

# Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia: A Case Study in the Sukabumi Regency, West Java

Output 5 – Train Governmental Bodies in the CSA  
Practices and the Fully Integrated System

Concluding Workshop Report

D5.2.2

United Nations Environment  
Programme (UNEP)

11828079-RPT-411 Rev. 01  
March 2023

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# Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia: A Case Study in the Sukabumi Regency, West Java

## Output 5 – Train Governmental Bodies in the CSA Practices and the Fully Integrated System

### Concluding Workshop Report

D5.2.2

Prepared for United Nations Environment Programme (UNEP)  
 Represented by Ms Clara Landeiro

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### Current Revision Approvals

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### Classification

<input type="checkbox"/> Open	<input checked="" type="checkbox"/> Restricted	<input type="checkbox"/> Confidential
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## Document Information

<b>Project No.</b>	62802781		
<b>Project Title</b>	Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia: A Case Study in the Sukabumi Regency, West Java		
<b>Subject</b>	Output 5 – Train Governmental Bodies in the CSA Practices and the Fully Integrated System		
<b>Client</b>	United Nations Environment Programme (UNEP)		
<b>Document No.</b>	11828079-RPT-411	<b>Rev</b>	01

<b>Distribution</b>	<b>Type of Data</b>	<b>No of copies</b>
Directorate General of Climate Change	Digital	01
National Research and Innovation Agency (BRIN)	Digital	01
United Nations Environment Programme (UNEP)	Digital	01
DHI Water & Environment (M) Sdn. Bhd.	Digital	01

## Document Revision History

<b>Rev</b>	<b>Rev Date</b>	<b>Description of Change/ Reason for Issue</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>
01	Mar 27, 2024	Final	SKS, AFF, SFF, AH	SMH	SMH

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## 1 Introduction

This report details a two-day workshop held on 5th and 6th March 2024 at the Aston Hotel Bogor Nirwana Residence in Bogor. The workshop was held as part of the Output package 5 of the CTCN Technical Assistance on Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia.

The workshop served as a crucial platform for bringing together a diverse group of participants. Contextual technology suppliers, a dedicated stakeholder working group, and representatives from various government bodies, academic institutions, farmer groups, and private companies all came together to share knowledge, foster collaboration, and explore innovative solutions for climate-resilient agriculture.

The primary objective of the workshop was to train participants on the principles and practices of CSA, including the implementation of fully integrated systems. Secondly, the workshop provided a stage for contextual technology suppliers, both domestic and international, to showcase their cutting-edge technologies designed to enhance climate resilience in agricultural practices. Finally, the workshop fostered a space for knowledge exchange and collaboration between stakeholders, facilitating the development of a unified approach to tackling the challenges posed by climate change in the agricultural sector.

This comprehensive report provides a detailed overview of the workshop, encompassing:

- A structured agenda outlining the sequence of events.
- A list of participants, highlighting the diverse range of stakeholders represented.
- A summary of key discussions held during the workshop.
- A compilation of all presentation materials used throughout the two days.

Through a thorough examination of these elements, this report aims to capture the essence of the workshop and its valuable contributions to advancing CSA implementation in Indonesia.

## 2 Agenda

The Workshop started at 09:00 and ended at 16:00 local time. The workshop material was presented by CSA Experts, National Designated Entity (NDE), National Research and Innovation Agency (BRIN) (the project proponent) and technology suppliers.

Agenda of the Workshop is presented in the following table:

Day and Time	Agenda
Tuesday, 5 March 2024	
09:00 – 09:30	Opening: <ul style="list-style-type: none"> <li>• Greetings from BRIN (Project Proponent)</li> <li>• Report from the Workshop Organizer - DHI</li> </ul>
09:30 – 10:15	Introduction to Climate Change and Low Carbon Technology (NDE)
10:15 – 10:30	Coffee Break
10:30 – 11:30	Introduction to Climate-Smart Agriculture (CSA): Definition and Objectives of CSA
11:30 – 12:15	Policy Evaluation and CSA Implementation in Indonesia: Case Studies and Best Practices in Indonesia (BRIN)
12:15 – 13:15	Lunch Break
13:15 – 14:15	Gender Mainstreaming in CSA: Strategy and Example of Gender Mainstreaming Implementation in CSA Project
14:15 – 15:15	Identification of Water Content and Soil Chemistry: Latest Methodology and Technology
15:15 – 16:00	Automatic Irrigation and Fertilizer Application: An Innovative Approach to Water and Nutrient Efficiency
Wednesday, 6 March 2024	
09:00 – 12:00	Product Presentation <ul style="list-style-type: none"> <li>• Automatic Irrigation Technology and Fertigation System</li> <li>• Sensor Technology for Detecting Water and Fertilizer Needs</li> </ul>
12:10 – 13:00	Lunch Break
13:00 – 13:45	Introduction to Integrated System: Concepts and Applications in CSA
13:45 – 14:45	Funding Mechanism: Funding Sources and Strategies for CSA Project
14:45 – 15:45	Discussion and Q&A
15:45 – 16:00	Closing

### 3 Participants

The Workshop participants came from a diverse range of organisations, fostering a rich exchange of knowledge and perspectives crucial for successful CSA implementation. This included government officials, school teachers, vocational academicians, farmers groups, agricultural instructors, and private sectors. The list of workshop participants is presented in the following table:

No.	Name	Sex	Institution/Organization
1	Budi Sisko Purnomo	Male	SMKN1 Sukaraja
2	Encep Abdul Rahman	Male	SMKN1 Sukaraja
3	Yandri Muhammad R.	Male	SMKN1 Cibadak
4	Siti Hilda Ma'rufah	Female	SMKN1 Cibadak
5	Dr. Ir. Ujang Sehabudin, Msi	Male	Sekolah Vokasi IPB
6	Erniati, S.TP., M.Sc	Female	Politeknik Pembangunan Pertanian Bogor
7	Zubhan Zainal Arifin	Male	Biro Perencanaan dan Kerja Sama Kemendes
8	Akbar	Male	Poktan Tani Makmur
9	Yandi Rustandi	Male	Poktan Asri Tani
10	Putra Dwi Nanda	Male	Poktan Muda Mandiri
11	Entis	Male	Poktan Lohjinawi
12	Wulan Oktaviani	Female	Balai Penyuluhan Pertanian (BPP) Sukaraja
13	Dwi Karti Agustina, S.Pt.	Female	Balai Penyuluhan Pertanian (BPP) Cibadak
14	Pera Meliyanti	Female	Dinas Sumberdaya Air Provinsi Jawa Barat
15	Garan Paruta	Male	Bappelitbangda Kabupaten Sukabumi
16	Indra Bachtiar	Male	PT. Nudira Sumberdaya Indonesia
17	Arief Fatullah	Male	PT. Great Giant Pineapple
18	Susilo	Male	Ditjen Prasarana dan Sarana Kementan
19	Iqbal M	Male	PT. Aneka Tambang (ANTAM)
20	Muhammad Rusdan	Male	PT. Aneka Tambang ANTAM

#### Resource Persons:

- Directorate of Climate Change Control – Ministry of Environment and Forestry (KLHK)
- National Research and Innovation Agency (BRIN)
- DHI Technical Assistance Experts
- Technology Suppliers

Technology suppliers that presented their products in the workshop were:

1. Netafim
2. PT. Mertani
3. PT Daya Sentosa Rekayasa Irrigation

4. BIOPS Agrotekno
5. Meteo Nusantara Instrumen
6. Massgro

## 4 Minutes of Workshops

The workshop notes report is presented in Appendix A.

## 5 Presentation Materials

The workshop utilised a meticulously designed training module that focused on key Climate Smart Agriculture (CSA) topics relevant to the Indonesian context. The module comprised three core sections:

**Module 1:** Introduction to CSA and its Implementation in Indonesia

- Module 1.1 Introduction to Climate-Smart Agriculture
- Module 1.2 CSA Implementation in Indonesia – A National Perspective
- Module 1.3 Gender Mainstreaming in CSA – Ensuring Equitable Benefits

**Module 2:** Soil monitoring, Automatic Irrigation Technology and Fertigation

- Module 2.1 Identification of Water Content and Soil Chemistry – Essential Tools for Informed Decisions
- Module 2.2 Automatic Irrigation and Fertilization Applications – Enhancing Efficiency and Productivity
- Module 2.3 Presentations by Technology Suppliers - Showcasing Innovative Solutions

**Module 3:** CSA Integrated Irrigation System and Financial Analysis

- Module 3.1 Introduction to Implementation of Integrated System: Soil Monitoring, Automatic Irrigation with Fertilizer Application – A Holistic Approach
- Module 3.2 Feasibility Analysis of Agricultural Businesses in Climate Smart Agriculture (CSA) - Ensuring Sustainability and Profitability

The learning objectives of the modules designed are:

1. Participants understand and can explain the concept of Climate-Smart Agriculture (CSA).
2. Participants can explain the implementation of CSA in Indonesia.
3. Participants will be able to explain the importance of a gender-responsive Climate-Smart Agriculture (CSA) and describe strategies to support CSA as a gender-responsive program.
4. Participants learn about soil water content and soil chemistry identification technology.
5. Participants understand automatic irrigation technology and fertilization applications.
6. Participants know the products available for CSA implementation.
7. Participants understand the component of integrated system of soil sensor technology and automatic irrigation-fertilization.

8. Participants understand how to analyze the business and financial feasibility of an agricultural business using modern technology.

All presentation materials are presented in Appendix B.

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# APPENDIX A

## Workshop Notes

# Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia

Project Reference: CTCN 22-011

## Workshop Day 1

**Date:** 05 March 2024 (9.00 am to 4.00 pm)

**Place:** Aston Bogor Hotel & Resort

**Participants:**

Present

Budi Sisko Purnomo (Mr)	SMKN1 Sukaraja
Encep Abdul Rahman (Mr)	SMKN1 Sukaraja
Yandri Muhammad R. (Mr)	SMKN1 Cibadak
Siti Hilda Ma'rufah (Ms)	SMKN1 Cibadak
Dr. Ir. Ujang Sehabudin, Msi (Mr)	Sekolah Vokasi IPB
Erniati, S. TP, M.Sc (Ms)	Politeknik Pembangunan Pertanian Bogor
Zubhan Zainal Arifin (Mr)	Biro Perencanaan dan Kerja Sama Kemendes
Akbar (Mr)	Poktan Tani Makmur
Yandi Rustandi (Mr)	Poktan Asri Tani
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Wulan Oktaviani (Ms)	Balai Penyuluhan Pertanian (BPP) Sukaraja
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Garan Paruta (Mr)	Bappelitbangda Kabupaten Sukabumi
Indra Bachtiar (Mr)	PT. Nudira Sumberdaya Indonesia
Arief Fatullah (Mr)	PT. Great Giant Pineapple
Susilo (Mr)	Ditjen Prasarana dan Sarana Kementan
Iqbal M. (Mr)	PT. Aneka Tambang (ANTAM)
Muhammad Rusdan (Mr)	PT. Aneka Tambang (ANTAM)

Absent

BNI  
Balai Pengendalian Perubahan Iklim Wilayah Jawa, Bali Nusra

### Agenda:

- Opening of the meeting.
- Introduction to Climate Change and Low Carbon Technologies (NDE)
- Introduction to Climate Smart Agriculture: Definition and Objectives of CSA
- Policy Evaluation and CSA Implementation in Indonesia: Case Studies and Best Practices in Indonesia
- Gender Mainstreaming in CSA: Strategy and Example of Gender Mainstreaming Implementation in CSA Projects
- Identification of Water Content and Soil Chemistry: Latest Methodology and Technology
- Automatic Irrigation and Fertilizer Application: An Innovative Approach to Water and Nutrient Efficiency
- Closing of meeting.

### Notes:

Item	Discussion Notes	Remarks
1.0	The meeting was conducted in Bahasa Indonesia. The workshop was moderated by Ms Aryu Tazkia and started at 9.00 am (Jakarta time). It was officially opened by Mr. Dr. Dudi Iskandar from BRIN (Project Proponent).	-
2.0	A presentation on the Introduction to climate change and low-carbon technologies was done by Ms Rizkia Amelia from NDE with the following main points:	-
	<ul style="list-style-type: none"> <li>- Sources causing emissions: CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>2</sub></li> <li>- 5 main emission reduction sectors: energy, waste, forestry, IPPU, Agriculture &gt; emission reduction target from 5 sectors = 31.89%</li> <li>- 2 actions to reduce emissions: mitigation (prevention) and adaptation</li> <li>- Sustainable agricultural sector: animal feed composition is a technology to reduce livestock burps (fodder and livestock burps are the biggest sources of emissions) so it needs to be considered in terms of animal feed</li> </ul>	
3.0	A presentation on the Introduction to Climate Smart Agriculture: Definition and Objectives of CSA was done by Dr. Satyanto with the following main points:	-
	<ul style="list-style-type: none"> <li>- 3 things about productivity: Income, climate change and increasing agricultural sustainability (carbon emissions). Addressing food security and climate change.</li> <li>- Livestock management: sustainable livestock practices, rotation development&gt; even better livestock.</li> <li>- Rice intensification system: moist soil and not waterlogged, soil improvement (organic matter), seedling transplantation, little irrigation water.</li> <li>- Water management: rainwater is collected for use and water savings, increased micro-irrigation for vegetables, wetting techniques.</li> </ul>	

Item	Discussion Notes	Remarks
	<ul style="list-style-type: none"> <li>- CSA Stakeholders: farmers, researchers, policymakers, civil society organizations, private sector companies, and consumers.</li> <li>- CSA: forward thinking for sustainability in the era of climate change, utilizing technological advances that can protect the environment.</li> </ul>	
4.0	A presentation on the Evaluation of CSA policy and implementation in Indonesia: case studies and best practices in Indonesia was done by Dr. Dudi Iskandar with the following main points:	-
	<ul style="list-style-type: none"> <li>- Indonesian sustainable agriculture &gt; urgent need for food security in climate change</li> <li>- CSA stakeholders in the Indonesian government &gt; KLHK, Ministry of women's empowerment and child protection, Ministry of Public Works, Coordinating Ministry for Economic Affairs, Ministry of Agriculture, BRIN</li> <li>- Research and innovation facilities, target 2025: 80% private, 20% government</li> </ul>	
5.0	A presentation on Gender Mainstreaming in CSA: Strategies and example of gender mainstreaming implementation in CSA Project was done by Ms Srin Wulan Ferindian, M.Si with the following main points:	-
	<ul style="list-style-type: none"> <li>- Gender (women and men) have their respective roles or responsibilities.</li> <li>- Women tend to be less likely to make decisions</li> <li>- Gender responsive: consistent and systematic attention to gender differences</li> <li>- Women farmers are subjects in CSA development</li> <li>- Gender responsive CSA &gt; building increased gender equality</li> <li>- Job task distribution profile &gt; women tend to be in the maintenance and irrigation sector, while men tend to be in the marketing sector</li> </ul>	
6.0	A presentation on Identification Water Content and Soil Monitoring, Automatic Irrigation and Fertigation Technology was done by Dr. Satyanto with the following main points:	-
	<ul style="list-style-type: none"> <li>- Soil water content &gt; do not give excess water to the soil &gt; require monitoring equipment for the depth of plant roots</li> <li>- Soil fertility &gt; supports plants (nutritional aspect)</li> <li>- Necessary content in the soil (N, P, K and micro nutrients)</li> <li>- Pore space &gt; roots breathe from pore space &gt; drainage and water storage</li> <li>- Soil moisture and chemicals &gt; soil moisture and chemical sensing systems &gt; site-embedded sensors &gt; satellites &gt; drones &gt; combined approaches</li> </ul>	
7.0	Discussion main points:	

Item	Discussion Notes	Remarks
	<ul style="list-style-type: none"> <li>➤ Other alternatives aim to be environmentally friendly:               <ul style="list-style-type: none"> <li>- The challenge in southern areas is still relying on pump suction for chili and rice plants, an environmentally friendly alternative is using solar panels, het: when low can be an alternative to pump suction.</li> <li>- Improving the irrigation. in rice commodities &gt; the water is not stagnant or not always saturated &gt; as an alternative, use the SRI system</li> </ul> </li> </ul>	
	<ul style="list-style-type: none"> <li>➤ How to deal with water problems with climate change               <ul style="list-style-type: none"> <li>- Climate uncertainty and increasing temperatures cause plants to die, so they can rely on the availability of rainwater, the automatic irrigation system uses a timer (satellite or weather data to calculate irrigation hours in each unit) so it needs to be improved in terms of technology to increase water, water storage and irrigation. CSA requires a more reliable water source, the assumption is that CSA has sufficient water but in fact there is not enough water</li> </ul> </li> </ul>	
	<ul style="list-style-type: none"> <li>- smart agriculture &gt; high productivity but expensive costs</li> <li>- smart farming &gt; very good for agriculture</li> <li>- Our smart aquaculture technology is still traditional. because it's hard to control</li> <li>- smart greenhouse &gt; harvest &gt; promotion on social media has a more expensive selling point.</li> </ul>	
	<ul style="list-style-type: none"> <li>➤ Gender and age influence a business               <ul style="list-style-type: none"> <li>- Involving workers over 46 years of age will find it difficult to learn new technology and educate workers, both women and men.</li> <li>- We need workers who are suited to their field and like their duties</li> <li>- There is a need for training in calculating carbon emissions</li> </ul> </li> </ul>	
	<ul style="list-style-type: none"> <li>- Sensors need intensive maintenance, so that the data is efficient, otherwise the results on the data will be inefficient</li> <li>- Sensor selection is important, depending on conditions in the field</li> <li>- Sensors have a technical lifespan</li> </ul>	
8.0	The meeting ended at 4.00 pm (Jakarta time).	

# Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia

Project Reference: CTCN 22-011

## Workshop Day 2

**Date:** 06 March 2024 (9.00 am to 4.00 pm)

**Place:** Aston Bogor Hotel & Resort

**Participants:**

Present

Budi Sisko Purnomo (Mr)	SMKN1 Sukaraja
Encep Abdul Rahman (Mr)	SMKN1 Sukaraja
Yandri Muhammad R. (Mr)	SMKN1 Cibadak
Siti Hilda Ma'rufah (Ms)	SMKN1 Cibadak
Dr. Ir. Ujang Sehabudin, Msi (Mr)	Sekolah Vokasi IPB
Erniati, S. TP, M.Sc (Ms)	Politeknik Pembangunan Pertanian Bogor
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Indra Bachtiar (Mr)	PT. Nudira Sumberdaya Indonesia
Arief Fatullah (Mr)	PT. Great Giant Pineapple
Susilo (Mr)	Ditjen Prasarana dan Sarana Kementan
Iqbal M. (Mr)	PT. Aneka Tambang (ANTAM)

Absent

BNI

Balai Pengendalian Perubahan Iklim Wilayah Jawa, Bali Nusra

**Agenda:**

- Opening of the meeting.
- Product Presentation: Automatic Irrigation Technology and Fertigation System, and Sensor Technology for Detecting Water and Fertilizer Needs.
- Introduction to Integrated System: Concepts and Applications in CSA.
- Funding Mechanism: Funding Sources and Strategies for CSA Project.
- Discussion.
- Closing of meeting.

**Notes:**

Item	Discussion Notes	Remarks
1.0	The meeting was conducted in Bahasa Indonesia. The workshop was moderated by Ms Aryu Tazkia and started at 9.00 am (Jakarta time). It was officially opened by Dr. Satyanto on behalf of DHI.	-
2.0	Product Presentation: <ul style="list-style-type: none"> <li>- Automatic Irrigation Technology and Fertigation System</li> <li>- Sensor Technology for Detecting Water and Fertilizer Needs</li> </ul>	
2.1	A presentation on the Grow More With Less was done by Mr Alghienka from Netafim with the following main points: <ul style="list-style-type: none"> <li>- Digital farming &gt; problems in cultivation</li> <li>- Grow sphere uses software in the automatic irrigation system to provide information on plant growth conditions</li> <li>- 3 unique grow spheres: operation, agronomic, hydraulic.</li> <li>- Grow sphere for large and small scales</li> <li>- Soil moisture measures soil moisture</li> <li>- Environmental rainfall, wind speed</li> <li>- Full presentation regarding products is available in pdf file</li> </ul>	-
2.2	A presentation on the Implementation of Climate Smart Agriculture (CSA) in Indonesia was done by Mr Ashif from PT. Mertani with the following main points: <ul style="list-style-type: none"> <li>- Climate change &gt; impacts on agriculture &gt; uncertainty (seasons, climate, drought, flood disasters, crop failure, etc.) &gt; adapting to climate change (using manual data tools to become more sophisticated) manual data tools (data errors)</li> <li>- Full presentation regarding products and services is available in pdf file</li> </ul>	
2.3	A presentation on the Total crop intelligence one simple system was done by Mr Agus Setyo from Daya Sentosa ReKayasa with the following main points: <ul style="list-style-type: none"> <li>- Produced product &gt; detects the air used &gt; stronger cellular &gt; solar panel (operates for 2 months even though the intensity of sunlight is small) &gt; camera (plant</li> </ul>	

Item	Discussion Notes	Remarks
	<p>growth) visually, as an analysis of environmental conditions, weather and plant conditions</p> <ul style="list-style-type: none"> <li>- NDVI &gt; numerical data -1 to 1, the thicker the value, the higher the value, an indicator of plant health, you can anticipate if the NDVI value means you need to use additional fertilizer, etc.</li> <li>- Leaf wetness &gt; air on the plant surface &gt; meeting leaf wetness, temperature, etc</li> <li>- Spraying pesticides, fungicides and herbicides &gt; to find out how long the rain will last</li> <li>- Netajet &gt; can mix fertilizer solutions until homogeneous</li> <li>- Monitoring &gt; air, nutrients, opt,</li> <li>- Smart fertigation &gt; farming conditions</li> <li>- Full presentation regarding products is available in pdf file</li> </ul>	
2.4	<p>A presentation on More Precise, more productive was done by Mr Malik from BIOPS Agrotekno with the following main points:</p>	
	<ul style="list-style-type: none"> <li>- Monitoring (measuring temperature, weather, air requirements) focuses on horticulture and control</li> <li>- The use of technology has an impact on productivity increasing by 40%, operational costs decreasing by 50% and water usage decreasing by 40%</li> <li>- Full presentation regarding products and services is available in pdf file</li> </ul>	
2.5	<p>A presentation on online data and irrigation control, more productive was done by Mr Rusianto from Meteo Nusantara Instrumen with the following main points:</p>	
	<ul style="list-style-type: none"> <li>- Sensors for automatic irrigation and automatic fertigation: sensors for water level, soil water content, soil temperature, soil EC, soil pH, soil water potential</li> <li>- Full presentation regarding products and services is available in pdf file</li> </ul>	
2.6	<p>A presentation on Climate Smart Agriculture (CSA) was done by Mr Antoni, Budi and Faris from Massgro with the following main points:</p>	
	<ul style="list-style-type: none"> <li>- Precision system: delivering water consistently and on target, design, monitoring</li> <li>- Independent irrigation solutions &gt; customized land packages &gt; prepare 200 m - 1 hectare</li> <li>- Controller &gt; input and output adjust irrigation levels &gt; simple system &gt; plants can be watered per second &gt; small doses but frequent &gt; 1 box 15 hectares</li> <li>- Not all water conditions are the same, sometimes water quality is different from wells, so land area&gt; irrigation design must be comprehensive (optimal), the irrigation system is important from sources to plants</li> <li>- Full presentation regarding products is available in pdf file</li> </ul>	
3.0	<p>A presentation on Introduction to integrated systems, concepts and applications in CSA was done by Dr. Satyanto with the following main points:</p>	

Item	Discussion Notes	Remarks
	<ul style="list-style-type: none"> <li>- Integrated system: supports climate intelligent farmers (CSA)&gt; a system that works automatically and includes a monitoring system</li> <li>- Drip system &gt; technology that can be managed by farmers</li> <li>- Sensors depend on air humidity and electro conductivity</li> <li>- Component of integrated system &gt; the control system uses a computer so it can move automatically</li> </ul>	
4.0	<p>A presentation on Funding mechanisms: Funding sources and strategies for CSA projects was done by Dr. A. Faroby Falatehan with the following main points:</p>	
	<ul style="list-style-type: none"> <li>- Financial feasibility &gt; analyzing whether the business being run is feasible or not</li> <li>- NPV&gt; calculation of the difference in cash flows issued by the company, the NPV value uses interest rates, if the NPV value is positive then it can be said to be feasible</li> <li>- IRR (Internal rate of return) &gt; to see the rate of return of funds</li> <li>- Cash costs: own land needs to be calculated, whether or not it is worth a business</li> </ul>	
5.0	<p>Discussion and Q&amp;A</p>	
	<p>Discussion with Mr Alghienka</p> <ul style="list-style-type: none"> <li>- Tools that are easy for farmers to use at low prices are the Netafim kit &gt; for an area of 250 - 1 hectare, filter, pipe, connector &gt; water source using a pump or gravity.</li> <li>- The price of this tool is still flexible and easy for farmers to understand.</li> <li>- Netafim's current corporate tools are not yet available for small-scale farmers.</li> </ul> <p>Discussion with Mr Ashif</p> <ul style="list-style-type: none"> <li>- The available sensors that are more commonly used are temperature, humidity, pH, and electrocollectivity</li> <li>- If nutrition sensor nutrition is a productivity sensor method</li> </ul> <p>Discussion with Mr Malik</p> <ul style="list-style-type: none"> <li>- Farmers think about investing, their products on a minimum scale of 500 meters/square</li> <li>- Farmers will receive capital for 3 planting periods</li> <li>- 100 meters/square land, land control, but has not included the price of water withdrawal costs/entered the price of the water source, from the ground to the reservoir.</li> </ul> <p>Discussion with Mr Rusianto</p> <ul style="list-style-type: none"> <li>- The advantages of the tool are its technology, maintenance and operation &gt; using a remote data logger, so that the problem can be identified &gt; after installing the tool. there is training with people in the field</li> </ul>	

Item	Discussion Notes	Remarks
	<p>&gt; the problem in the field is that the telemeter equipment is not maintained properly, so it can disrupt the equipment &gt; every week to month it is controlled.</p> <ul style="list-style-type: none"> <li>- 1 year guarantee period</li> </ul> <p>Discussion with Mr Antoni, Mr Budi, and Mr Faris</p> <ul style="list-style-type: none"> <li>- Water quality &gt; no need to use chemicals, the TSS filtration system is good &gt; filtration from the smallest 20 - 500 M3</li> </ul> <p>Discussion with Dr. A. Faroby Falatehan</p> <ul style="list-style-type: none"> <li>- The most ideal data for cultivation in one year is 1 year, planting rice twice a year and secondary crops once a year. provide alternatives to these two commodities. so you can see what the productivity</li> <li>- Land ownership of 0.3 by implementing CSA is better, in accordance with the commodities planted, because they are looking for more profit. as an alternative, perhaps other commodities that use CSA. Usually melons are quite profitable, especially if irrigation uses SPT it is definitely profitable</li> <li>- IPB Sukabumi Vocational School and Polbangtan Bogor invite them to work together in order to utilize existing facilities. IPB Sukabumi Vocational School has facilities in the form of a green house, close house, fish pond and 6.5 hectares of rice fields, farmers (labor). Meanwhile, Polbangtan Bogor has a green house, and accepts street vendors and recruits employees who have expertise in the field of sustainable agriculture or animal husbandry.</li> </ul>	
11.0	The meeting ended at 4.00 pm (Jakarta time).	

## APPENDIX B

### Presentation Materials

CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Introduction to Climate-Smart Agriculture and its Implementation in Indonesia

## Training Module 1

# Modules Overview

## **Module 1:** Introduction to CSA and its Implementation in Indonesia

This module equips participants to implement CSA practices in Indonesia, fostering climate resilience and gender equality

- **Module 1.1. Introduction to Climate-Smart Agriculture**
- Module 1.2 CSA Implementation in Indonesia
- Module 1.3 Gender Mainstreaming in CSA

## **Module 2:** Soil monitoring, Automatic Irrigation Technology and Fertigation :

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- Module 2.1 Identification of Water Content and Soil Chemistry
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## **Module 3:** CSA Integrated Irrigation System and Financial Analysis :

This module explores integrated soil sensor and irrigation-fertilization systems

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# Module 1

## Learning Objectives

1.1. Participants understand and can explain the concept of Climate-Smart Agriculture (CSA)

1.2. Participants can explain the implementation of CSA in Indonesia

1.3. Participants will be able to explain the importance of a gender-responsive Climate-Smart Agriculture (CSA) and describe strategies to support CSA as a gender-responsive program.

CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Introduction to Climate- Smart Agriculture



UN Climate Technology Centre & Network  
UNFCCC Technology Mechanism



# Learning Objective 1.1

Participants understand and can explain the concept of  
Climate-Smart Agriculture



UN Climate Technology Centre & Network  
UNFCCC Technology Mechanism

UN   
environment  
programme



UNEP-DHI CENTRE

# Introduction



Climate-smart agriculture Climate-smart agriculture (CSA) is an integrated approach to managing landscapes to help adapt agricultural methods, livestock and crops to the effects of climate change and, where possible, counteract it by reducing greenhouse gas emissions from agriculture, at the same time taking into account the growing world population to ensure food security



By focusing on food security, climate change adaptation, and ecosystem management, the concept of CSA addresses the three dimensions of sustainable development (Economic, environmental and social) and aims to maintain a balance between them while enhancing agricultural productivity

# Why climate-smart agriculture?



It is an approach that jointly addresses food security and climate change by achieving its three goals



sustainably increasing agricultural **productivity and incomes;**



adapting and building **resilience to climate change;**



reducing and/or removing **greenhouse gas emissions,** where possible

# Soil management



Conservation agriculture,  
biomass recycling and soil  
health



Integrated farming - nutrient  
management

# Crop management



Use of diverse and appropriate varieties



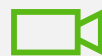
Crop and livelihood diversification



Organic farming for sustainable agriculture



Participatory seed production and seed saving



Seed System

# System of Rice Intensification

Moist and not flooded soil

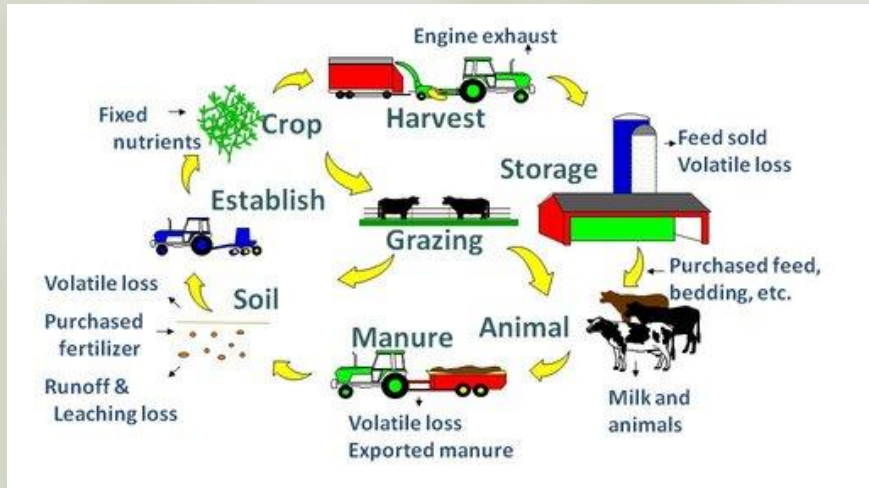
Soil enhancement with organic matter content

