# Product -1 Instant Food Quality Testing Solution

Developed by AgNext Pvt. Ltd.,
In collaboration with IIT Kharagpur faculty
(Dr. Mrigank Sharad)

# Problem Statement

- Grain quality testing is a way for farmers to improve their quality control, develop marketing strategies and maximise their returns.

- Grain needs to meet certain standards for ensuring good price

- Current practices involve manual inspection by traders which are prone to errors and biases.

- Lab tests are required for accurate estimation of chemical constituents, which is time taking and costly.

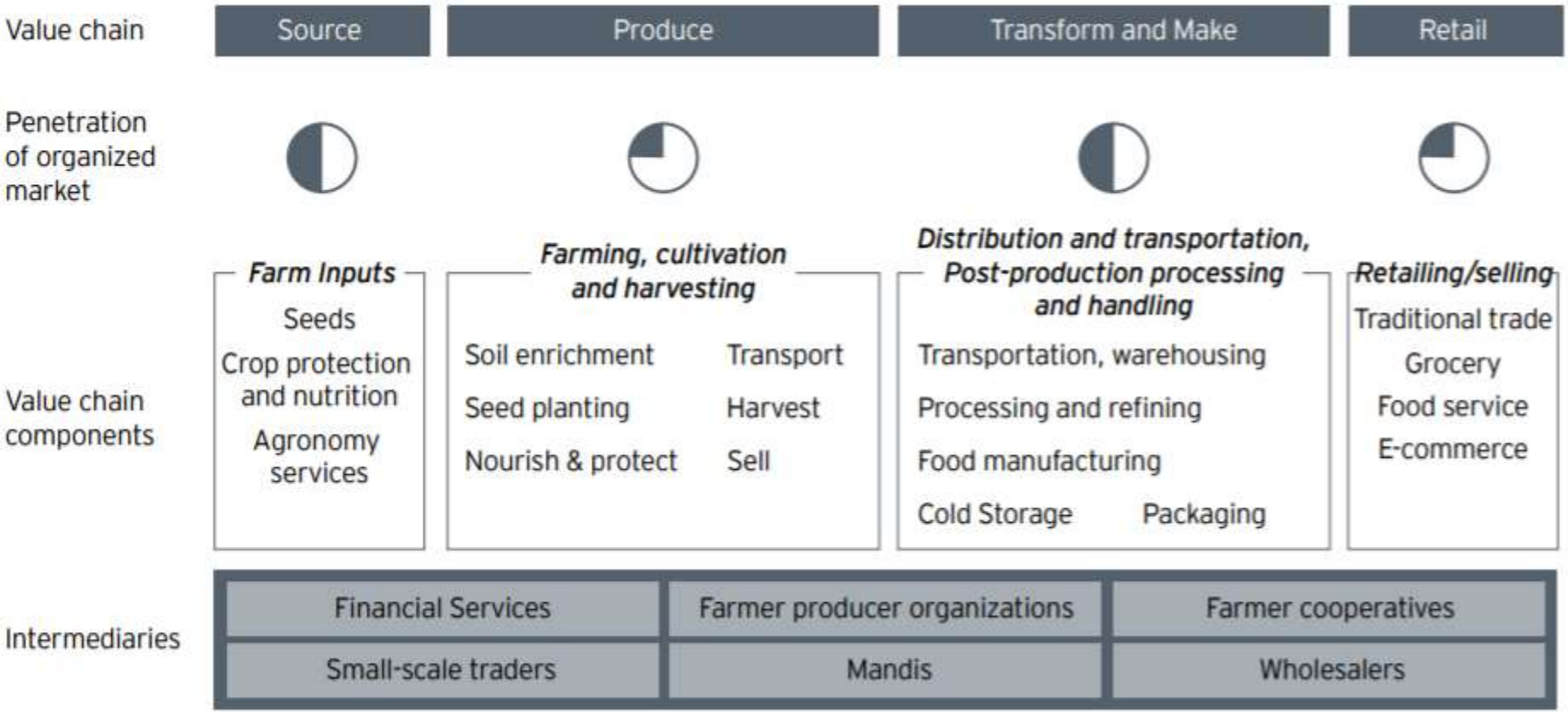
https://www.calibrecontrol.com/news-blog/2020/11/11/the-advantages-of-on-farm-grain-testing

## Highlights

**Food Corporation of India (FCI) will have testing kits that can use AI to test the quality of foodgrains.**

By year-end, government-owned Food Corporation of India (FCI) will have a chemical-based testing system for determining the age of both rice and wheat during procurement. Similarly, it would finalise the testing kits that can use artificial intelligence (AI) to test the quality of foodgrains and moisture meters which can measure the moisture content automatically.

