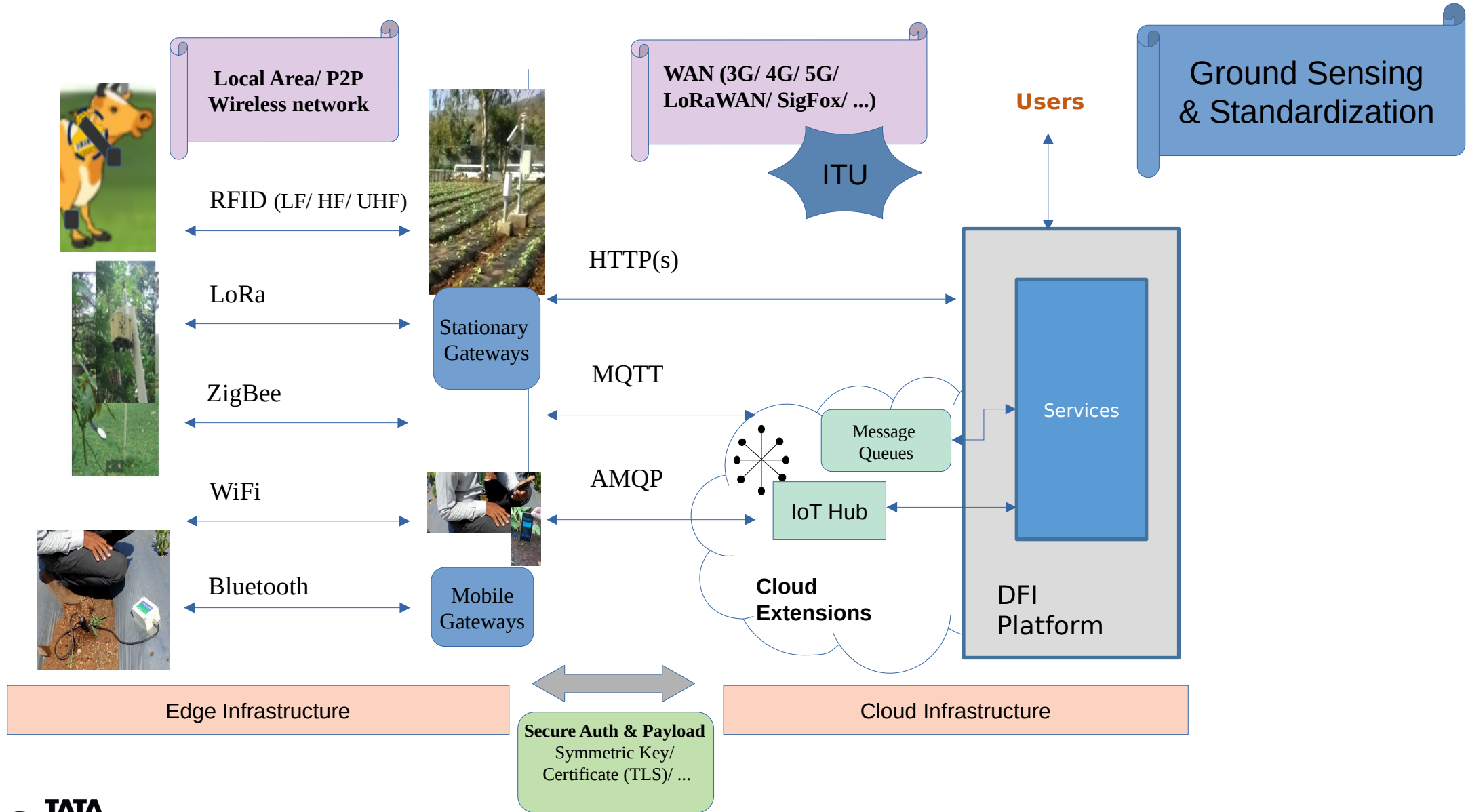
What should be height of drone flights?  
 What should be the imaging specification?

...