Young seedlings transplant spaced widely in a square grid pattern

Less irrigation water



# Crop and livelihood diversification



Crop diversification to reduce risk in adversely affected areas



Integrated farming system



Mixed, Inter, Relay cropping & Cropping System

# Water management



Water harvesting and saving techniques



Improved micro irrigation for vegetables



Alternate Wetting and Drying techniques for rice cultivation

# Agroforestry

Agroforestry

Sloping Agricultural  
Land Technology

Community forestry

# Challenges and Solutions

Despite its benefits, CSA faces obstacles such as lack of awareness, initial high costs, market barriers, regulatory hurdles, and cultural resistance

Support from governments and NGOs is crucial in overcoming these challenges, by providing incentives, crafting supportive policies, and fostering knowledge exchange and technological support

# Stakeholders of CSA



- CSA stakeholders include farmers, researchers, policymakers, civil society organizations, private sector companies, and consumers

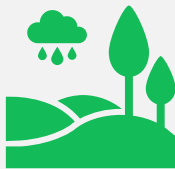
# Farmers



Crucial stakeholders in CSA



Responsible for implementing the practices that make their farms more sustainable and resilient to climate change



Directly impacted by the effects of climate change, including droughts, floods, and changes in temperature and precipitation patterns

# Researchers and scientists



Developing and testing new technologies and practices that can help reduce greenhouse gas emissions, improve productivity, and enhance resilience to climate change



Monitoring and evaluating the impacts of CSA interventions to ensure effectiveness and efficiency

# Policymakers and government officials



Important stakeholders in CSA



Provide the necessary national regulatory framework



Provide financial support to scale up CSA interventions



Play a role in shaping international policies and agreements that promote sustainable agriculture and reduce greenhouse gas emissions

# Civil society organizations and private sector companies



Key stakeholders in CSA



Can provide funding, technical expertise, and other forms of support to farmers and other actors in the food system



Driving demand for sustainable and climate-friendly agricultural products



Promoting greater transparency and accountability across the food system

# Consumers



Driving demand for sustainable and climate-friendly agricultural products

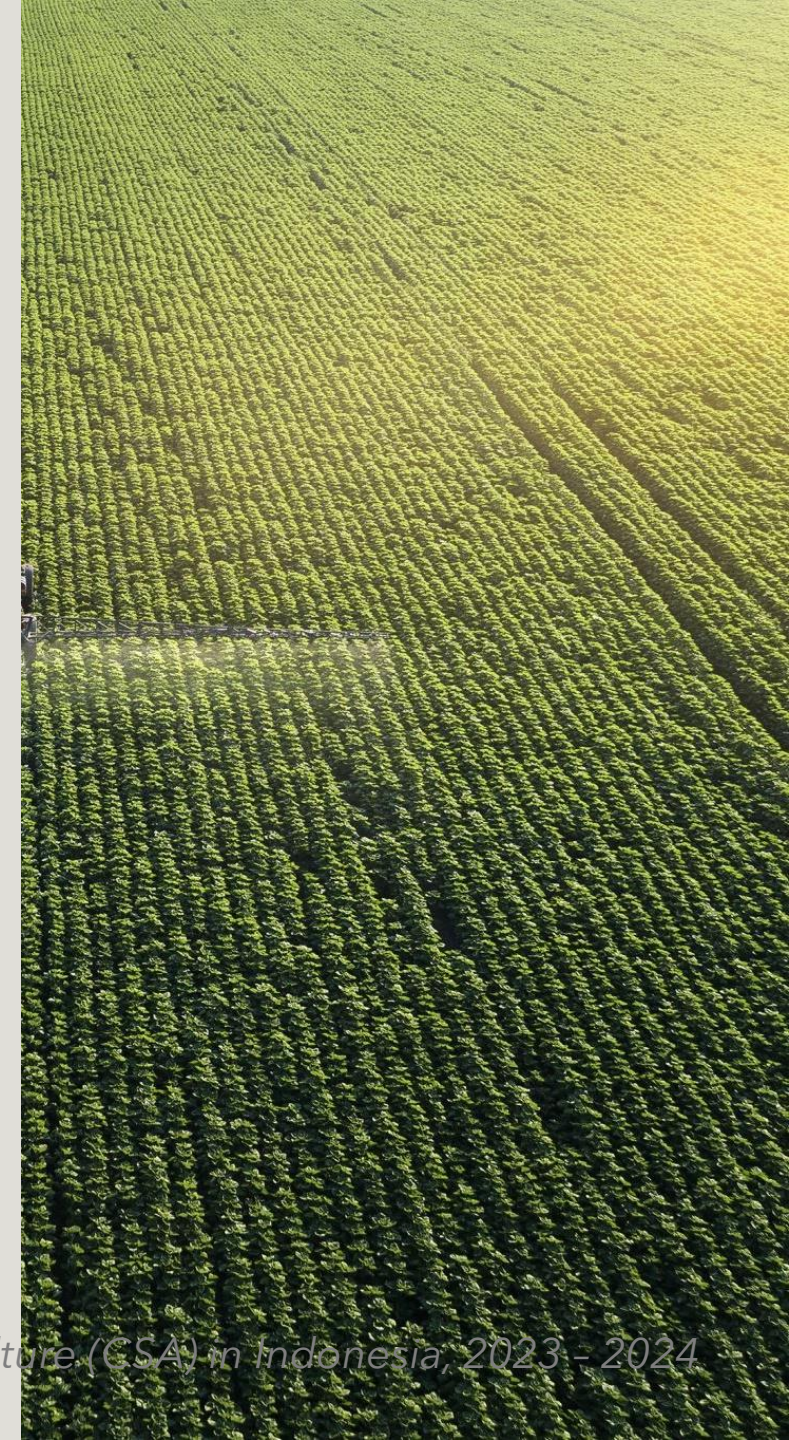
# Role of Technology



Precision agriculture and remote sensing technologies are essential in the adoption and optimization of CSA practices



Platforms like Crop Monitoring offer valuable insights into environmental conditions, enabling farmers to make informed decisions and adjust practices accordingly



# Conclusion

Climate-smart agriculture represents a forward-thinking approach to ensuring food security and agricultural sustainability in the era of climate change

By addressing the core pillars of CSA and leveraging technological advancements, it's possible to meet the dual challenges of feeding a growing global population and protecting the environment

Governments, NGOs, and the agricultural community must collaborate to scale up the adoption of CSA practices, ensuring a resilient and sustainable food system for future generations



# Links



FAO'S OFFICIAL PAGE ON CSA  
[HTTPS://WWW.FAO.ORG/CLIMATE-SMART-AGRICULTURE/EN/](https://www.fao.org/climate-smart-agriculture/en/)



UNEP GUIDELINE FOR CSA  
[HTTPS://LEAP.UNEP.ORG/EN/COUNTRIES/TZ/NATIONAL-LEGISLATION/CLIMATE-SMART-AGRICULTURE-GUIDELINE](https://leap.unep.org/en/countries/tz/national-legislation/climate-smart-agriculture-guideline)



CTCN'S RESOURCES FOR AGRICULTURE: [HTTPS://WWW.CTCN.ORG/TECHNOLOGY-SECTORS/AGRICULTURE](https://www.ctcn.org/technology-sectors/agriculture)



**UN Climate Technology Centre & Network**  
UNFCCC Technology Mechanism

**Thank You**  
**Terima Kasih**

- CTCN Technical Assistance on Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

UN  
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CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Introduction to Climate-Smart Agriculture and its Implementation in Indonesia

## Training Module 1

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# Module 1

## Learning Objectives

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CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Implementation of Climate- Smart Agriculture in Indonesia



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# Learning Objective 1.2

Participants can explain the implementation of CSA in  
Indonesia



UN Climate Technology Centre & Network  
UNFCCC Technology Mechanism

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environment  
programme



UNEP-DHI CENTRE

# CSA Implementation in Indonesia

- Climate-Smart Agriculture represents a transformative approach to ensuring sustainable agricultural practices and food security in the face of climate change.
- Climate-Smart Agriculture is essential for the sustainability of Indonesian agriculture, by answering the urgent need for food security in the midst of climate change.
- Indonesia is facing the real impacts of climate change, which threatens agricultural productivity and biodiversity.



# CSA Implementation in Indonesia

- International support from UNEP and CTCN brings global technical expertise and resources, which underscore the importance of international partnerships in addressing climate challenges.
- BRIN's contribution is very important in the research and development of innovative technologies tailored to the diverse needs of Indonesian agriculture.



# CSA Implementation in Indonesia

- Programs such as SIMURP (Strategic Irrigation Modernization and Mitigation Project) highlight the practical application of CSA, demonstrating the effectiveness of combining Policy support, international collaboration and local innovation.
- Participants will explore and gain insight into the multifaceted approach required for successful CSA implementation.



# Stakeholders of CSA in Indonesia's Government

Ministry of Environment and Forestry	<ul style="list-style-type: none"><li>• As the National Designated Entity , KLHK spearheads the national agenda on climate change, including the integration of CSA into national policies</li></ul>
Ministry of Women Empowerment and Children Protection	<ul style="list-style-type: none"><li>• KPPA ensures that CSA initiatives are gender-sensitive, promoting community involvement with a strong emphasis on empowering women in agriculture</li></ul>
Ministry of Public Works and Housing	<ul style="list-style-type: none"><li>• KPUPR is instrumental in improving and maintaining irrigation infrastructure, a cornerstone for increasing water use efficiency in climate-resilient agricultural practices</li></ul>
Coordinating Ministry for Economic Affairs	<ul style="list-style-type: none"><li>• KemenKoE oversees the monitoring, analysis, evaluation, and reporting in the food and agribusiness sector</li></ul>
Ministry of Agriculture	<ul style="list-style-type: none"><li>• Kementan is at the forefront of facilitating smallholder access to extension services that assist with CSA technology</li></ul>
National Research and Innovation Agency	<ul style="list-style-type: none"><li>• BRIN conducts research and development activities focused on identifying and developing practical CSA practices</li></ul>

# Stakeholders of CSA in Indonesia's Government

## Government Institutions

## Role in CSA

Ministry of Environment and Forestry (KLHK)

National designated entity (NDE)

Ministry of Women Empowerment and Children Protection (KPPA)

To ensure community involvement (gender- sensitive)

Ministry of Public Works and Housing (KPUPR)

Improving and maintaining irrigation infrastructure to increase the efficiency of water use in climate-resilient agricultural practices.

Coordinating Ministry for Economic Affairs (KemenKoE)

Monitoring, analysing, evaluating, and reporting in the field of food and agribusiness

Ministry of Agriculture (Kementan)

- Facilitate smallholder with excellent extension who can provide assistant related CSA technology
- Supporting farmers to adopt CSA practices by providing the necessary infrastructure and services to enhance agricultural productivity, improve resilience, and reduce greenhouse gas emissions. Provide program support/input for smallholders regarding CSA's pillar

National Research and Innovation Agency (BRIN)

Conduct research and development activities to identify and develop CSA practices that can be adopted by farmers



# KELEMBAGAAN IPTEK DI INDONESIA

## KEMENDIKBUD RISTEK

Perumusan dan penetapan kebijakan di bidang iptek di lingkungan pendidikan tinggi (Perpres No. 62 Tahun 2021, Pasal 5 huruf b)

## BRIDA

Pemanfaatan riset dan inovasi mendukung kebijakan dan pemanfaatan teknologi di daerah



## PERGURUAN TINGGI

- *Research university, teaching university, vocational university*
- Produsen sumber daya iptek, riset dan inovasi

## BRIN

- Pelaksana dan penghasil produk riset strategis (inovasi dan inovasi)
- Penguatan ekosistem dan fasilitator utama riset dan inovasi
- Perumusan dan penetapan kebijakan di bidang riset dan inovasi nasional (Perpres No. 78 Tahun 2021, Pasal 4)

## KEMENTERIAN/ LEMBAGA

Pemanfaatan riset dan inovasi mendukung kebijakan (*evidence / science based policy*)

Joint Research and Smart Farm Technology Support to Improve Scientific  
Agricultural Technology in Indonesia



① Building K-  
Greenhouse

Shinhan A Tech Ltd

② Smart Farm  
Technology

KIST 한국과학기술연구원강릉  
천연물연구소

③ Joint Research &  
Training

green  
GATE  
Global Agri Tech & Exchange



# CSA best practices in Indonesia

---

In Indonesia, the implementation of Climate Smart Agriculture best practices is transforming the agricultural landscape towards better sustainability and resilience to climate change

---

The Rice Intensification System is another example of a practice that revolutionizes rice production through optimization of planting techniques and water management

---

Efficient water management practices, including rainwater collection and the use of micro-irrigation systems, demonstrate Indonesia's commitment to addressing the challenge of water scarcity

---

By implementing these best practices, Indonesia not only increases its agricultural productivity but also strengthens its food security and contributes to global efforts against climate change.

# Examples of CSA best practices in Indonesia

1. The application of CSA technology in Nagekeo Regency, East Nusa Tenggara, through the SIMURP Program of the Indonesian Ministry of Agriculture, resulted in an increase in maize productivity on one hectare using modern agricultural techniques and smart agricultural practices to adapt to climate change.
2. The Bio-Industry Model in West Papua, which integrates cocoa and goat farming, shows a sustainable cycle of diversification of materials and products that increases land income and productivity.
3. The introduction of smart irrigation at P4S Buana Lestari, Nganjuk Regency, features a micro-irrigation system that manages water efficiently for agricultural purposes, highlighting its specifications and operational efficiency.



# Teknologi CSA jadikan Petani Nagekeo NTT Pintar Adaptasi Perubahan Iklim

## *Indonesia Irrigation Development the Target of Government's Grant Program*

Editor : M. Achsan Atjo  
Translator : Dhelia Gani

PUBLISHED: Jum'at, 29 September 2023 , 01:55:00



PROGRAM SIMURP: Tim SIMURP dari Kementan melakukan evaluasi penerapan CSA di lahan pertanaman jagung milik Oseas [kanan atas] setelah koordinasi dengan Koordinator BPP maupun audiensi dengan pejabat dinas terkait.

**Nagekeo, NTT [B2B]** - Penerapan teknologi Pertanian Cerdas Iklim/Climate Smart Agriculture [CSA] menjadikan petani di Kabupaten Nagekeo, Provinsi Nusa Tenggara Timur [NTT] pintar mengadaptasi perubahan iklim, didukung teknologi pertanian modern

**Nagekeo of East Nusa Tenggara [B2B]** - The objective of the Strategic Irrigation Modernization and Urgent Rehabilitation Project [SIMURP] with Indonesia Agriculture Ministry is to increase production and productivity, increasing farmers' knowledge

# Teknologi CSA Berhasil Genjot Produktivitas Padi di Buluspesantren Kebumen

udin abay | Minggu, 20 Agustus 2023 , 23:03:00 WIB



**Swadayaonline.com** - Kabupaten Kebumen di Provinsi Jawa Tengah, merupakan salah satu pelaksana kegiatan SIMURP yang ada di Indonesia. Pelaksana kegiatan SIMURP di Kabupaten Kebumen mencakup 20 kecamatan, salah satunya Kecamatan Buluspesantren. Di kecamatan ini, terdapat 24 kelompok tani (poktan) dari 17 desa penerima kegiatan SIMURP. Teknologi yang disampaikan meliputi tanam jajar legowo, pembuatan pupuk organik padat dan cair, penggunaan perangkat uji

tanah sawah (PUTS) untuk penggunaan pupuk berimbang, teknologi hemat air AWD (*Alternate Wetting and Drying*), dan pembuatan rumah burung hantu (rubuha).