# Food Testing in Agri Business Eco System: India




**The vast production base offers India tremendous opportunities for export but India's share of the global market is still nearly 1% only, and one of the key reasons is poor food quality.**

# Existing solutions

Food Testing Labs Accredited by Govt. Agencies :

- Agricultural and Processed Food Products Export Development Authority (**APEDA**)
- Marine Products Export Development Authority **(MPDA)**
- National Accreditation Board for Testing and Calibration Laboratories **(NABL)**
- Food Safety and Standards Authority of India **(FSSAI)**
- Export Inspection Council **(EIC)**

**What do they do:**

- Chemical Testing (nutrition, pesticide residue, composition etc)
- Biological Testing (bacterial/microbial/fungal contamination)
- Physical quality testing

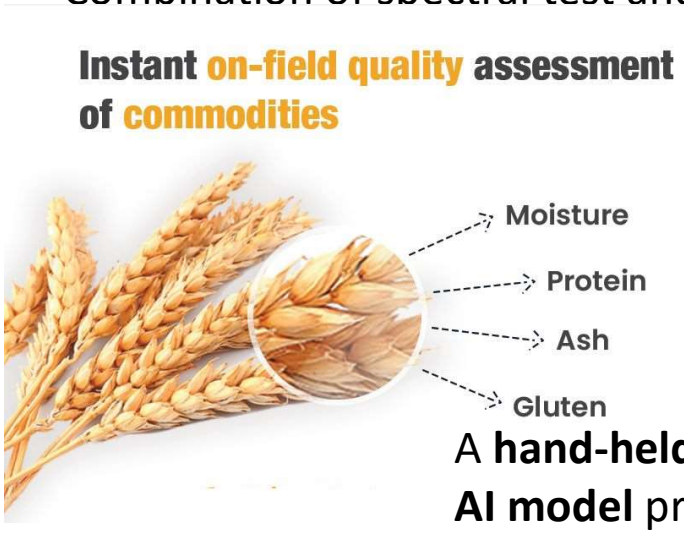
**Challenges :**

Equipment cost, skilled manpower,
Cost to customer, limited sample testing for certification.

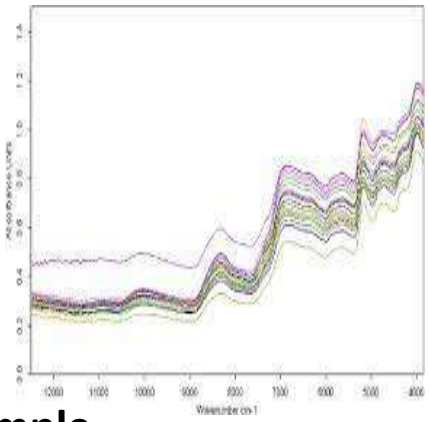
Applicable to processed / semi processed food products, for certification

# *AI and IOT based Food Quality Assessment : AGNEXT*
# *On the Spot, Quick Quality Check*

Combination of spectral test and image analysis for instant, portable Chemical and physical





