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International Commission on Irrigation and Drainage (ICID)

Ms Yuslina binti Hj. Mohd Sani
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Transforming Malaysia's Irrigation Schemes Towards Smart Irrigation Management through Modernisation and Digital Technologies

2nd Indo Global Irrigation Summit

24-25 June 2026, New Delhi India

SMART IRRIGATION MANAGEMENT

Transforming Malaysia's Irrigation Schemes through Modernization and Digital Technologies

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2nd Indo-Global Irrigation Summit
24-25 June 2026, New Delhi, India

PRESENTED BY:
Ir. YUSLINA BINTI HJ. MOHD SANI
CHAIRMAN MANCID

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WHY IRRIGATION MODERNIZATION MATTERS?

Rice is Malaysia's most strategic food commodity. Paddy cultivation area in Malaysia exceeded 640,000 hectares with annual paddy production remaining above 2.3 million metric tonnes.

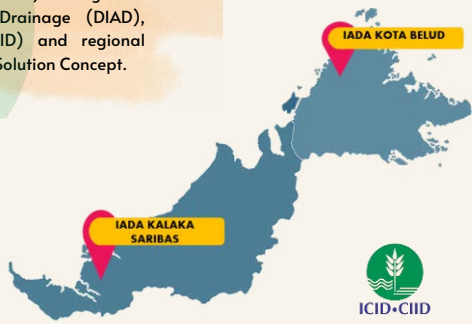
Malaysia's rice self-sufficiency ratio continues to fluctuate and remains vulnerable to production disruptions caused by extreme weather events, water shortages and increasing production costs.

Self Sufficent Rate (SSR)

52.9 % in year 2024

56.2 % in year 2023

To remedy these challenges, the Malaysian government, primarily Ministry of Agriculture and Food Security (MAFS) through the Department of Irrigation and Agriculture Drainage (DIAD), Department of Irrigation and Drainage (DID) and regional development authorities has adopted the Total Solution Concept.



Critical Dependency

More than 70% of national rice production originates from irrigated areas managed under major granary schemes such as MADA, KADA and IADA. These irrigation systems were originally designed decades ago

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CHALLENGES TO IRRIGATION SYSTEMS

CLIMATE VARIABILITY

Increasing frequency of droughts and El Niño events causing critically low reservoir levels.

AGEING INFRASTRUCTURE

Infrastructure designed decades ago operating below intended efficiency and needing rehabilitation.

WATER SCARCITY

Growing competition for water resources and the urgent need for water-use efficiency.

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CHALLENGES TO IRRIGATION SYSTEMS

REALITY CHECK :

In 2024, for example IADA Kerian had to deploy 33 mobile pumps to recycle water from drainage canals back into irrigation channels due to critically low water levels at Bukit Merah Dam, demonstrating the urgent need for more resilient and adaptive irrigation management systems.

CLIMATE VARIABILITY

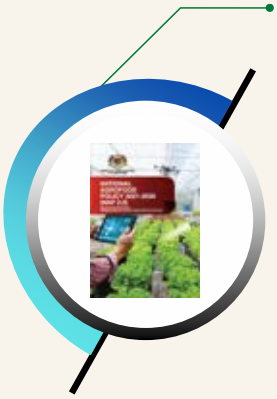
Increasing frequency of droughts and El Niño events causing critically low reservoir levels.

POLICY FRAMEWORK SUPPORTING MODERNIZATION

National Agrofood Policy 2021-2030 (NAP 2.0)

Water Sector Transformation 2040 (WST2040)

POLICY FRAMEWORK SUPPORTING MODERNIZATION



National Agrofood Policy 2021–2030 (NAP 2.0)

Serves as the principal framework guiding the development of Malaysia's agrofood sector. **NAP 2.0 recognizes that increasing agricultural productivity can no longer rely solely on land expansion.** Instead, future growth must be achieved driven by a paradigm shift towards smart agriculture, integrating technological innovation, precision farming, mechanization, and the comprehensive modernization of agricultural infrastructure.

The policy emphasizes:

- Increasing rice productivity per hectare
- Enhancing water-use efficiency
- Promoting climate-resilient agriculture
- Accelerating digital transformation
- Strengthening agricultural institutions
- Supporting precision farming technologies

POLICY FRAMEWORK SUPPORTING MODERNIZATION

PINTAR represents KPKM's leading initiative to reform the agrofood sector through innovation and modernization.