# Examples of CSA best practices in Indonesia - continued

4. Development of solar-powered automatic irrigation technology in North Tarakan, which demonstrates the efficiency of water use and its positive impact on irrigation productivity through the operation of soil moisture-based pumps.
5. The implementation of CSA strategies on Sumba Island, introducing water use efficiency and management innovations such as mulch, drip irrigation, and agroforestry, contributes to drought resilience and sustainable agriculture
6. The governments of Central Java and Wonogiri Regency developed an agroforestry system in Tempursari Village, integrating food crops with forestry, thereby increasing biodiversity, soil protection, and additional income through diversification of agricultural practices.



## Yuk, Tingkatkan Produktivitas Pertanian dengan Panel Surya!

© Mohammad Sholla Aghista 📅 April 27, 2023



Ilustrasi Pertanian Teknologi Panel Surya. Photo: Pinterest

- Produktivitas pertanian ditingkatkan dengan menggunakan panel surya.
- Penggunaan energi surya menekan biaya pengeluaran, memaksimalkan keuntungan, dan ramah lingkungan.
- Indonesia merupakan negara agraris dengan sumber energi matahari yang melimpah.

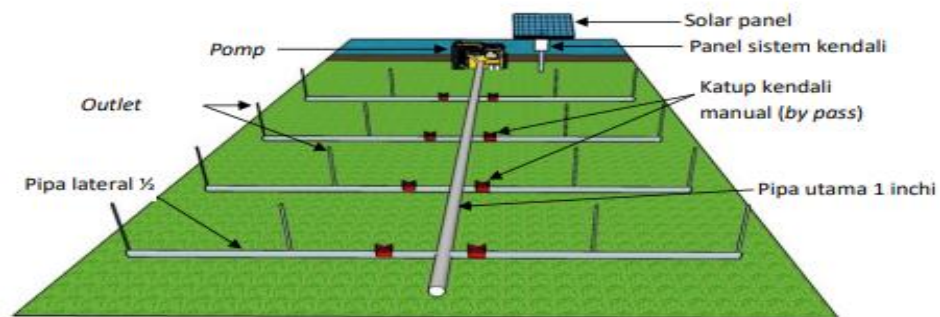
Produk-produk yang masyarakat konsumsi sehari-hari sebagian merupakan hasil sumbangsih sektor pertanian. Beras, jagung, kedelai, dan lain-lain termasuk produk-produk hasil pertanian. Ketahanan pangan juga dipengaruhi oleh sektor penting tersebut. Karena itu, perlu adanya upaya untuk memaksimalkan produktivitas di bidang pertanian secara berkelanjutan.



## Petani Banua Huta Terapkan Teknologi Irigasi Tetes Otomatis Tenaga Surya

📷 :

J-PEN Borneo: Jurnal Ilmu Pertanian 2(3): 1-8, Oktober 2019

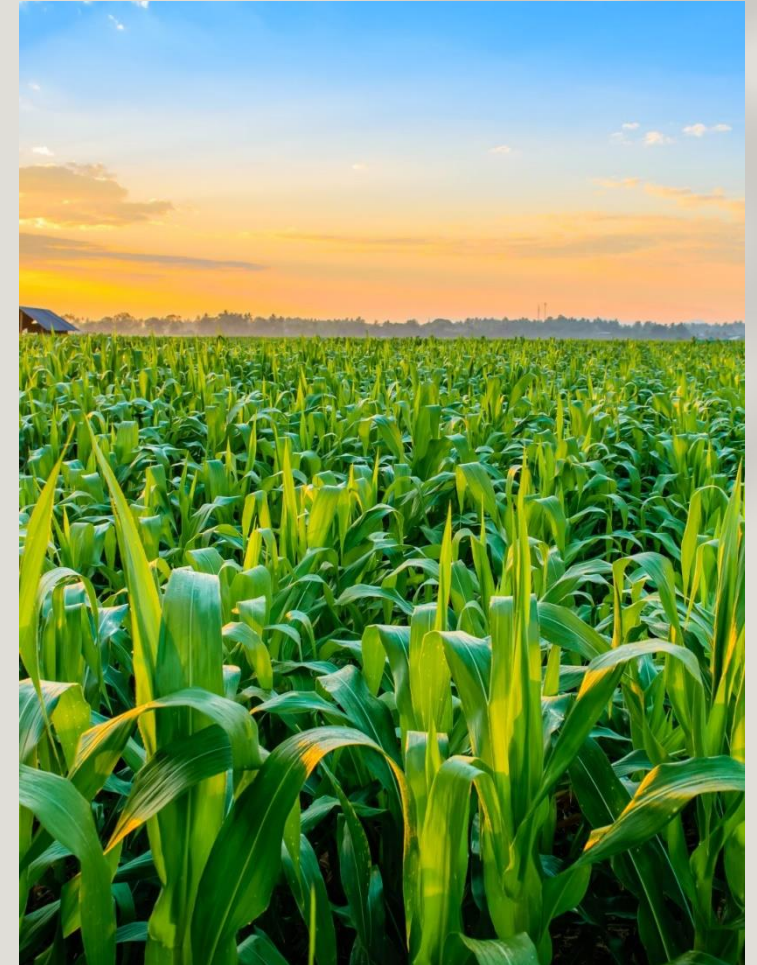


14 digital input/output (6 diantaranya dapat

# Examples of CSA best practices in Indonesia

7. Research on irrigated rice fields in Central Java compares traditional agriculture with CSA techniques, showing the potential of CSA in reducing greenhouse gas emissions, increasing crop productivity, and increasing economic returns.

8. Positive perceptions of smart agricultural technologies among farmers and extension workers in Aceh for rice, maize, and potatoes, citing benefits such as cost reduction and productivity improvement despite challenges in technology adoption



# Manfaatkan Teknologi CSA, Banjarnegara Tanam Padi Pertama

udin abay | Kamis, 27 Mei 2021 , 16:28:00 WIB



**Swadayaonline.com** - Sebanyak 15 orang regu tanam, melaksanakan tanam padi perdana dengan dukungan teknologi Climate Smart Agriculture (CSA) atau Pertanian Cerdas Iklim, di lahan demplot seluas 1 hektar, milik kelompok tani Sida Dadi, desa Tapen, Kecamatan Wanadadi, kabupaten Banjarnegara, Jawa Tengah.

Berbagai jenis teknologi CSA yang diterapkan sebelum, saat dan setelah tanam. Jenis yang digunakan diantaranya dengan penggunaan benih unggul dan bersertifikat, perlakuan seleksi benih,

penggunaan bibit muda serta penanaman dengan sistem jajar legowo 2:1 dan 4:1.

Pemupukan berimbang yang meliputi pemupukan dasar dan pemupukan susulan, sistem irigasi intermitten dengan penggunaan alat kontrol Alternate Wetting And Drying (AWD), Pengendalian Organisme Pengganggu Tanaman (OPT) ramah lingkungan dan pengukuran Gas Rumah Kaca (GRK) juga merupakan bagian dari CSA.

# Examples of CSA best practices in Indonesia - continued

9. Demonstration of the effectiveness of urban agriculture programs in Surabaya in poverty alleviation, overcoming water shortages in the dry season, and producing high-quality vegetables through modified farming techniques

10. Analysis of cropping patterns in Banyumas Regency based on climate index and rainfall, recommending various rotations to optimize water use and crop yields in changing climatic conditions.

11. Various studies show how Climate Smart Agriculture and smart agriculture technologies effectively address climate challenges, increase productivity, and help sustainable agriculture





**UN Climate Technology Centre & Network**  
UNFCCC Technology Mechanism

**Thank You**  
**Terima Kasih**

- CTCN Technical Assistance on Identification of Technical Practices for Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

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CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Introduction to Climate-Smart Agriculture and its Implementation in Indonesia

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# Module 1

## Learning Objectives

1.1. Participants understand and can explain the concept of Climate-Smart Agriculture (CSA)

1.2. Participants can explain the implementation of CSA in Indonesia

1.3. Participants will be able to explain the importance of a gender-responsive Climate-Smart Agriculture (CSA) and describe strategies to support CSA as a gender-responsive program.

CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Gender Responsive Climate- Smart Agriculture

# Learning Objective 1.3

Participants will be able to explain the importance of a gender-responsive Climate-Smart Agriculture (CSA) and describe strategies to support CSA as a gender-responsive program

# AGENDA

- **Objectives and Participants**
- **Introduction**
  - Significance of Gender-Responsive CSA Projects
  - Strategies for Building a Gender-Responsive CSA
- **Discussion**



# Objectives and Participants

- **Objectives**
  - Participants can explain the importance of gender-responsive CSA
  - Participants can explain strategies to support CSA as a gender-responsive program
- **Participants**
  - Government and non-government employees who will facilitate the adoption of CSA technology in the community



# Significance of Gender-Responsive CSA Projects

- As an adaptation project to climate change, CSA is realized to have different impacts on men and women.
- Women are often less involved in decision-making than men in land management in agricultural irrigation and benefit less from farmer organizations (Memon et al, 2019; Aduwo et al. 2019).
- However, when in the study of CSA technology adoption, men's income are found higher than women's (Agarwal et al. 2022).
- Women have lower access to fertilization than men (Tang et al. 2023; Makate et al. 2021).

# Significance of Gender-Responsive CSA Projects

- Adaptive capacity building policies that have awareness are needed to empower men and women to achieve gender equality and justice.
- Gender Responsiveness is a consistent and systematic attention to differences between women and men in society in needs, experiences, and aspirations, accompanied by efforts to remove structural and cultural barriers to achieve gender equality (Minister of PPPA No. 25 of 2010; MoEF).



## **Significance of Gender-Responsive CSA Projects**

- The culture constructs differently the roles of men and women.
- The heterogeneity of peasant women: having role as heads of families and in the other hand are poor.
- Men and women can have different perspectives and knowledge about the risks of climate change that can affect their livelihood strategies and respond to change. This is constructed from the social and cultural dimensions.
- Gender-responsive CSAs need to be built to improve gender equality and justice.

## CSA Implementation Example

- Several efforts in Indonesia have involved women in smart farming techniques to increase productivity, such as the use of yard land for vegetable crops from the Ministry of Agriculture's Strategic Irrigation Modernization and Urgent Rehabilitation Project (SIMURP) in Bogor and Solo. This is done through KWT with operational assistance for processing household industries of agricultural products and strengthening capital.



Sumber: Pangannews

## Strategies for Building a Gender-Responsive CSA

- Gender analysis based on profiles of the division of labor in male and female agriculture was mapped before the existence of CSA. The more activities carried out together, it is considered that agricultural practices that are carried out tend to apply gender equality and justice (Table 1).
- The analysis can be improved to identify the practical needs of gender and its gender strategic needs in CSA practices (Table 2).
- Approach through women's farmer groups so that women can control resources, gender-sensitive extension workers (Brisbois et al. 2022; Makate & Mutenje, 2021).

Table 1. Example of Profile of Division of Labor in Farmers by Gender in Rice, Chrysanthemum, and Chili Commodities in Sukabumi Regency in 2023

<b>Activity</b>	<b>Man</b>	<b>Woman</b>
Sow	√	√
Maintenance	√	√√
Irrigation	√	√√
Fertilization		√
Panen		√
Post-harvest (sorting and grading)	√	√
Marketing	√√	√

Table 2. Practical and Strategic Needs of Gender in CSA Implementation

Practical needs	<p>Concerns the current conditions that need to be met and prioritized</p> <ul style="list-style-type: none"><li>● Selection and promotion in employment in CSA technology operation</li><li>● CSA technology training</li><li>● Health and safety of the work environment in CSA technology operation</li><li>● Revenue from role as a CSA technology operators</li></ul>
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Table 2. Practical and Strategic Needs of Gender in CSA Implementation

Strategic needs	<p>Related to the position of women towards men through structural interventions.</p> <ul style="list-style-type: none"><li>• Women's participation and women's institutions in financial planning and decision-making for CSA implementation</li><li>• Equal division of labor between men and women in CSA-implementing organizations and households</li></ul>
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Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Soil monitoring, Automatic Irrigation Technology and Fertigation

## Training Module 2

# Modules Overview

## **Module 1:** Introduction to CSA and its Implementation in Indonesia

This module equips participants to implement CSA practices in Indonesia, fostering climate resilience and gender equality

- Module 1.1. Introduction to Climate-Smart Agriculture
- Module 1.2 CSA Implementation in Indonesia
- Module 1.3 Gender Mainstreaming in CSA

## **Module 2:** Soil monitoring, Automatic Irrigation Technology and Fertigation :

This module equips participants with essential CSA technologies for sustainable farming, covering soil analysis, irrigation, fertilization, and product solutions

- **Module 2.1 Identification of Water Content and Soil Chemistry**
- Module 2.2 Automatic Irrigation and Fertilization Applications
- Module 2.3 Presentations by Technology Suppliers

## **Module 3:** CSA Integrated Irrigation System and Financial Analysis :

This module explores integrated soil sensor and irrigation-fertilization systems

- Module 3.1 Introduction to Implementation of Integrated System Soil Monitoring, Automatic Irrigation with Fertilizer Application
- Module 3.2 Feasibility Analysis of Agricultural Businesses in Climate Smart Agriculture

# Module 2

## Learning Objectives

2.1. Participants learn about soil water content and soil chemistry identification technology.

2.2. Participants understand automatic irrigation technology and fertilization applications.

2.3. Participants know the products available for CSA implementation.

CTCN Technical Assistance on Identification of Technical Practices for  
Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Identification of Water Content and Soil Chemistry

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Climate-Smart Agriculture (CSA) in Indonesia, 2023 - 2024

# Learning Objective 2.1

Participants understand and can explain the concept of  
Climate-Smart Agriculture

# Introduction



Understanding soil water content is crucial for effective agricultural practices, especially in the context of Climate-Smart Agriculture



**Soil Moisture:** Soil moisture refers to the water held in the spaces between soil particles



**Root Depth:** Root depth is the measure of how deep the roots of a plant extend into the soil



**Available Water Capacity:** Available water capacity is the amount of water that the soil can store and that is available for use by plants

# Soil Fertility

- Soil fertility is a critical aspect of agricultural productivity, encompassing various factors that contribute to the growth and health of plants



# Content of N, P, K, and Micronutrients

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Nitrogen : Essential for plant growth, nitrogen is a key component of amino acids, proteins, and chlorophyll

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Phosphorus : Vital for energy transfer within the plant, phosphorus contributes to root development, flower and seed production, and overall plant vigor

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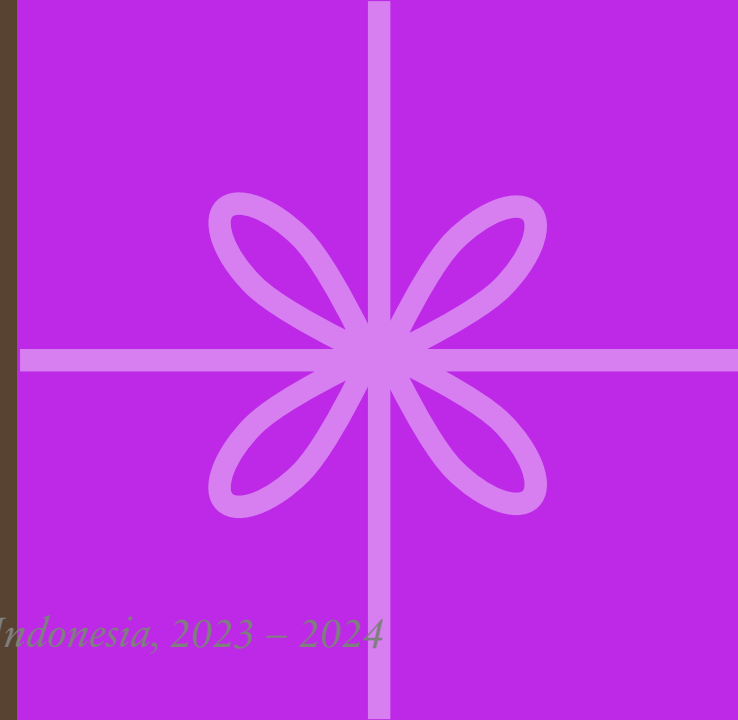
Potassium : Important for water uptake and retention, potassium aids in photosynthesis, protein synthesis, and resistance to diseases