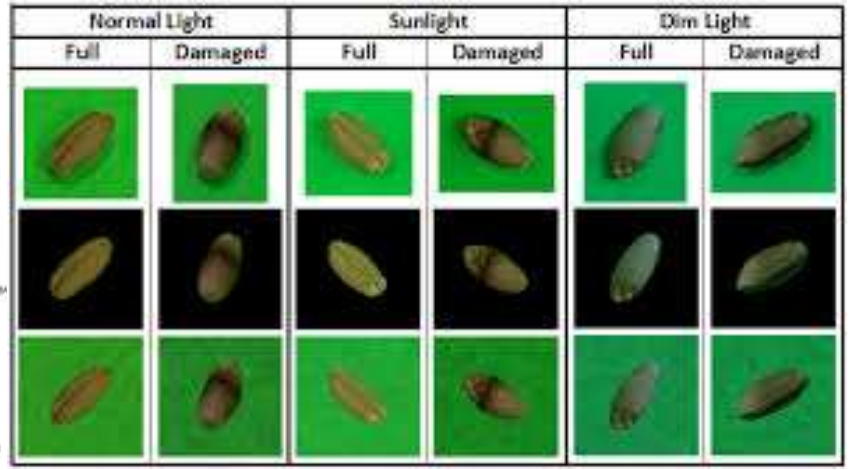


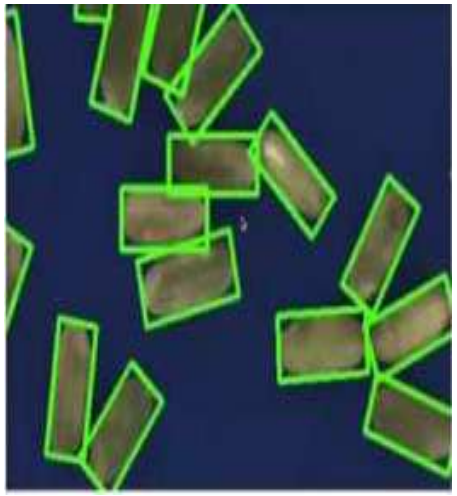
A **hand-held NIR Device** used to **scan food sample**.
**AI model** predicts the chemical quality parameters
( like nutrient content, moisture , adulteration etc)

**Sample image** captured by **mobile phone** is analyses
the **physical quality** parameters through **image processing**
in cloud. ( like shape, color, uniformity, broken, damaged grains)

Applicable to large number of commodities, grains, pulses,
oil seeds, milk products, spices , cash crops

# Grain Quality Detection



Mobile Imagery used to analyse the physical quality of food grains using Computer vision.

Grains classified into different standard categories: normal, broken, shrivelled, Weeviled, discoloured, foreign matter and so on.

Instant analysis using android application for different verities of food grains: cereals, pulses, oil seeds

# Technology Description

- NIR analysis involves directing near infrared light onto a grain sample.

- Light reflects back from the grain sample, which allows for analysis of the sample's absorbent qualities.

- NIR penetrates deep into the sample to analyse its internal makeup, but it does not affect the sample in any way. It is a non-destructive method of analysis.

- NIR measurement technology uses highly accurate, predictive equations based on very large databases as the basis for its calibrations.

- Calibration with large number of known samples provides computing model for assessing quality parameters directly from the NIR spectrum.

- NIR spectroscopy can then test for critical properties in grain such as moisture, protein, oil content and weight.

- This makes NIR a very accurate method and can achieve more than 90% accuracy

**3. Scale of the Problem (Why should anyone care)?**

- Huge volumes of agri commodity transaction in an unorganized manner, lacking transparency.
- Large number of procurement centers(mandi) ( every district) : need solution for quality check.
- Move towards E-Marketing by govt demands digital quality check solutions

Corporate procurers

Export volumes of different produc

- lack of on the spot, portable, and cost effective methods,

Negative influence on export Price Disadvantage or low negotiation power for farmers

- Existing solution like lab test or use of large costly devices makes instant check difficult .

**4. What is the deal (financial)?:** subscription charges provide huge recurring revenue channel.

**5. Key metrics table** (3-5 key indicators): versatile product, applicable to many commodities, models available for grains, oil, dairy, spices.

## Recent reforms announced for the agriculture sector relevent to Food Quality Testing

### Reforms for the produce selling process

► ~146 million farmers can sell their produce to any person/organization anywhere in the country with a PAN card (ENAM plantform)

► Incentives for aggregators and agritech start-ups that procure produce from farmers dismantling of the APMC (Agriculture Produce Marketing Committee) monopoly

► Better returns and transaction transparency for the farmers

### The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020

► Scheme for a written agreement with a buyer which specifies terms and conditions of quality, grade, time of supply price and extension service

► Better prices and returns for the farmers with higher transparency on the contracts and terms

*Ref: ey-agritech-towards-transforming-indian-agriculture*

# Market Segmentation

**Segment based on Type of Food**

- Dairy products
- Processed food
- Fruits & vegetables
- Cereals & grains
- Oil seeds
- Spices
- Cash Crops (tea, Coffee, Cotton etc)
- Meat, poultry, and seafood

**Segment based on Target Tests**

- Nutrient Content
- Physical quality
- Pathogens
- Pesticides
- Adulterants

**Segment based on Type of Test**

- Traditional
- Rapid (approximate , cheap test kits)
- Computer vision
- Polymerase chain reaction (PCR) (*Bench top/portable setup using chemical reagents )*
- Immunoassay (*portable test kit using bio-chemical reagents*)
- Chromatography & spectrometry

**Segment based on customer profile**

- Traders
- Whole sellers
- Retailers (Chains)
- Govt. Agencies
- Commodity Logistic Firms
- Export Firms