The programme focuses on four strategic industries:

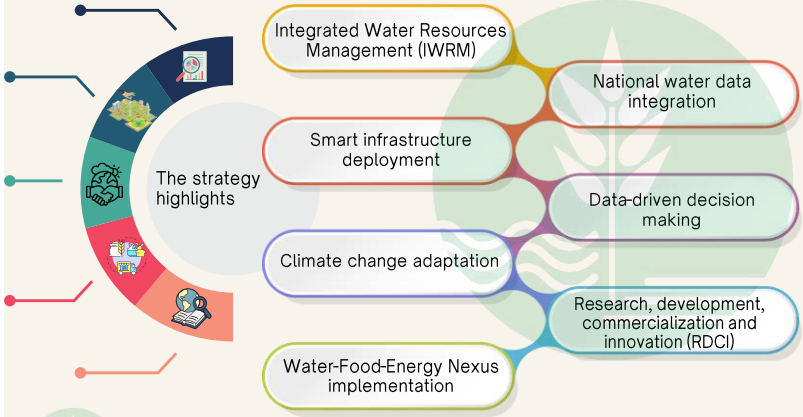
Under PINTAR, five strategic pillars have been established:

- Infrastructure development and capacity building
- Institutional and governance reforms
- Research, development and innovation
- Mechanization and automation technologies
- Strategic collaboration networks.

POLICY FRAMEWORK SUPPORTING MODERNIZATION

WST2040

- Provides the overall framework for transforming Malaysia's water sector into a sustainable and resilient economic sector.
- A key objective is the preparation of the water sector for IR4.0 through smart technologies and digital solutions.



Water Sector Transformation 2040 (WST2040)

The framework specifically promote the use of smart technologies to support long-term sustainability and resilience in water infrastructure. For irrigation schemes, WST2040 provides the strategic justification for modernizing irrigation assets through automation, md predictive management tools.

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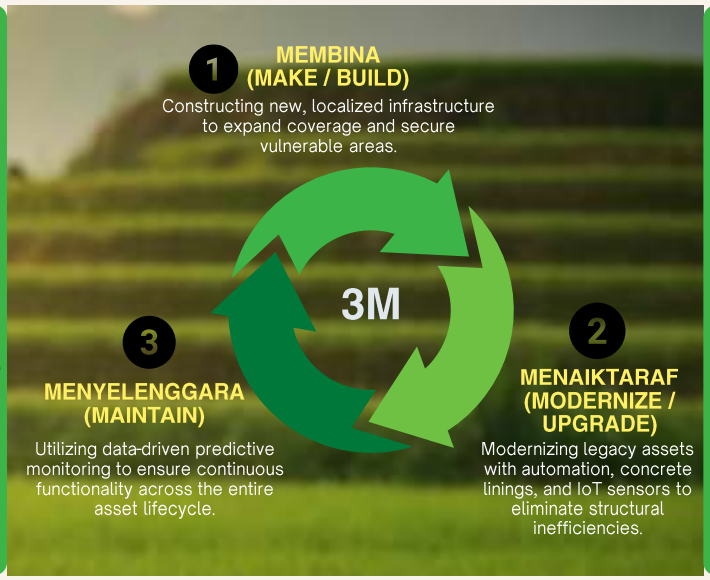
TOTAL SOLUTION CONCEPT

Framework

Priority :

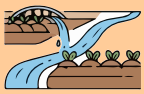
- Ensuring sufficient water resources and develop the necessary storage infrastructure to ensure sustainable supply for agriculture.
- Presence of existing farming communities.
- Active Water Users Groups (WUGs).
- Officially gazetted as an agricultural zone by the State Government.
- Enhancing water use efficiency through regular maintenance
- Availability of a reliable land clearly identified water source (e.g., river or pond/reservoir).



The Shift in Paradigm

Old Model

Merely delivering water to paddy field.



Total Solution Model

Delivering the **right amount** of water at the **right location** and at the **right time.**

TOTAL SOLUTION CONCEPT

CURRENT SITUATION

- Ageing and inefficient agricultural infrastructure necessitates strengthening, rehabilitation and modernization to improve system performance and resilience.
- The absence of integrated infrastructure and agricultural asset data limits effective planning, monitoring, and decision-making.

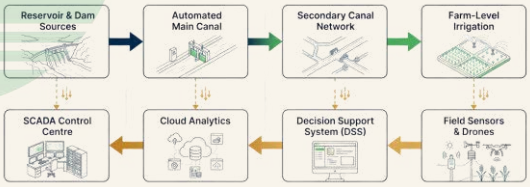
OUTPUT

- Ensures sufficient and consistent water availability for agricultural activities.
- Supported by comprehensive and well-developed infrastructure.
- Contributes to improved agricultural productivity and higher crop yields.