---

Micronutrients: Elements like iron, manganese, zinc, copper, molybdenum, and boron, although needed in smaller quantities, are essential for plant development, enzyme function, and various physiological processes

# Cation Exchange Capacity

- The Cation Exchange Capacity refers to the soil's ability to hold and exchange positively charged ions or cations



# Pore Space

Pore space in soil refers to the voids or gaps between soil particles, which are filled with air or water

Aeration: Allowing roots to access the oxygen needed for respiration

Water Drainage and Retention: Managing the balance between water being held for plant use and excess water draining away

Root Penetration: Facilitating root growth and access to nutrients

# Soil Moisture and Chemical Measurement Technology



Soil moisture and chemistry sensing systems are pivotal in climate-smart agriculture, offering insights critical for soil health, crop growth, and sustainability management



On-site implanted sensors provide real-time, localized data on soil moisture and chemistry by being directly placed in the soil



Remote sensing satellites cover extensive areas, even on a global scale, making them invaluable for broad-scale soil monitoring



Drones present a versatile solution, capable of rapidly covering large areas with high-resolution imaging to assess soil conditions



Combined approaches leverage the strengths of multiple sensing systems to enhance the accuracy and reliability of soil information

# On-site implanted sensors

- Deploying sensors such as soil moisture probes, ion-selective electrodes, and electrochemical sensors will provide valuable information on the local soil conditions, nutrient levels, and soil moisture



# Product catalog of Site Implanted Sensors



Name of Sensor :  
RiTx Jinawi sensor  
Measurement parameters:  
levels of N, P, K and pH

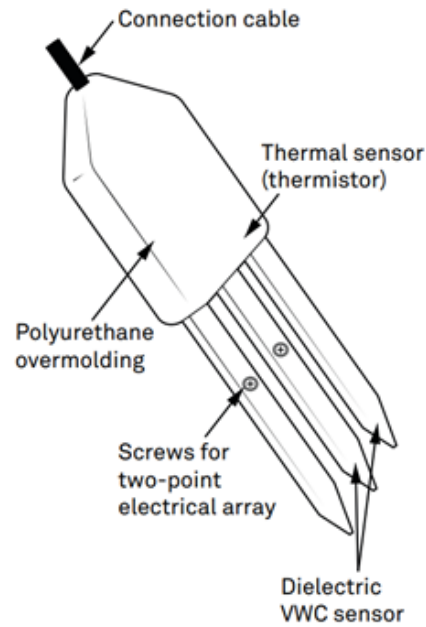


Name of Sensor :  
Campbell CS655  
Measurement parameters:so  
il volumetric-  
water content, bulk electrical  
conductivity, and temperatur

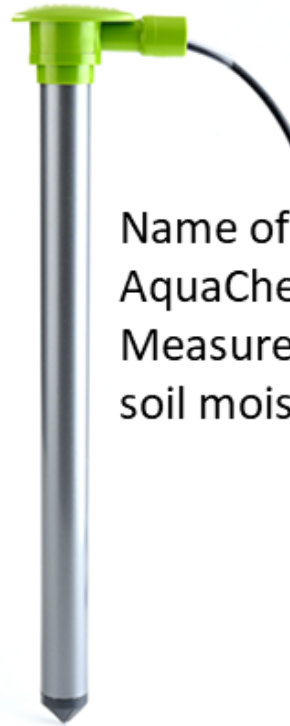


Name of Sensor :  
Sensor Jingxunchangtong (JX IoT)  
Soil analyzer-5 in 1  
Measurement parameters:  
soil temperature, soil moisture, soil pH,  
soil electrical conductivity, soil nitroge  
n, phosphorus and potassium

# Product catalog of Site Implanted Sensors



Name of Sensor :  
METER 5TE  
Measurement parameters:  
VWC, Temperature, and EC



Name of Sensor:  
AquaCheck Sub-Surface  
Measurement parameters:  
soil moisture and soil temperature



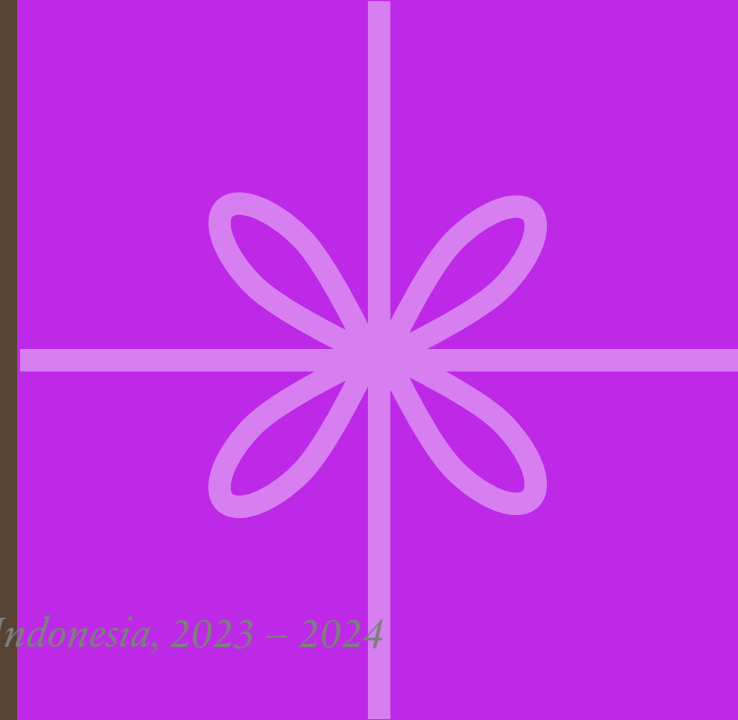
Name of Sensor : SENTEK  
SDI-12 SERIES II Probe  
Measurement parameters:  
soil moisture, salinity, tem  
perature and humidity



Name of Sensor : Delta-T PR2  
Measurement parameters:  
moisture content

# Drones / UAVs based Sensor

- Utilizing drones equipped with multispectral or hyperspectral cameras will enable high-resolution monitoring of crop health, pest and disease detection, and nutrient deficiencies



# Product catalog of Drone Base Technology



Name of Drone Base Technology:  
DJI Phantom 4 RTK with Sentra 6X  
Multispectral Sensor

Measurement parameters:  
soil moisture



Name of Drone Base  
Technology: Parrot Bluegrass  
Fields with Parrot Sequoia  
Multispectral Sensor

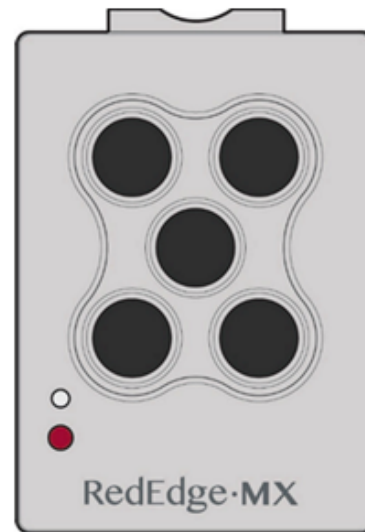
Measurement parameters:  
volumetric water content

# Product catalog of Drone Base Technology



Name of Drone Base Technology:  
senseFly eBee X with MicaSense RedEdge-  
MX

Measurement parameters:  
soil moisture



# Satellite remote sensing

- Integrating data from satellite remote sensing platforms, such as Sentinel-2 or Landsat, can provide large-scale information on vegetation health and land use changes



# Product catalog of Remote Sensing Technology

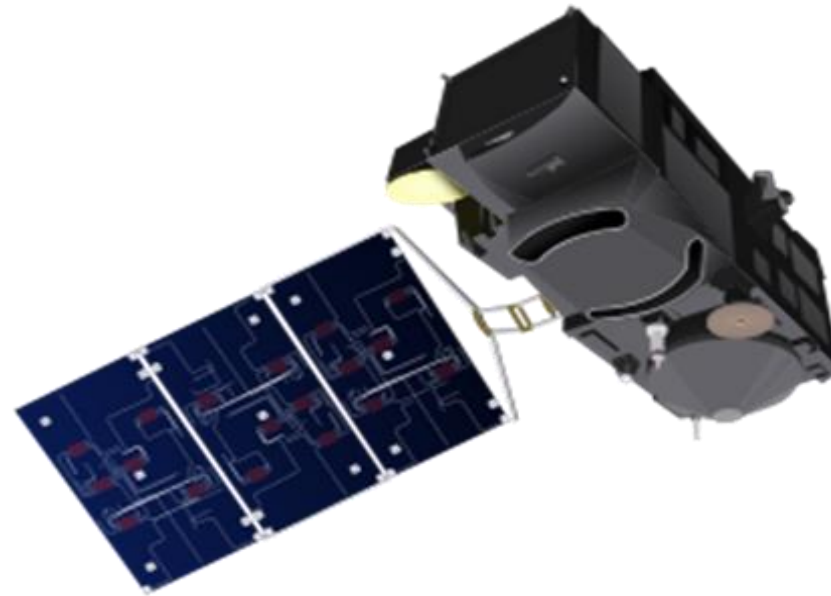


Name of Remote Sensing Technology :

Sentinal -1 Satellite

Measurement parameters:

soil moisture content, surface roughness,  
vegetation biomass, crop type and health,  
soil salinity and chemical properties



Name of Remote

Sensing Technology: Sentinel  
– 3 Satellite

Measurement parameters:  
soil moisture content, surface  
temperature, vegetation  
indices, land cover and land  
use, soil salinity and chemical  
properties

# Product catalog of Remote Sensing Technology



Name of Remote Sensing Technology:

USGS Landsat 8

Measurement parameters:

observations of land surface (e.g soil moisture content)

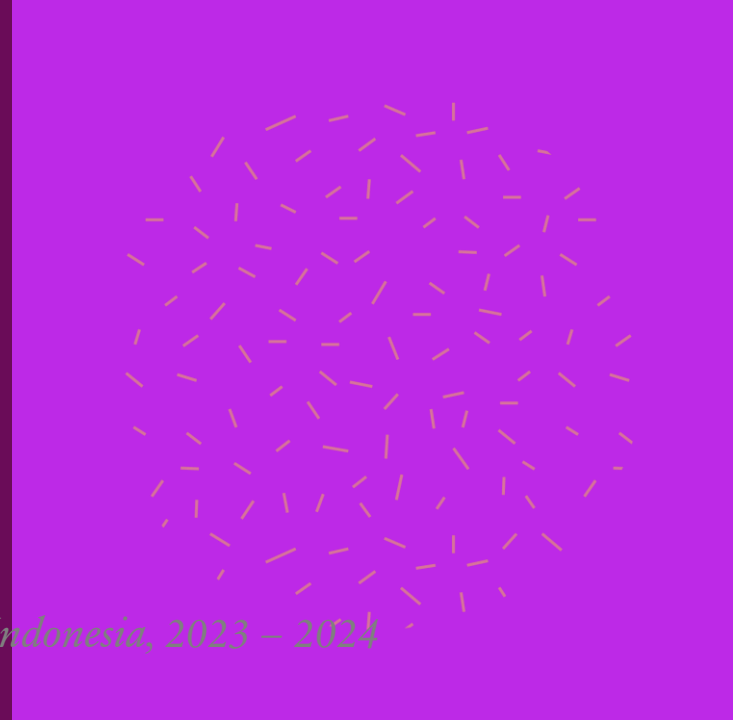


Name of Remote Sensing Technology: Landsat – 9 Satellite

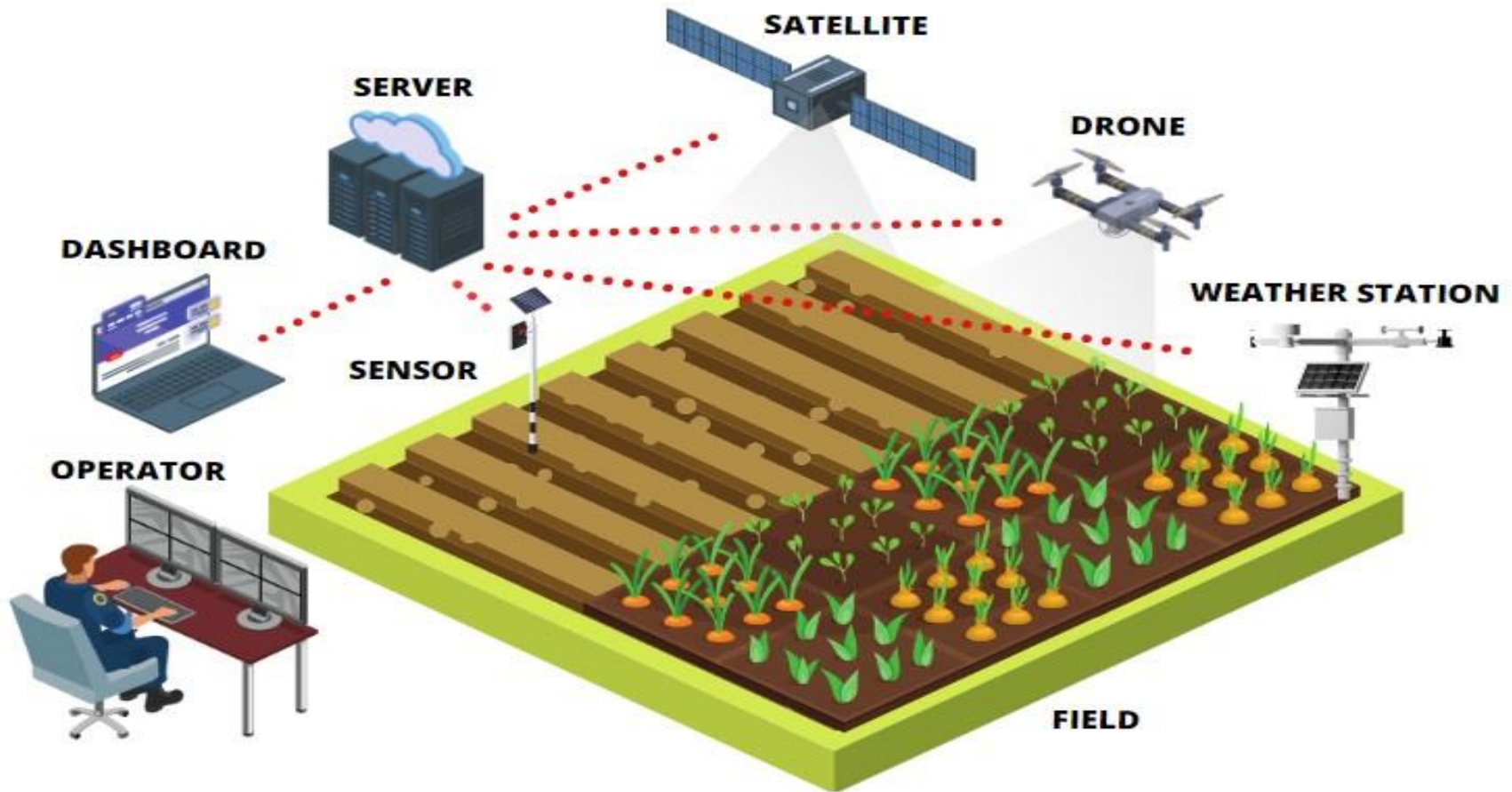
Measurement parameters: soil moisture, soil salinity, soil pH, and chemical of soil

Combining the data from field-implemented sensors, drone-based sensors, and satellite remote sensing

enable a comprehensive understanding of the agricultural landscape



# Illustration of the soil monitoring system



# Implementation



The implementation of sensors in Climate-Smart Agriculture practices is important for enhancing agricultural sustainability and resilience in the face of climate change