# Existing solutions-

Physical parameters to be tested for Rice , for govt. Procurement (2021-22)

| S.No | Refraction | | Maximum limit (%) as per uniform specifications for Grade 'A' & Common | Maximum permissible limit (%) for Grade 'A' & Common |
|---|---|---|---|---|
| 1 | Damaged/Slightly Damaged/Pin-point Damaged Grains | Raw | 3 | 5 |
| | | Parboiled/Single Parboiled Rice | 4 | 5 |
| 2 | Discolored Grains | Raw | 3 | 7 |
| | | Parboiled/Single Parboiled Rice | 5 | 7 |
| 3 | Broken | Raw | 25 | 30 |
| | | Parboiled/Single Parboiled Rice | 16 | 19 |
| 4 | Chalky Grains | Raw | 5 | 6 |
| 5 | Red Grains | Raw/Parboiled/Single Parboiled Rice | 3 | 4 |
| 6 | Dehusked Grains | Raw/Parboiled/Single Parboiled Rice | 13 | 16 |
| 7 | Foreign Matter | Raw/Parboiled/Single Parboiled Rice | 0.5 | 1.0 |

# Product and Services : Features

### RAPID FOOD QUALITY ASSESSMENT

Instant on-field quality assessment of grains, oilseeds, pulses, spices, tea, milk animal feed

### REAL-TIME DATA

Real-time untampered visibility of quality during procurement, transit, and storage

### AUTOMATE DECISION MAKING

Digital records for quality, with un-tampered data for quality & full traceability, lead to better decision making for procurement

### QUALITY MAPS FOR BUSINESS INTELLIGENCE

Quality digitised on farmer level, farm level, agent level, geographical level, warehouse level, etc, through quality maps that enable better trade value price