MAIN FOCUS

- Rehabilitation of Abandoned Paddy Fields Nationwide
- Development of New Paddy Granary Areas in Sabah and Sarawak
- Strengthening Irrigation and Drainage Infrastructure
- Agricultural Digitalization and Integrated Data Platform
- Automated Water Resources Management Transformation
- Development of Southern Paddy Granary Areas

Smart Irrigation Ecosystem under Total Solution Approach:



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TOTAL SOLUTION CONCEPT

Diagnostic Matrix	Existing Granary Areas	Non-Granary Areas
Total Area	399,336 ha	180,370 ha
Estimated Cost	RM19.97 billion	RM9.02 billion
Primary Tech & Infrastructure Focus	Upgrading tertiary canal networks, deploying concrete linings to prevent transit loss, and introducing secondary recycling pump stations to capture drainage outflow.	Deploying minor check-dams, low-pressure micro-irrigation networks, alternative shallow tube wells, and localized rainwater harvesting.

Irrigation Strengthening Programme Allocation :

Phase 1 (2026 - 2030)	Phase 2 (2031 - 2035)	Phase 3 (2036 - 2040)	Total Initial Allocation:
RM 1.5 Billion	RM 1.5 Billion	RM 1.5 Billion	**RM4.5 Billion**

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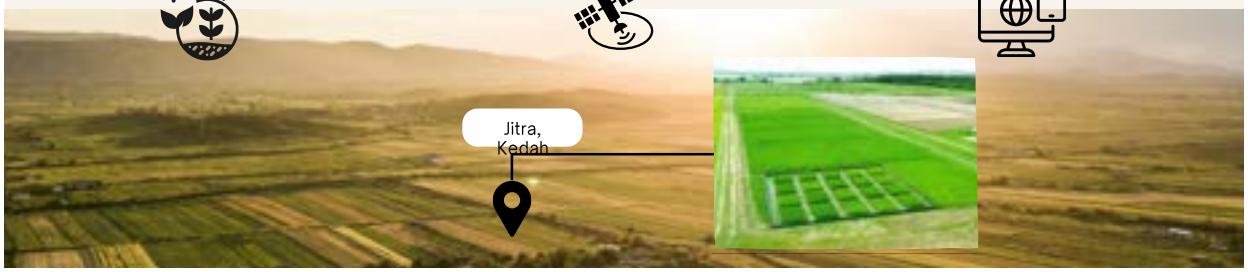
PROJEK LADANG PADI IR4.0

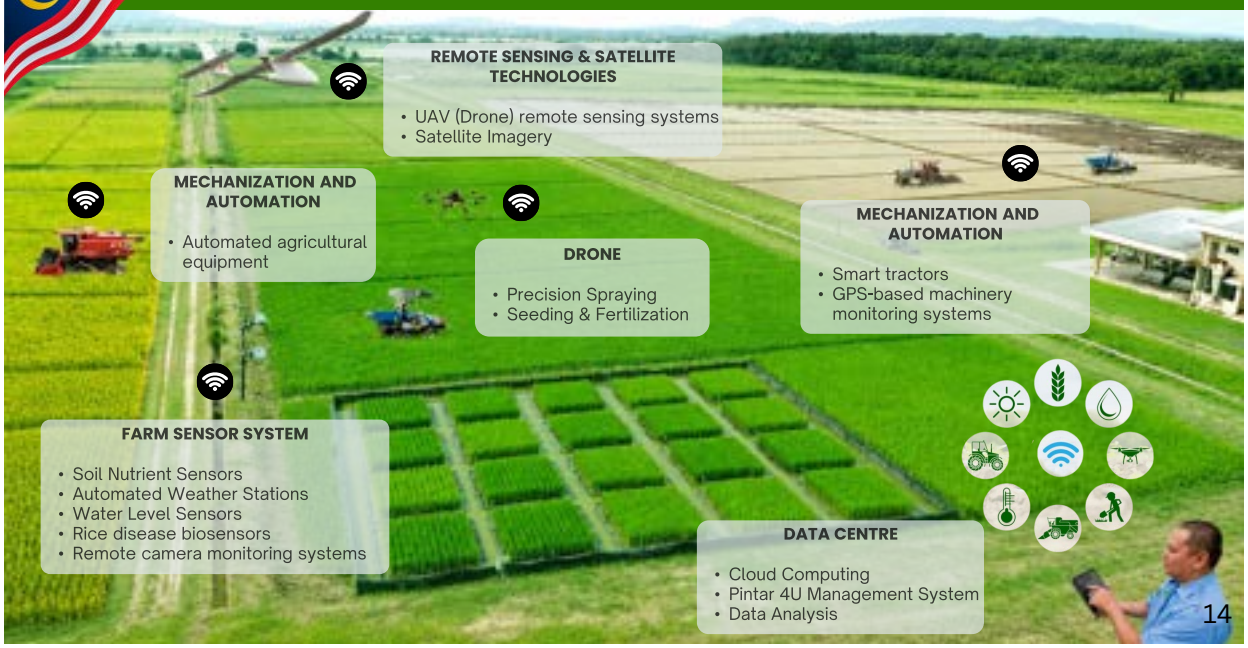
The Projek Ladang Padi IR4.0 is an initiative by MADA with a total allocation of RM6.0 million. The project focuses on digital, smart and precision farming concepts. Its primary goal is to build a smart decision support system (DSS) using Artificial Intelligence (AI), big data analytics and Internet of Things (IoT) applications to optimize input use, lower management costs and boost crop yields.