Sensors for soil moisture, chemistry, and other environmental parameters provide vital data that enable farmers to make informed decisions about irrigation, fertilization, and crop management

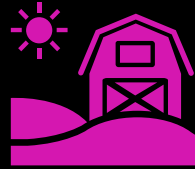


This real-time information helps optimize water use, reduce waste, and increase crop yields while minimizing environmental impacts

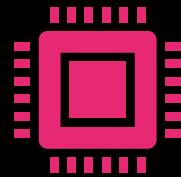


By precisely monitoring soil conditions, sensors allow for the implementation of targeted interventions that improve soil health and crop productivity

# Implementation



Sensor technology supports the adaptation of agricultural practices to changing climate conditions, ensuring food security and reducing the agriculture sector's carbon footprint



The strategic use of sensor technology in CSA not only promotes efficient resource management but also contributes to the overall goal of achieving sustainable and resilient agricultural systems

# Implementation



These sensors, buried within the soil, provide real-time insights into soil health indicators such as moisture levels and nutrient content



By ensuring optimal water and nutrient application, these sensors mitigate the risks associated with overuse while promoting higher crop yields



comprising a soil moisture, temperature, and EC sensor, data logger, internet connection, and cloud server

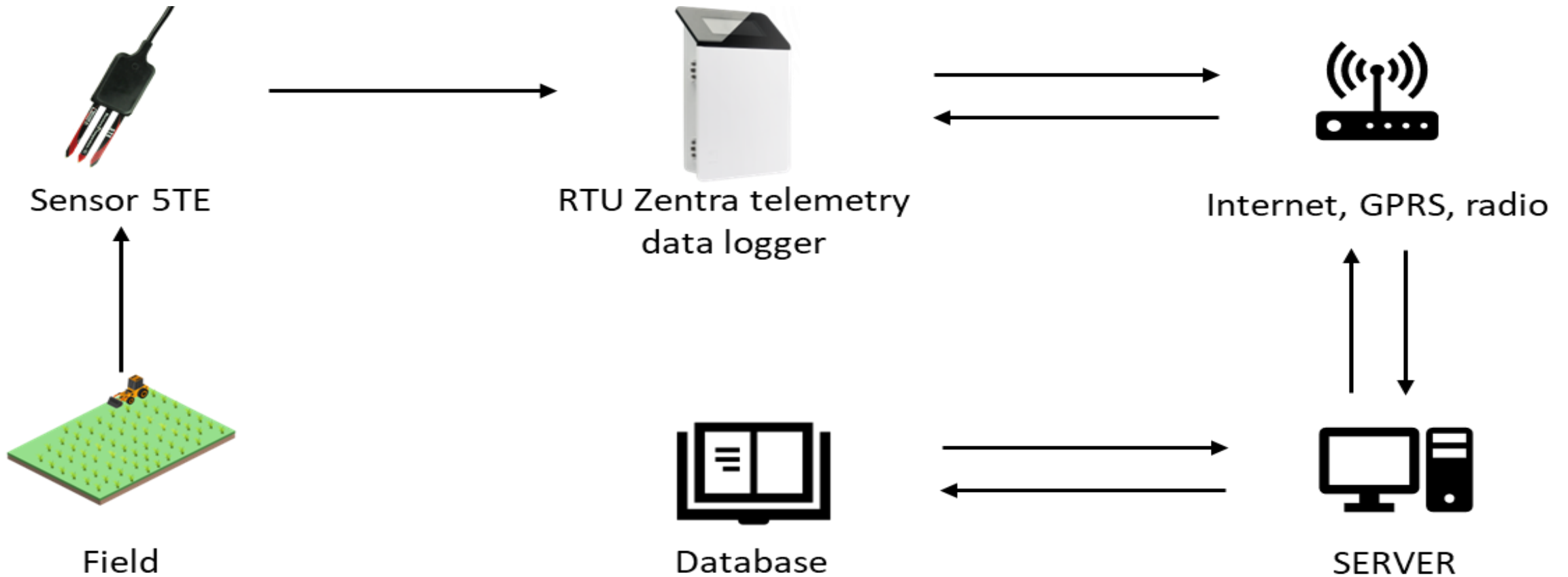


Soil temperature and EC are indicators of the soil's chemical properties, relating to soil fertility



EC can indicate nutrient availability in the soil, overall soil fertility, water or soil salinity, and the need for soil amendments

# Soil moisture and nutrient monitoring





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# Soil monitoring, Automatic Irrigation Technology and Fertigation

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# Automatic Irrigation and Fertilization Applications

# Learning Objective 2.2

Participants understand automatic irrigation technology and  
fertilization applications

# Introduction

- Understanding the irrigation water requirements is essential for the sustainable management of water resources in agriculture. At the end of this session, participants will be able to plan irrigation and fertilization schedules, understand automatic irrigation technology and fertilization applications, and modify automatic irrigation technology and fertilization applications using available technology.



# Key factors for determining the precise amount of irrigation water



**Cropping pattern planning:** It is important to plan the cultivated crop during a year



**Evapotranspiration :** This refers to the amount of water evaporated from the soil and transpired by plants over a specific planting period



**Crop Coefficient :** The Kc value adjusts ETo to reflect the water use of a particular crop at different stages of its growth cycle



**Crop Water Requirement:** ETo multiply by Kc



**Effective Rainfall:** Not all rainfall contributes to meeting the crop's water needs



**Available Water:** This is the quantity of water in the soil that is readily accessible for plant uptake



**Irrigation Scheduling:** Effective irrigation scheduling considers traditional practices, local wisdom, labor availability, and water sources

# Fertigation : Fertilisation and Irrigation



**Nutrient Management:** Involves the strategic application of fertilizer to match the nutritional requirements of the crop, considering the soil's nutrient status and the crop's growth stage



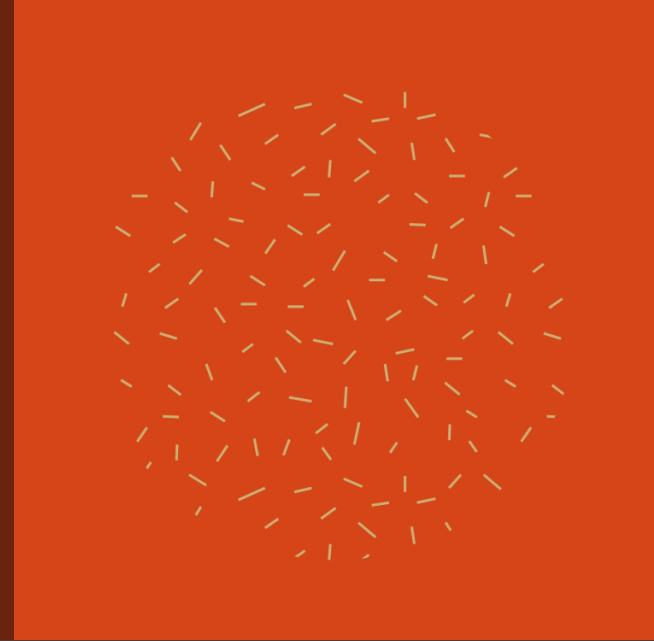
Integrating Fertigation into this equation allows for the precise application of nutrients through the irrigation system, ensuring that plants receive the right amount of nutrients at the right time



This approach not only supports agricultural productivity but also aligns with the principles of sustainable water management in the face of changing climate conditions and varying water availability



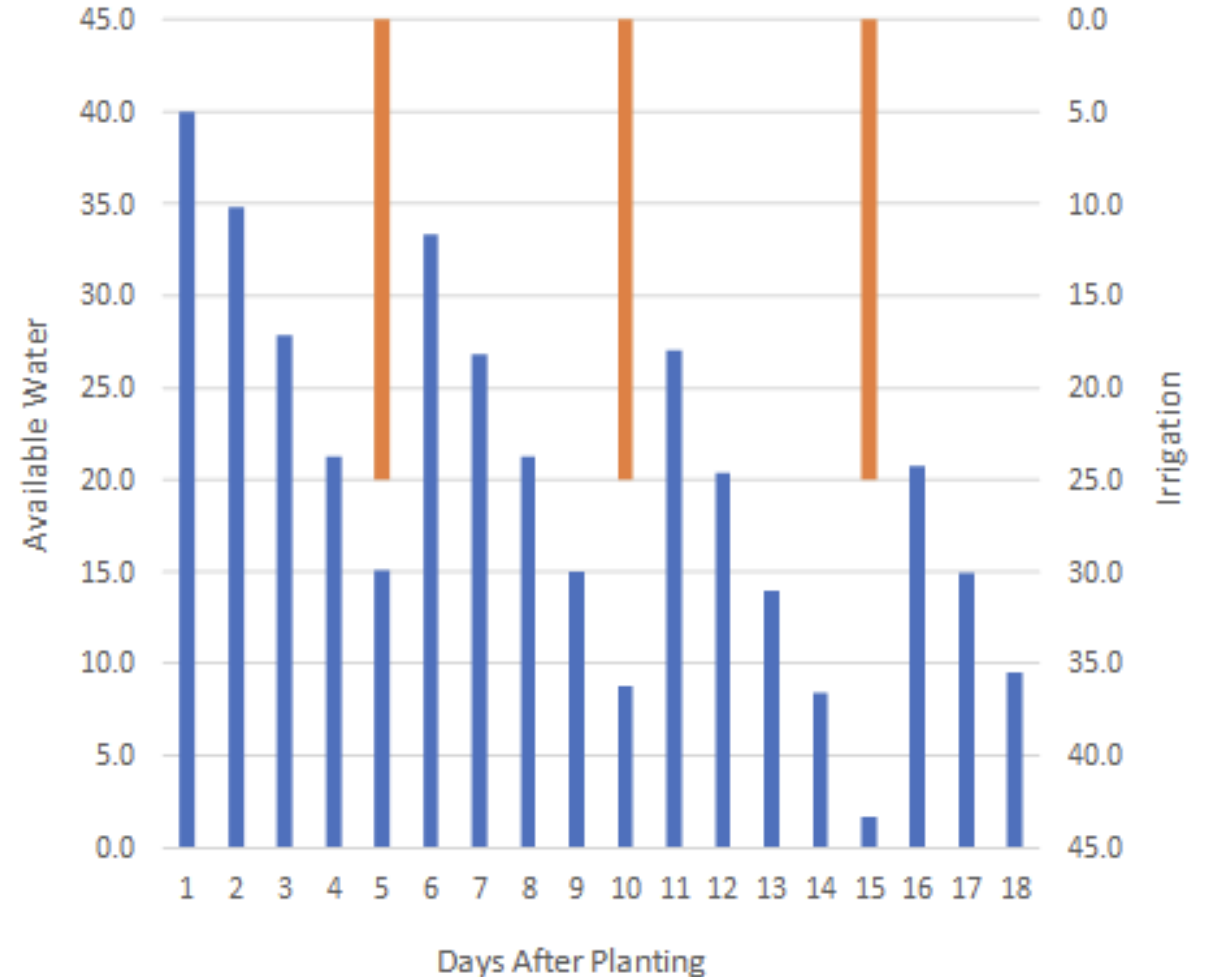
This method enhances nutrient uptake efficiency, reduces nutrient leaching, and contributes to better water management by combining irrigation with nutrient delivery



# Planning of irrigation and fertilizing systems

# No rain, Fixed Irrigation Amount and Interval

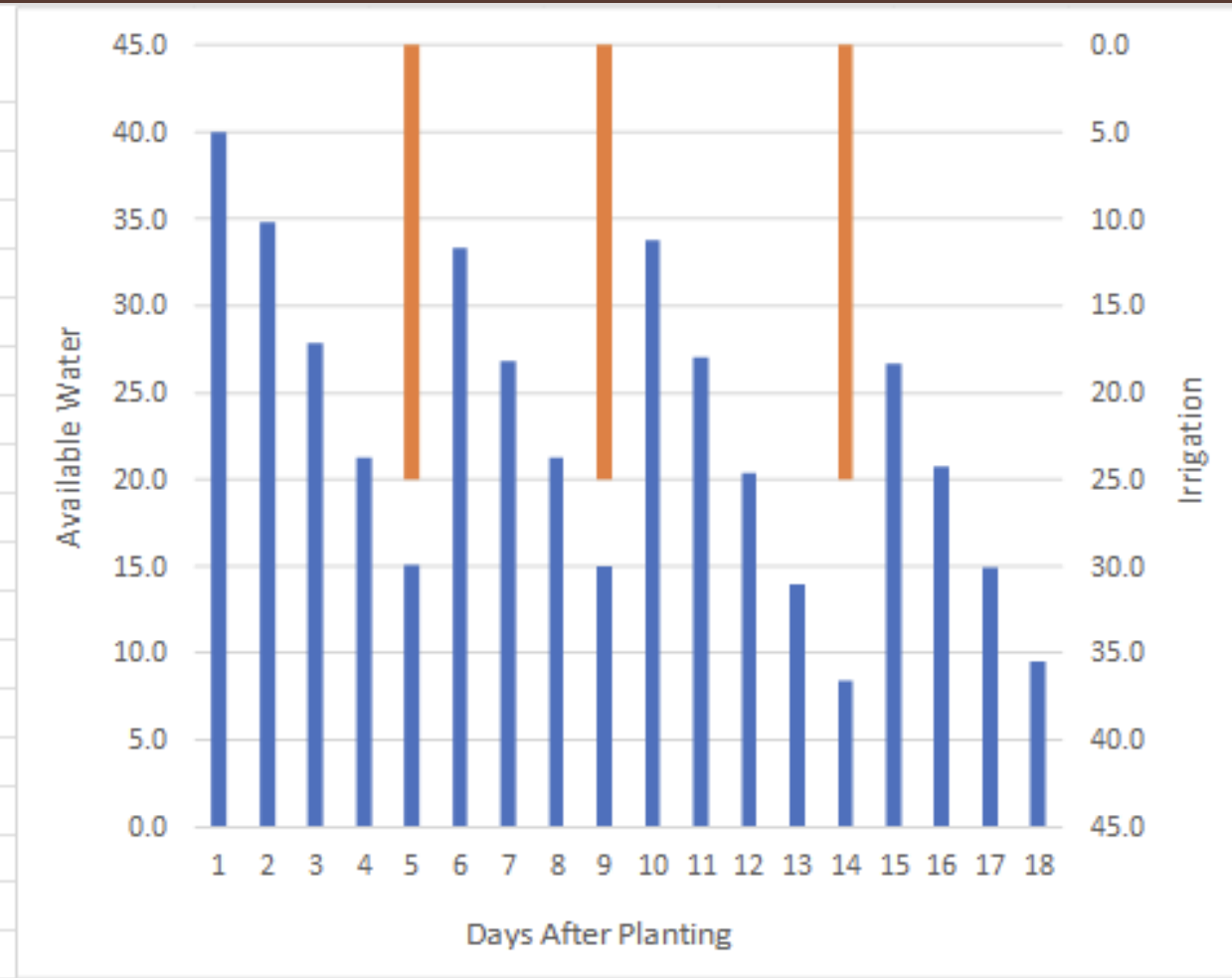
DAP	ET*	Effectif Rainfall*	Irrigation (mm)	Available Water (mm)
1	5.2			40.0
2	6.9			34.8
3	6.6			27.9
4	6.3			21.3
5	6.7		25.0	15.0
6	6.5			33.3
7	5.5			26.8
8	6.3			21.3
9	6.2			15.0
10	6.8		25.0	8.8
11	6.6			27.0
12	6.5			20.4
13	5.5			13.9
14	6.7			8.4
15	5.9		25.0	1.7
16	5.9			20.8
17	5.4			14.9
18	5.7			9.5



- DAP = Days After Planting
- \*Forecast Values using climate data
- Available water is the result of the water balance as well as readings from calibrated sensors. The value of 40 is the maximum amount of water present in the soil, is the function of the soil type and root depth.