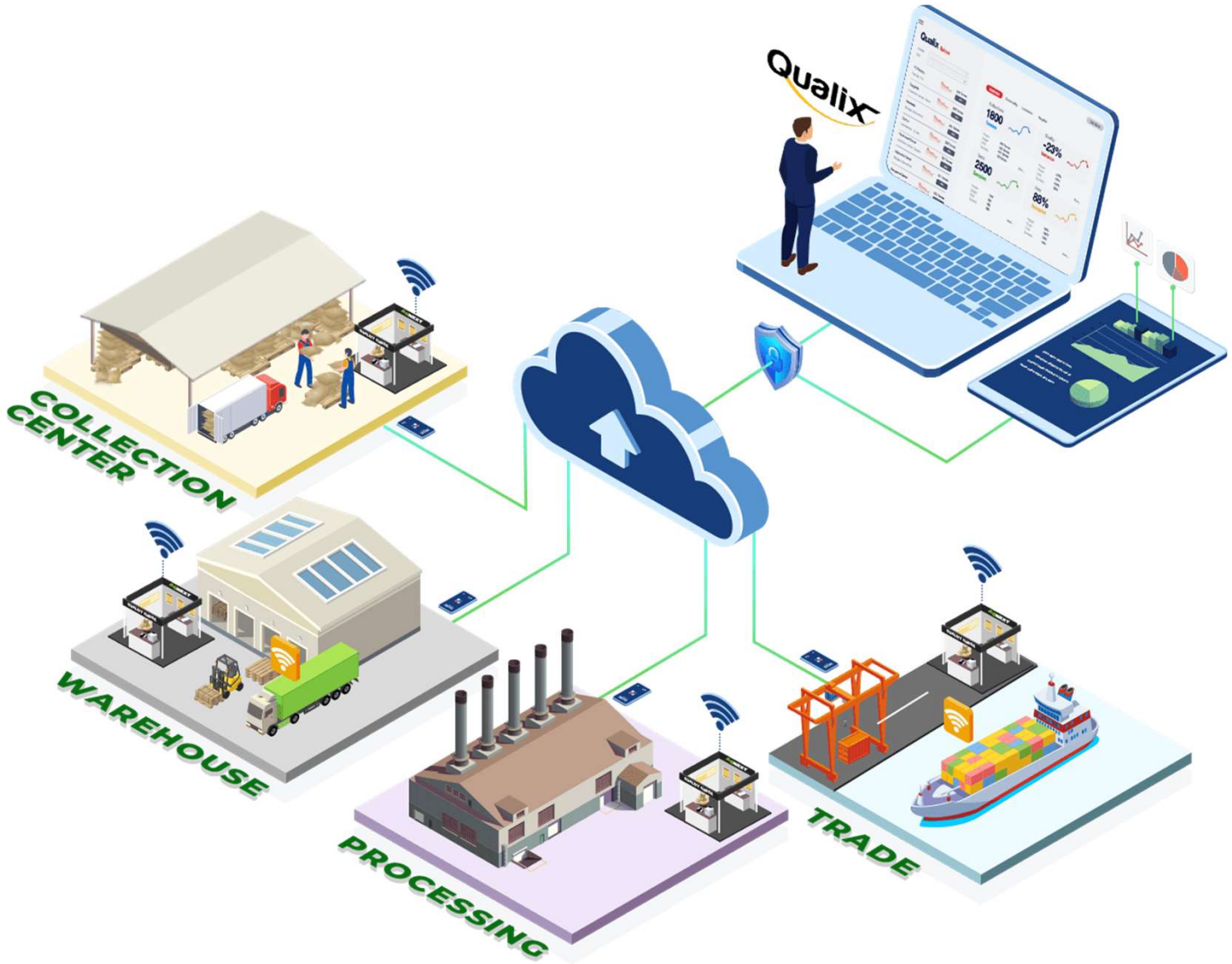
### TRACEABILITY

Track food through all stages of the supply chain

### QUALITY-BASED TRANSACTIONS

Digitising transactions in the entire value chain with digital quality assessments

# Product and Services : Features



# Product -2 Tea Leaf Quality Monitoring Machine

Developed by AgNext Pvt. Ltd.,
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# AI based Tea Leaf Quality Assessment Machine

- A machine for automatically assessing the quality of tea leaves has been developed.
- Currently, the quality assessment of tea leaves is done using manual labour, which involves counting the number of ‘fine leaves’ This process is crucial for determining the quality and the price of the lot. The manual process is slow and tedious.
- The automatic FLC machine includes a hopper which makes the bunches all against a white screen in a uniform manner.
- A camera captures the images of the falling leaves and sends it to a computer for AI based analysis.
- Using image processing each bunch of leaves is classified as ‘fine’ or ‘coarse’.
- The fine leaf count in the sample is directly send to an android app handled by the observer, along with the complete report and pictures of ‘coarse’ leaves.

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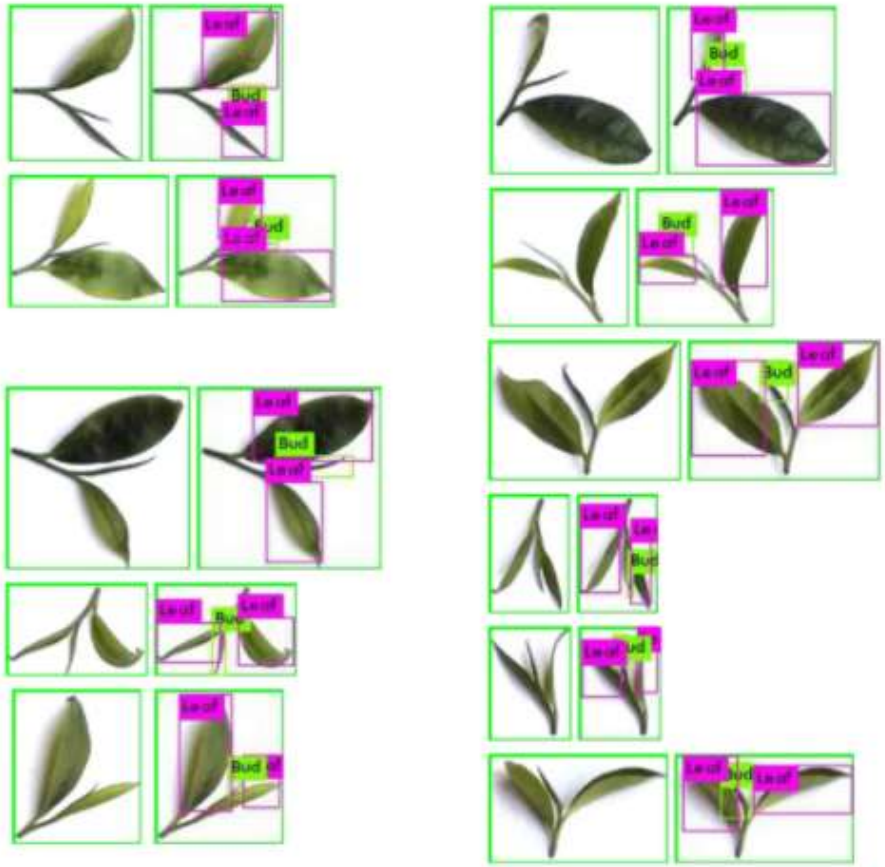
# AI based Tea Leaf Quality Assessment Machine

