

**Project ID :**

25-26J-016

1. Topic (12 words max)

Exporting Best Quality Pineapples

2. Research group the project belongs to

Select Research Cluster

3. Specialization of the project belongs to

Computer Systems and Network Engineering(CSNE)

4. If a continuation of a previous project:

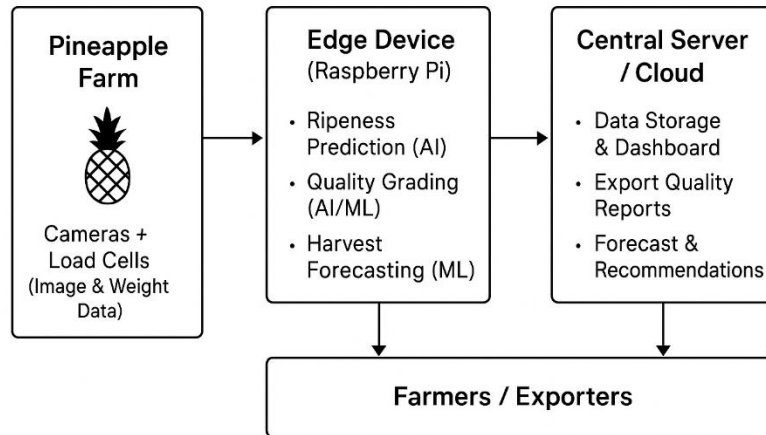
Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

Pineapple is one of the most important tropical fruits in the global market, but ensuring consistent export quality remains a major challenge. Traditional methods of assessing ripeness, grading, and forecasting harvest yields are highly manual, time-consuming, and subjective, leading to variability in quality and post-harvest losses. Export markets demand premium fruit with strict requirements on ripeness, skin condition, and uniformity, making automation a critical need. Farmers and exporters often lack reliable tools to predict harvest yields, detect defects early, and optimize irrigation and fertilization, which directly impacts profitability and competitiveness. Therefore, there is a need for an integrated AI- and IoT-based system that can automatically predict ripeness, grade fruit quality, forecast harvests, and support precision agriculture. By leveraging computer vision, machine learning, and smart IoT devices, such a system can help minimize losses, standardize quality, and increase the export value of pineapples.

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution is an integrated AI- and IoT-based system that automates pineapple ripeness prediction, quality grading, harvest forecasting, and farm management to ensure export standards. Using cameras and load cells connected to Raspberry Pi devices, the system collects images and weight data, which are processed by machine learning models to classify ripeness, detect defects, and grade fruit quality. Historical load cell and environmental data are used for yield forecasting, while IoT integration enables real-time monitoring and optional smart irrigation or fertilization. All data and results are transmitted to a central server and displayed on a dashboard, providing farmers and exporters with actionable insights to minimize losses, standardize quality, and maximize profitability.



7.) Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

The project requires expertise in agriculture, machine learning, and IoT systems to successfully design and implement the solution. Agricultural knowledge is essential to understand pineapple ripening stages, grading standards, common defects, and export requirements. Specialized expertise in computer vision and machine learning is required for developing models for ripeness prediction, defect detection, and yield forecasting, while IoT and embedded systems knowledge is necessary for integrating sensors, cameras, and Raspberry Pi devices for real-time data collection and edge processing. The project also depends on domain-specific datasets, including labeled pineapple images for ripeness and quality grading load cell time-series data for harvest forecasting and environmental parameters such as weather and soil conditions. Access to expert-labeled ground truth data and export grading protocols is critical to ensure model accuracy and system reliability.

**7.0 Objectives and Novelty**

<p><b>Main Objective</b> Develop an integrated AI- and IoT-based system that can automatically predict pineapple ripeness, grade fruit quality, forecast harvest yields, and support farm management to ensure consistent export standards, reduce post-harvest losses, and maximize profitability for farmers and exporters.</p>			
Member Name with Registration No	Sub Objective	Tasks	Novelty
IT22308566 M.K.Hasara	Forecast monthly pineapple harvest yields using historical weight and environmental data.	Forecast the next month's harvest yield using historical load cell data (weights), harvest logs, and optional environmental features.	Harvest Forecasting (Load Cell Data)
IT22086952 W.A.S.H.Wilwalaarachchi	Develop an image-based model to accurately classify pineapples into different ripeness stages.	Predict pineapple ripeness stage using only skin (peel) color from images.	Ripeness Prediction (Using Skin Color Only)
IT22158468 S.M.I.P.Samarakoon	Automate the grading process of pineapples based on skin quality, color uniformity, and visible defects.	Automatically grade pineapples for export quality by detecting skin condition, color uniformity, scars, bruises, rot, insect damage, and deformities.	Quality Grading (Skin Condition, Color, Visible Damages)

**IT4010 Research Project – 2025 July**  
**Topic Assessment Form**

<p>IT22889492 M.G.Gamage</p>	<p>Design an IoT-enabled system for real-time data collection, edge inference, and farm automation.</p>	<p>Create an IoT system that collects images and weight data, performs edge inference, and can optionally control irrigation and fertilization to improve fruit quality.</p>	<p>IoT Integration (Camera, Load Cell, Raspberry Pi) + Proposed Extension</p>
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**8.0 Individual component description of how it is complied with the specialization.**

Member Name with Registration No	Description
IT22308566 M.K.Hasara	Load cell data, combined with harvest logs and weather inputs, is analyzed using time-series and machine learning models to predict future yields. Accurate forecasting helps farmers and exporters plan logistics, optimize supply chains, and meet international demand consistently.
IT22086952 W.A.S.H.Wilwalaarachchi	This component uses computer vision and machine learning to analyze pineapple skin color and determine ripeness levels such as immature, early ripe, ripe, and overripe. Accurate ripeness prediction helps ensure that only fruits at the correct maturity stage are selected for export.
IT22158468 S.M.I.P.Samarakoon	High-resolution images are processed to detect bruises, scars, rot, insect damage, or irregularities. A grading system then classifies fruits into export premium, export standard, or local/processing grades. This ensures compliance with international export standards and improves efficiency in sorting.
IT22889492 M.G.Gamage	Raspberry Pi devices with cameras and load cells collect field data, run prediction models locally, and send results to a central server or dashboard. The system can be extended to include smart irrigation and fertilization control, improving fruit quality, reducing resource waste, and supporting precision agriculture practices.

**9.0 Supervisor details**

	Title	First Name	Last Name	Signature
Supervisor				
Co-Supervisor				
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				



Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

\* Detailed comments given below

Comments

Staff Member's Name	Signature

**\*Important:**

1. According to the comments given by the evaluator, make the necessary modifications and get the approval by the **Evaluator**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.