# No rain, Fixed amount, Irrigation interval changed

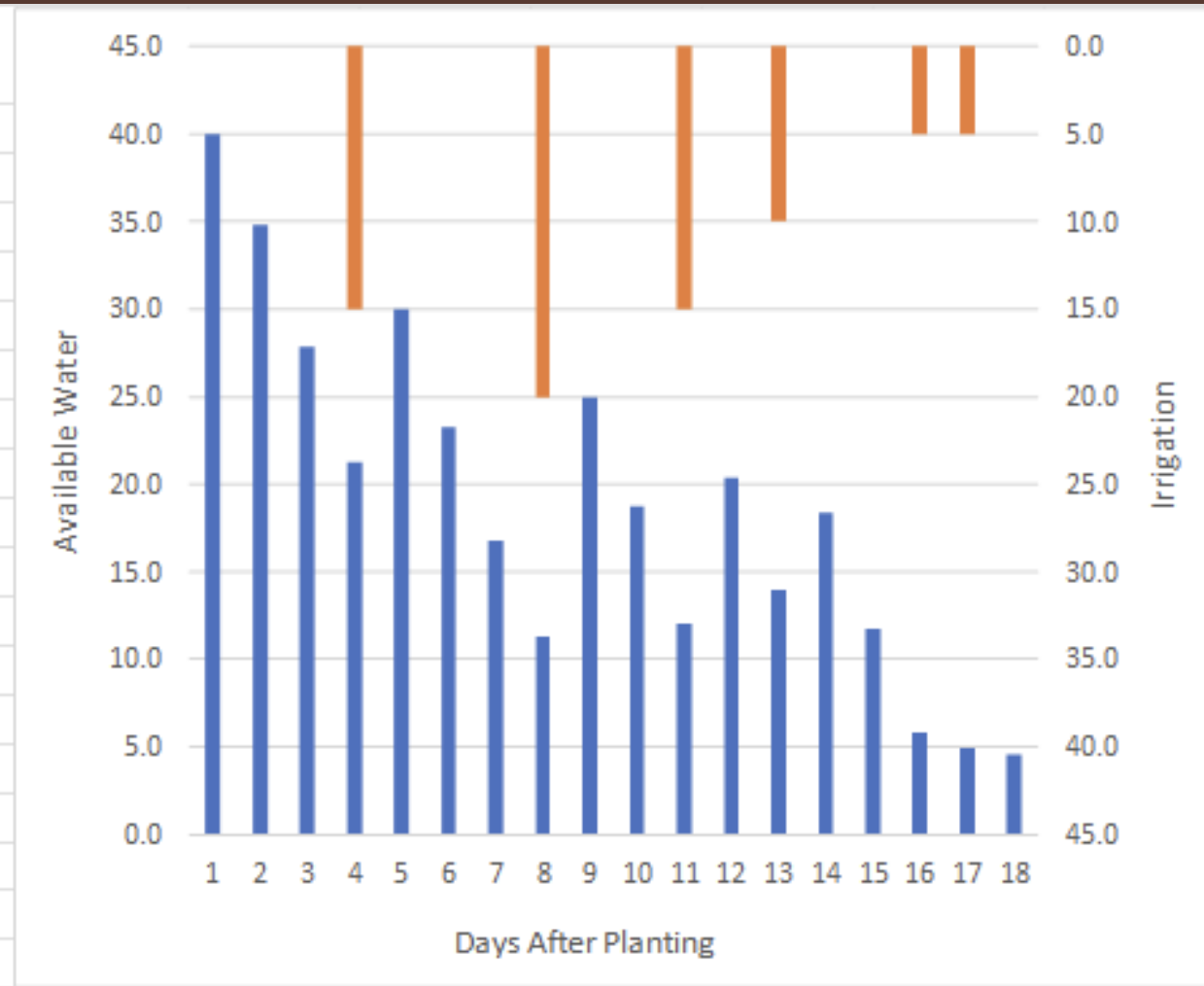
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# No rain, Amount and Interval of Irrigation changed

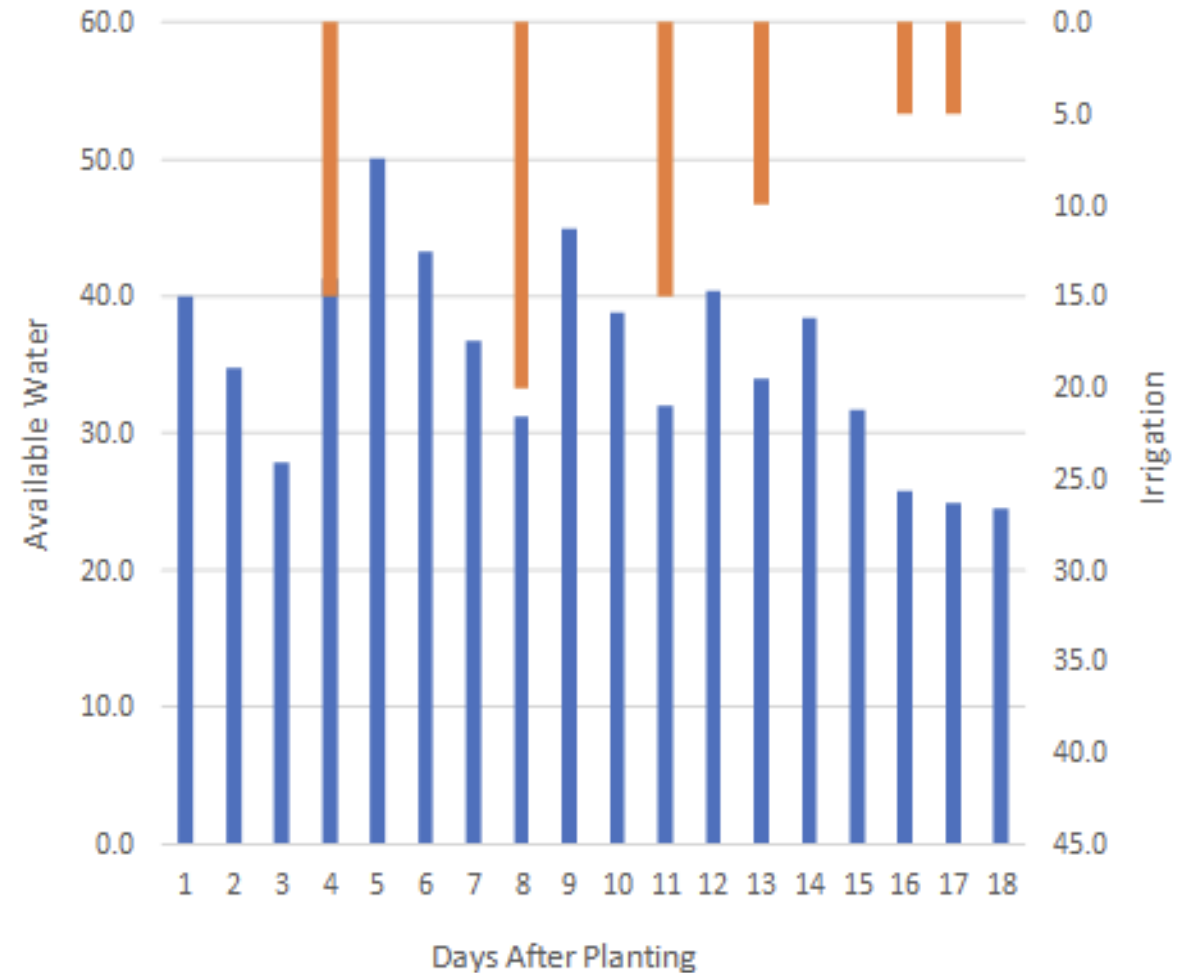
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5	6.7			30.0
6	6.5			23.3
7	5.5			16.8
8	6.3		20.0	11.3
9	6.2			25.0
10	6.8			18.8
11	6.6		15.0	12.0
12	6.5			20.4
13	5.5		10.0	13.9
14	6.7			18.4
15	5.9			11.7
16	5.9		5.0	5.8
17	5.4		5.0	4.9
18	5.7			4.5



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# There is rain, the Amount and Interval of Irrigation changes

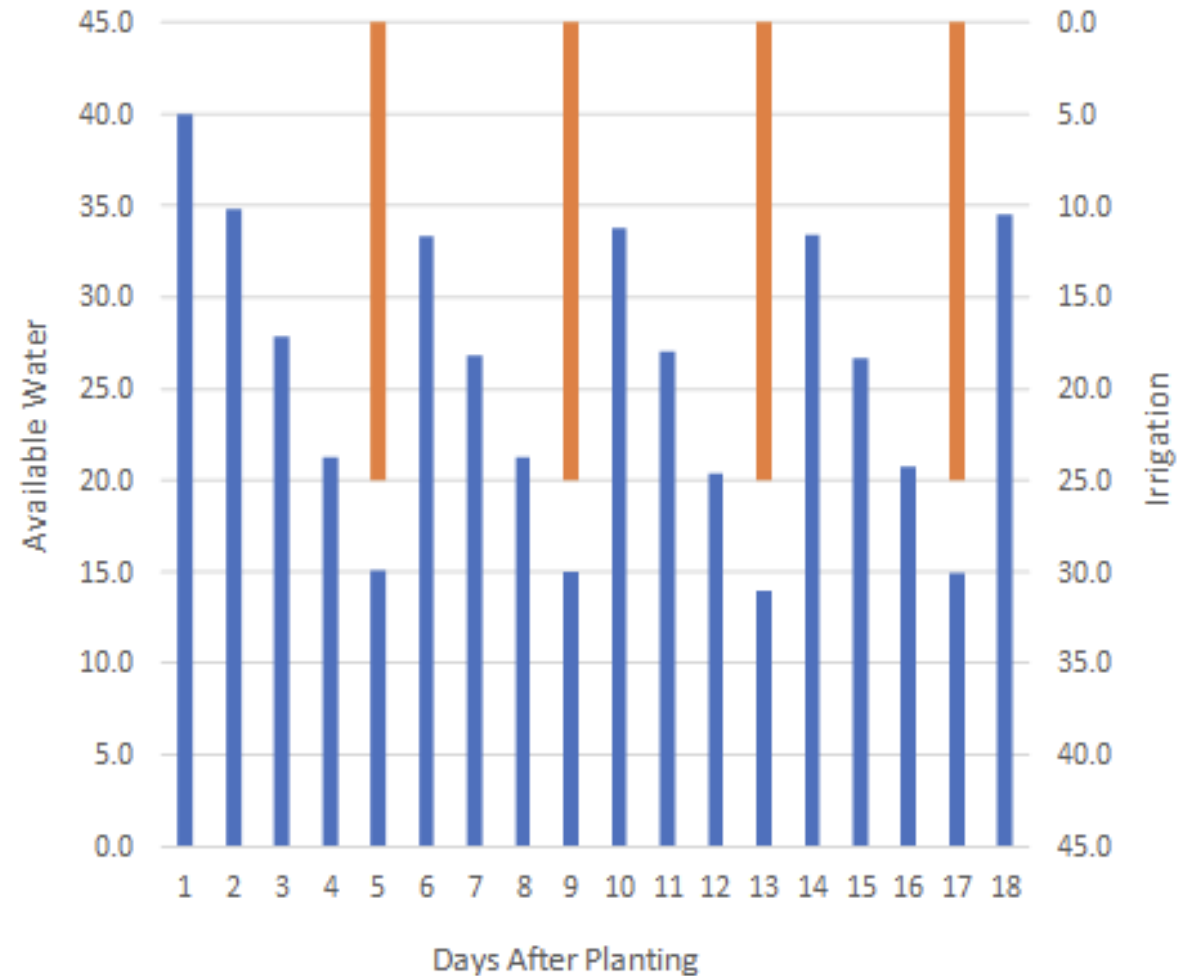
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4	6.3		15.0	41.3
5	6.7			50.0
6	6.5			43.3
7	5.5			36.8
8	6.3		20.0	31.3
9	6.2			45.0
10	6.8			38.8
11	6.6		15.0	32.0
12	6.5			40.4
13	5.5		10.0	33.9
14	6.7			38.4
15	5.9			31.7
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# Automation when water is available by 15 (no rain)

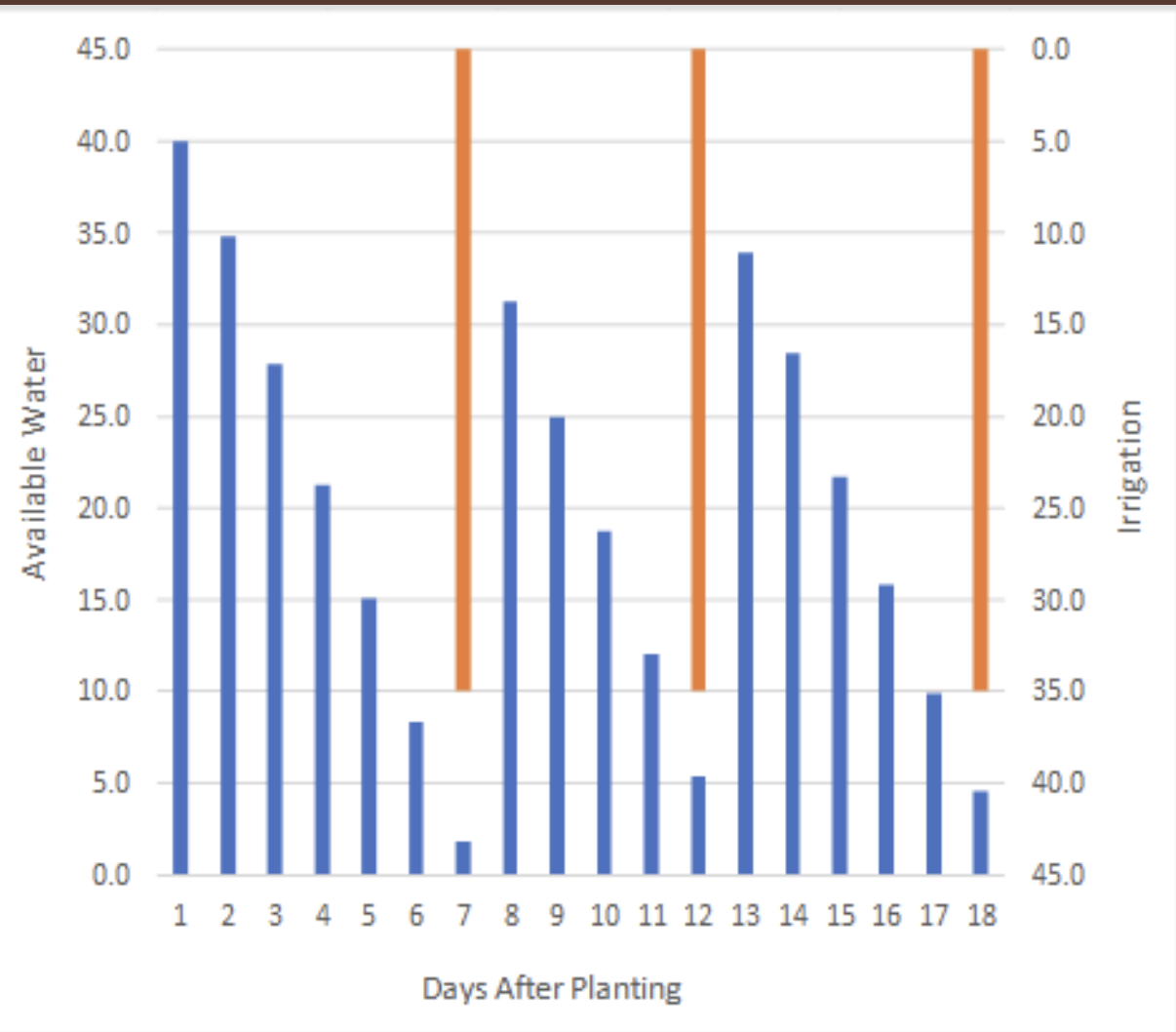
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6	6.5			33.3
7	5.5			26.8
8	6.3			21.3
9	6.2		25.0	15.0
10	6.8			33.8
11	6.6			27.0
12	6.5			20.4
13	5.5		25.0	13.9
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- Available water is the result of the water balance as well as readings from calibrated sensors. The value of 40 is the maximum amount of water present in the soil, is the function of the soil type and root depth.