Total number of bunches – 32
Actual fine leaf count – 32
Fine leaf count through app - 32

**FLC through app was done in mere 10 seconds**




Segmentation of leaves and buds

# Product -3  Pest Alert Device

Developed by AgNext Pvt. Ltd.,
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# Predictive Pest Monitoring Device

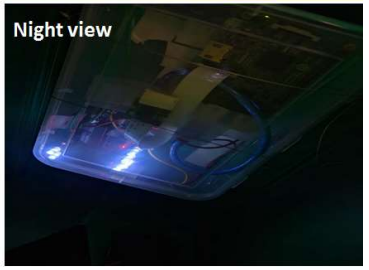
Sudden pest attacks can lead to huge losses for farmers. An early waring system can help farmers in taking preventive actions timely.

Developed an AI based pest monitoring system for farmers. It includes a small box with glue coated pheromone sheet and LED lights for attracting and trapping pests. A camera fixed inside the Box, captures the image of the sheet with trapped pests at periodic intervals. The embedded system Attached with the camera executes AI algorithms to Identify and count different types of pest getting stuck To the sheet and generates hourly statistics.

Any sudden pest outbreak can therefore be detected and farmers can be alerted , in case the count of any dangerous pest registers a sudden increase.

The project was awarded by Karnataka Government and was
Piloted by AgNext Technologies Pvt. Ltd.

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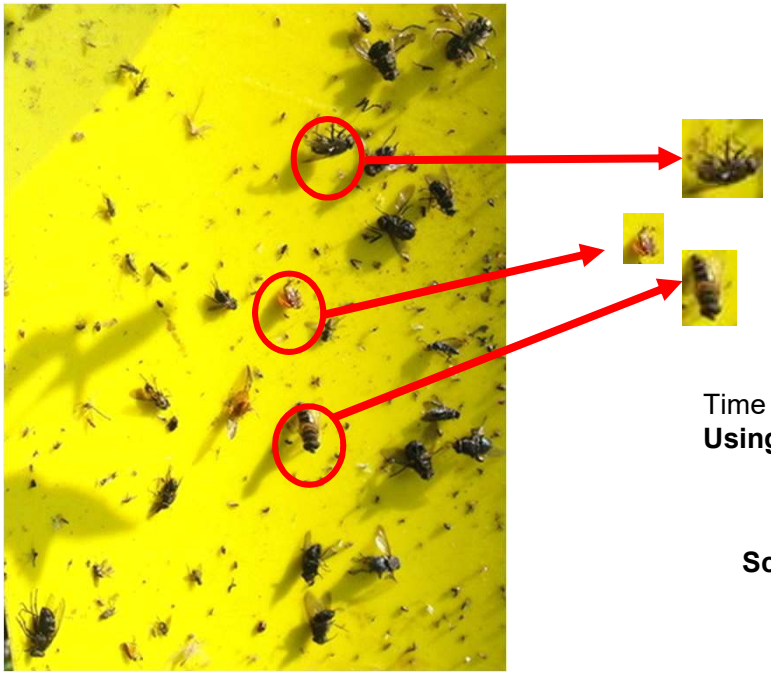
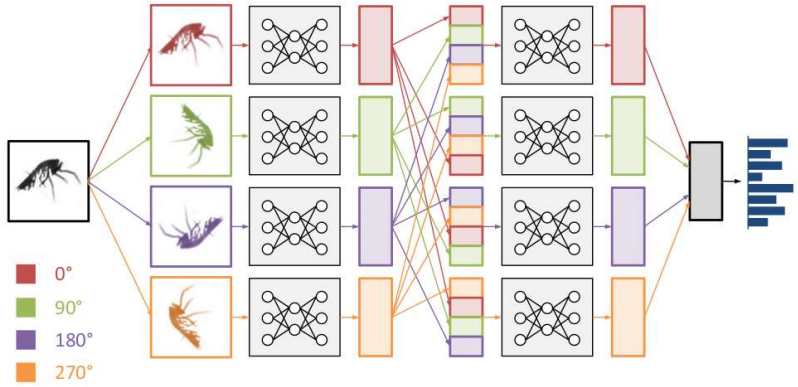
# Application of AI with IOT for Pest Monitoring