Location : (Projek Penanaman Padi Skala Besar – PPSB) in Bohor A, Kg. Bohor, Kepala Batas, Jitra, Kedah, spanning a localized area of 42.322 Hectares.

SMART FARM INFRASTRUCTURE + **REMOTE SENSING INTEGRATION** + **PINTAR 4U DIGITAL PLATFORM**



PROJEK LADANG PADI IR4.0



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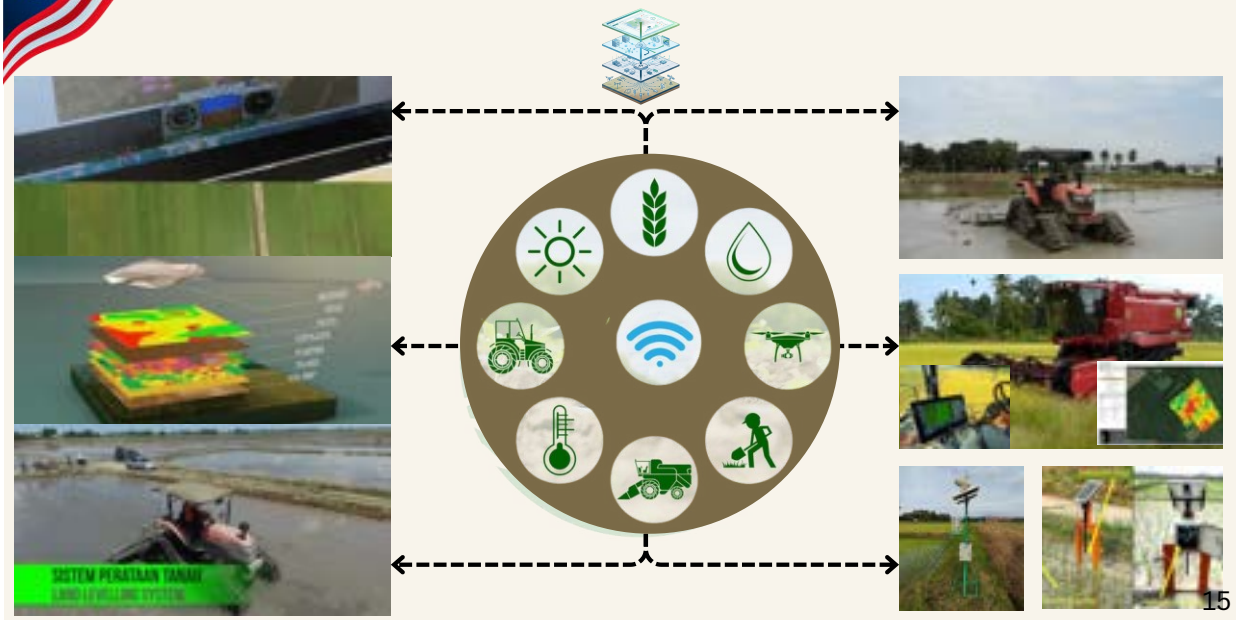
PROJEK LADANG PADI IR4.0



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PROJEK LADANG PADI IR4.0

SYSTEM ARCHITECTURE

END – USER APPLICATION LAYER

The Pintar4U Dashboard, granting real-time access to farmers, operators, and government agencies to optimize input use and lower costs.