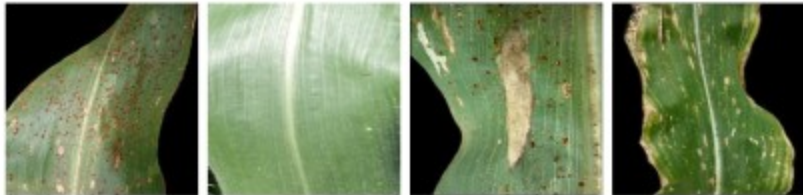
S. B. Choudhury, S. Sarangi et al. "UAV-assisted Multi-modal Detection and Severity Assessment for Red Spider Mites in Tea", IEEE GHTC 2022 [DOI: 10.1109/GHTC55712.2022.9911039]

# Data Capture with Various Edge IoT Scenarios



# Role of Standards in the Analyze Layer

Crop stress detection



(a) (b) (c) (d)

Healthy, Common Rust, Late Blight and Leaf Spot

Augmenting the data

Creating models for identification

Presenting outcomes and recommendations

P. Bhatt, S. Sarangi et al. "Identification of Diseases in Corn Leaves using Convolutional Neural Networks and Boosting, ICPRAM 2019 [DOI: 10.5220/0007687608940899]"

Carbon Footprint Estimation

**Scope 1: Direct Emissions**

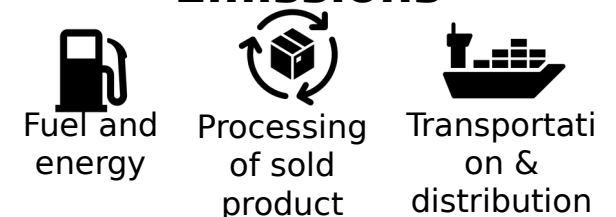


**Scope 2: Indirect Emissions**



Purchased electricity, heat and steam

**Scope 3: Indirect Emissions**

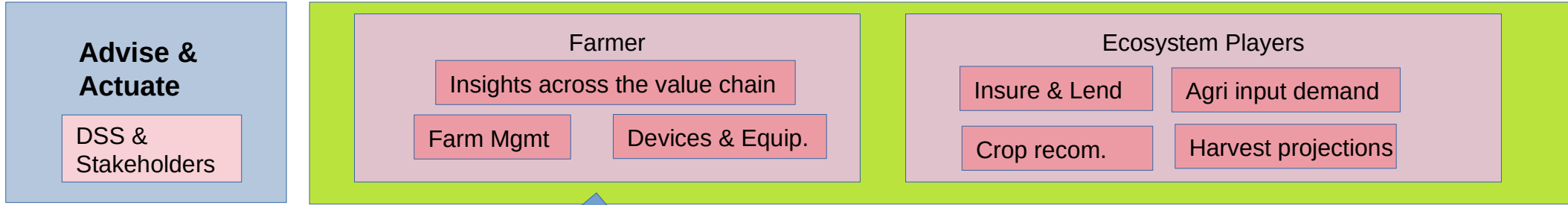


FAO/ IPCC

BSI PAS 2060: 2014



# Some Initiatives tying Multiple Stakeholder Interests



Department of Agriculture & Farmers Welfare  
Ministry of Agriculture & Farmers Welfare  
Government of India

Agri Stack



[courtesy]  
<http://agrystack.gov.in/>

- Being Implemented by Ministry of Agriculture & Farmer Welfare
- Foundational layer to provide tailored services to farmers
- With APIs and standardized protocols as part of UFSI
- For timely finance and agricultural inputs to farmer
- Provide localized and tailored early warning systems
- Enable multiple stakeholders to participate in service delivery
- Improve targeting of government benefits

S  
E  
C  
U  
R  
I  
T  
Y

# Security Considerations for IoT Deployments

S. No	Guidance for Service Owner	Reference Standards
1	(a) Development for IoT device in secure, integrated IDE (b) Adopt secure coding standard for each language or platform (c) Automated code review and code quality checks	NIST SP 800-53 Rev.5 SA-3
2	(a) Identify implementation of open-source components and dependencies (b) Identify one or more black-box security testing including Top 10 OWASP	NIST IR 8228
3	(a) Running software versions with the recommended elements (b) Patches and upgrades applied with authorized entities and securely (c) Apply hardening measures such as restricted access to network interfaces	OTA IoT Trust Framework V2.5
4	(a) Have unique logical and physical IDs accessible to authorized entities (b) Hardware should not expose attack surfaces and code to be minimized	NIST IR 8228
5	Ensure interoperability between IoT devices in a deployed architecture is achieved securely with authentication, authorization and secure protocols	ISO/IEC 21823-1:2019

Thank you