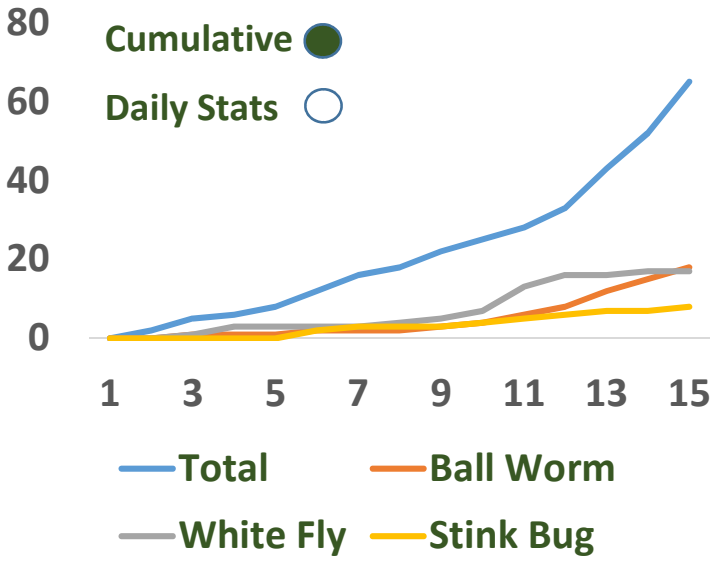


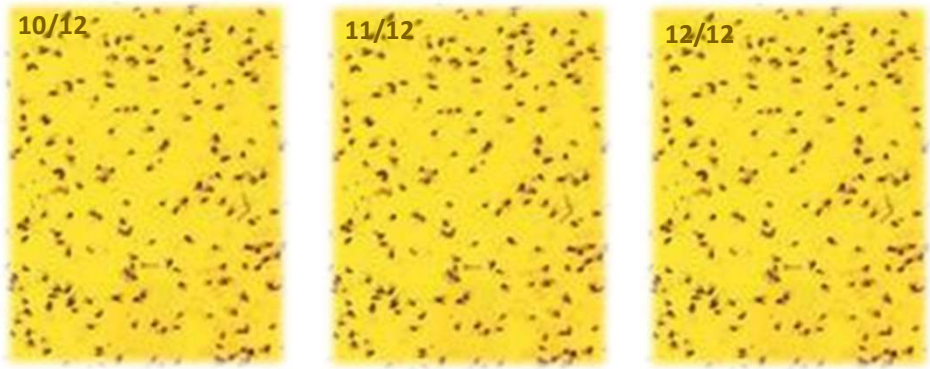



Time of local computing per-pest : 3 sec
**Using Optimized MobileNet Algorithm**

(Can be reduced further)

**Scheme for faster result:** Detect changes
and process only new pests




Snaps

Reset

## Critical Counts

Ball Worm

White Fly

Stink Bug

# Product -3  IOT based Barn Monitoring

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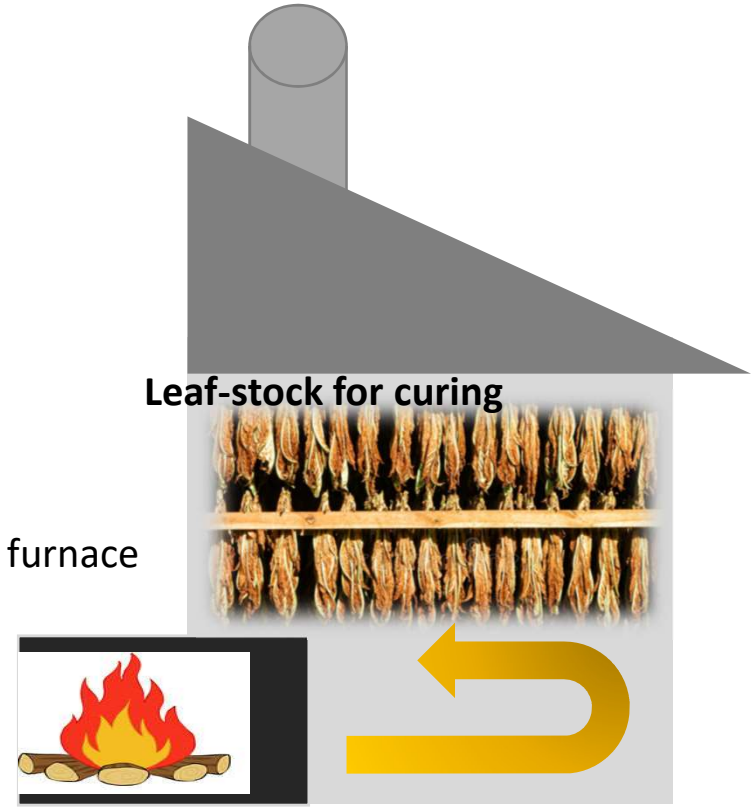
# Barn Monitoring Solutions

## Need of Temperature Monitor in Curing Barn




- Curing Barn for Tea/Tobacco require continuous monitoring.
- Maintaining appropriate temperature and humidity is crucial for high quality product.
- Temperature and humidity needs to be continuously monitored and maintained at appropriate values for different stages of curing, lasting a week.
- Undesirable increase in temperature at different stages of curing can lead to fire outbreak, causing huge losses.