DATA PROCESSING AND ANALYTICS LAYER

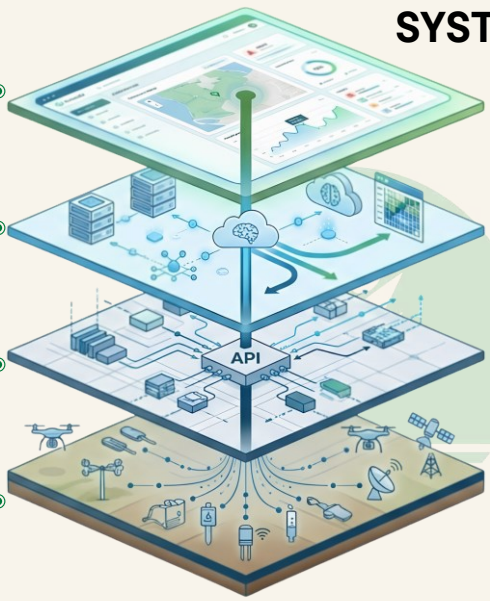
Generating actionable forecasts via cloud computing and AI-driven big data analytics.

SYSTEM AND DATA INTEGRATION LAYER

Seamless communication using Application Programming Interfaces (APIs) synthesizing fragmented datasets into a unified stream.

DATA COLLECTION LAYER

Gathering raw telemetry from soil/water sensors, plant health monitors, UAV/satellite imagery, and weather stations.



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ALTERNATIVE WATER SUPPLY DEVELOPMENT USING GROUNDWATER SOURCES

Groundwater & Solar photovoltaic (PV)

Developing groundwater as a strategic alternative to mitigate dependence on surface water during extreme dry periods.

Solar-Powered Pumps: Reducing grid dependency and greenhouse gas emissions.

IoT Monitoring: Real-time tracking of groundwater abstraction levels and automated pump control

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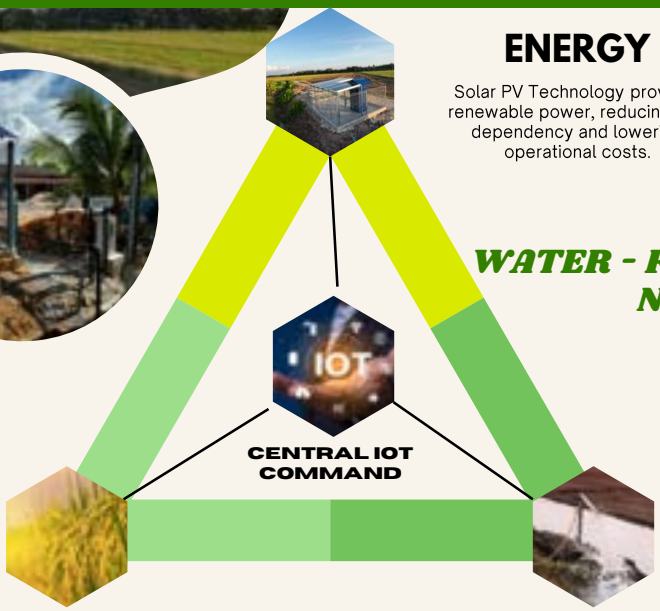
ALTERNATIVE WATER SUPPLY DEVELOPMENT USING GROUNDWATER SOURCES

ENERGY

Solar PV Technology provides renewable power, reducing grid dependency and lowering operational costs.

WATER - FOOD - ENERGY NEXUS



FOOD

Stabilized Paddy Cultivation protects national food security and sustains rural livelihoods regardless of surface climate conditions.

WATER

Alternative Groundwater Tube Wells bypass depleted surface reservoirs to provide reliable supply during severe El Niño droughts.

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ALTERNATIVE WATER SUPPLY DEVELOPMENT USING GROUNDWATER SOURCES

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THE WAY FORWARD

3 ACTION PLAN

01. Public-Private-People Partnerships (PPPP)

Shift the ownership model of expensive digital assets. Private firms can install, maintain and manage the SCADA networks and sensor frameworks, while regional authorities or agricultural cooperatives subscribe to the automated water delivery data services.

02. Establishing a National Open Data for Smart Agriculture

Enforce open-API regulations requiring that all future agritech hardware (e.g., IoT soil, water or weather sensors) utilize uniform data syntaxes capable of feeding directly into centralized analytics dashboards

03. Digital Extension Hubs and Micro-Credit Incentives

- Establish specialized local clinics within regional Water User Associations (PPK). These hubs will provide practical training on smart water valves, drone imaging interpretation and web-dashboard management.
- Launch specialized micro-credit program to help non-granary smallholders

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SMART WATER, SMART FARMING,
SECURE FUTURE
THANK YOU
Modernization is no longer just an infrastructure project; it is a strategic national imperative. By integrating the Total Solution approach with digital innovation and climate-resilient engineering, Malaysia will achieve lasting food security and agricultural competitiveness.
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