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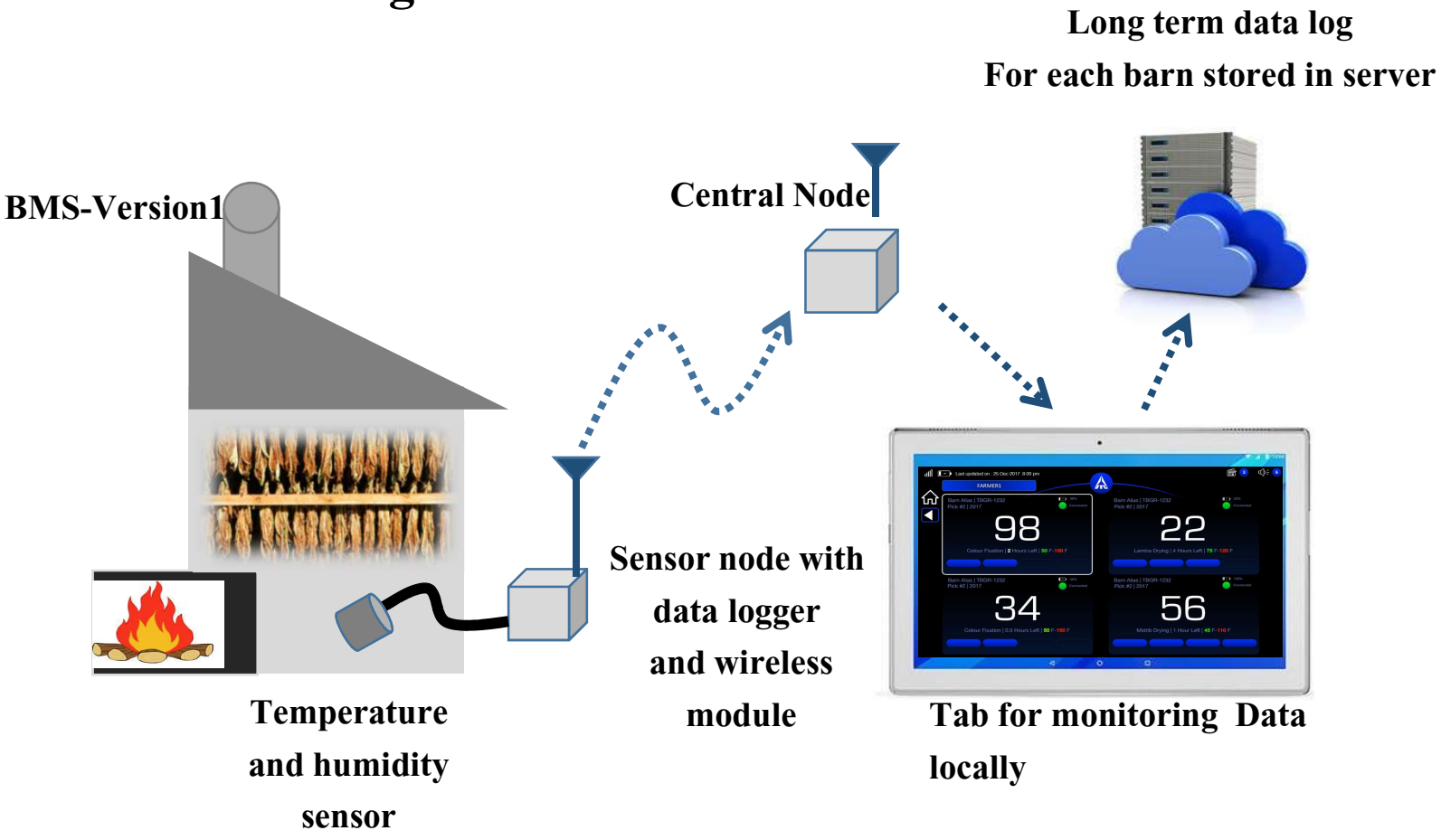
# Barn Monitoring Solutions



# Barn Monitoring Solutions

## Overall System