# Automation when water is available by 5 (no rain)

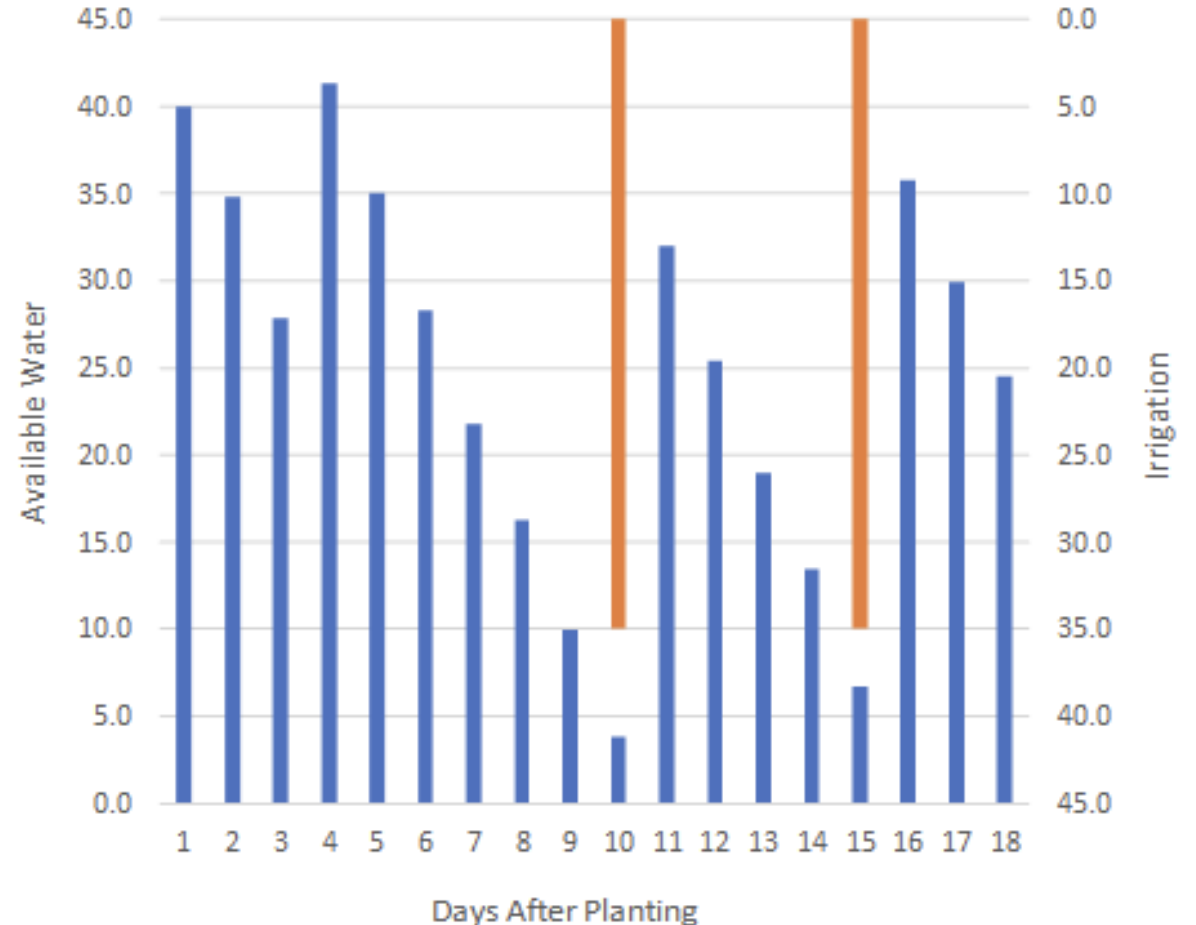
DAP	ET*	Effectif Rainfall*	Irrigation (mm)	Available Water (mm)
1	5.2			40.0
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6	6.5			8.3
7	5.5		35.0	1.8
8	6.3			31.3
9	6.2			25.0
10	6.8			18.8
11	6.6			12.0
12	6.5		35.0	5.4
13	5.5			33.9
14	6.7			28.4
15	5.9			21.7
16	5.9			15.8
17	5.4			9.9
18	5.7		35.0	4.5



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- \*Forecast Values using climate data
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# Automation when water is available by 5 (Rain at 3 HST of 20)

DAP	ET*	Effectif Rainfall*	Irrigation (mm)	Available Water (mm)
1	5.2			40.0
2	6.9			34.8
3	6.6	20.0		27.9
4	6.3			41.3
5	6.7			35.0
6	6.5			28.3
7	5.5			21.8
8	6.3			16.3
9	6.2			10.0
10	6.8		35.0	3.8
11	6.6			32.0
12	6.5			25.4
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# Irrigation methods are divided into 4 categories

- Selecting the type of irrigation—furrow, drip, or sprinkler—is crucial and should be based on the specific needs of the crop and soil conditions
- Irrigation Planning: To maximize irrigation efficiency, the maximum irrigation interval is determined by the available water divided by the crop evapotranspiration



Surface irrigation: This is the application of water to the soil surface by gravity flow, which includes flooding, border and furrow irrigation.



Sprinkler irrigation: This is the application of water to the soil surface by spraying it through nozzles or sprinklers



Drip irrigation: This is the application of water to the soil surface or root zone by dripping it through emitters or drippers



Subirrigation: This is the application of water to the soil below the surface by raising the water table or flooding the root zone

# Furrow Irrigation



# Sprinkler Irrigation



# Drip Irrigation

## Assessing

- Assessing the infiltration rate is necessary to ensure that water penetrates the soil effectively

## Determining

- Determining the operation duration leads to calculating the flow rate required



# Fertilization



Fertilizer application through drip irrigation systems, termed fertigation, facilitates precise and efficacious nutrient delivery directly to plant roots, thereby enhancing nutrient uptake efficiency and minimizing wastage



In this process, liquid fertilizer is mixed with irrigation water and uniformly disseminated across the field via the drip system



This strategy enables a controlled nutrient application, tailored to the plants' developmental requirements, effectively mitigating the risks associated with nutrient leaching and runoff



Adhering to a fertigation schedule that is synchronized with growth stages—namely, vegetative growth, flowering, and fruiting—ensures the provision of nutrients in optimal quantities at critical times

# Fertilization



This practice is particularly advantageous for crops where precise nutrient management is necessary for maximizing yield and quality



Moreover, the implementation of a drip fertigation system not only conserves water but also aligns with sustainable agricultural practices by enhancing fertiliser use efficiency and dropping the ecological footprint



Thus, it represents the principles of Climate-Smart Agriculture, supporting farmers in their efforts to improve crop productivity while parallelly advancing environmental sustainability

# Fertilization Planning



Soil sampling for laboratory analysis is a critical step in determining the precise fertilizer dosage, measured in tons per hectare per season



Nitrogen fertilizers are crucial during the vegetative growth phase



Phosphorus is vital during the generative phase to support flower and seed development



Potassium is required throughout the growing period, essential for the translocation of photosynthesis products within the plant, strengthening cell walls, and enhancing grain per panicle and the percentage of filled grains

# Fertilization Planning



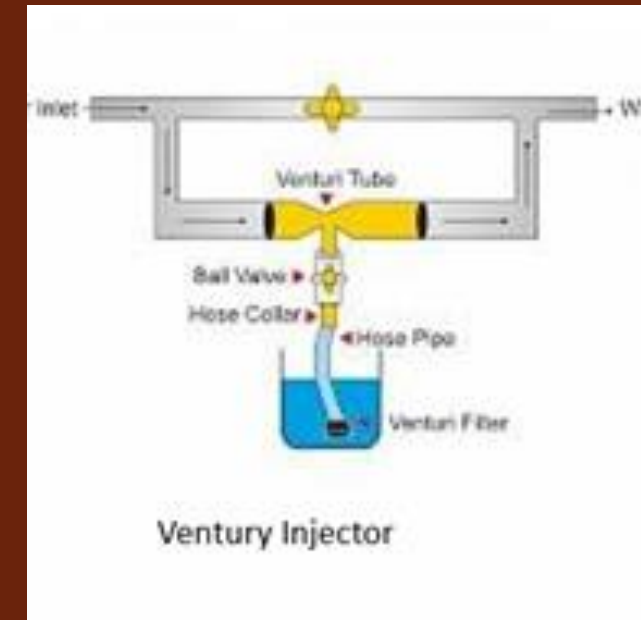
**Venturi Injectors:** Utilize the flow of water through a constricted section of the irrigation pipe to create a vacuum that draws the fertilizer solution from the mixing tank into the irrigation water



**Positive Displacement Pumps:** Directly inject the fertilizer solution into the irrigation line at precise rates, controlled by the pump's settings



**Injection Pumps :** These pumps offer precise control over the injection rate, making them ideal for delivering specific nutrient doses required by the crops



Ventury Injector



# Fertilization Planning

**System and Tools Used:** Modern irrigation and fertilization systems utilize automated technologies, such as programmable irrigation controllers, soil moisture sensors, and automated fertigation units, to apply water and nutrients precisely ~~when and where needed~~

**Advantages and Efficiency:** Automation offers significant benefits, including improved resource use efficiency, reduced labor costs, and enhanced crop performance

**Timer based automatic fertigation :** uses a timer to control the frequency and duration of fertigation

**Sensor based automatic fertigation :** uses sensors to monitor the soil moisture, nutrient status, pH, electrical conductivity, or other parameters of the crop root zone

## Automatic fertigation



Timer based automatic fertigation



Sensor based automatic fertigation



Smart fertigation



# Fertilization Planning

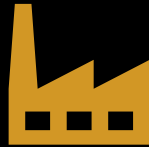
- Smart fertigation : uses the Internet of Things to connect the fertigation system with various devices, such as sensors, weather stations, drones, smartphones, or computers



# Implementation




The system architecture of fully integrated technologies consists of automatic irrigation and fertilization that integrates with the system for sensing of soil moisture and chemicals, controlling data acquisition from sensors, command to actuator, and data storage and analysis



These include field sensors, field controller/RTU, actuators, irrigation network pipe, fertilizer injection system, central computer and user interface/dashboard, all facilitated with internet connection



The system follows the architecture of Supervisory Control and Data Acquisition



# Soil Moisture Sensors: Using RK520-02 sensor to monitor water content at various soil depths to determine irrigation needs

Working Conditions: Soil Moisture,  
Temperature and soil EC Sensor

# Soil Nutrient Sensors

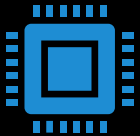
- Employ electrochemical or optical sensors to detect specific nutrient levels, ensuring optimal fertilization and preventing over-fertilization



# Weather Stations



Equipped with an array of instruments like anemometers , barometers , pyranometers , and hygrometers , these stations provide crucial climate data to optimize irrigation schedules



Specification: RK900-12 Ultrasonic Automatic Weather Instrument



Working Conditions: The weather sensor is installed at a standard height of 2 meters from ground level in a location that is not affected by the obstruction of high objects



# Field Controller/Remote Terminal Unit

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The field controller, or RTU, is a robust and reliable electronic device that collects data from the field sensors

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Data Aggregation: Collects readings from all sensors in real-time

---

Local Decision Logic: Can run preset logic to make immediate decisions if connectivity to the central computer is lost

---

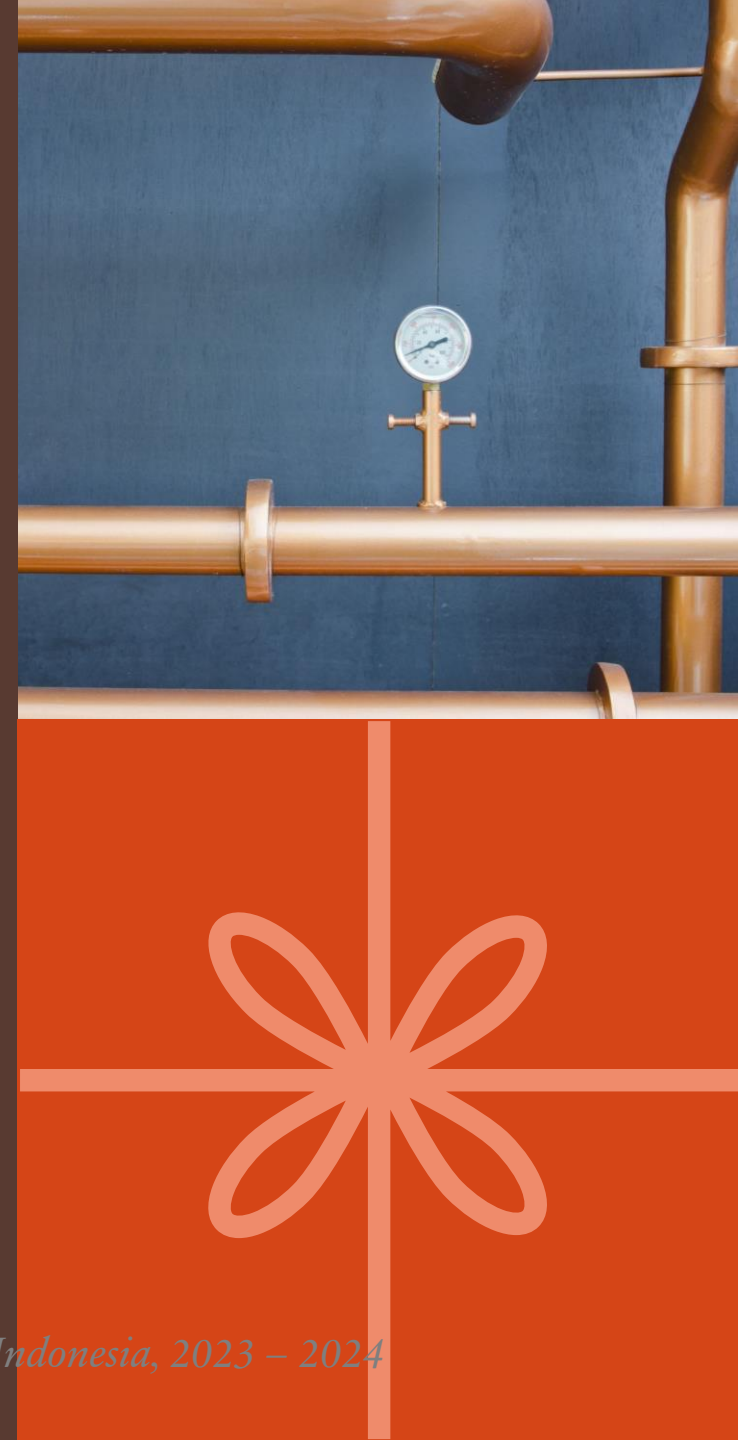
Communication Module: Facilitates data transmission between the RTU and the central computer

---

Specification and Working Conditions: The RTCU LX4 pro, designed to meet full TLS on all major protocols and includes a hardened protected execution environment with dual-boot and automatic fallback and recovery

# Irrigation Network : Drip Line

- This network comprises a series of interconnected pipes, hoses, and drippers/sprinklers/other emitters type
  - Mainlines and Sub-mainlines: High-capacity pipes that transport water from the source or storage to manifold locations
  - Pressure regulator: A pressure regulator ensures that the water pressure is not too high, which could damage the emitters
  - Laterals: Smaller pipes/drip tubes that deliver water directly to plants, often equipped with emitters or drippers for slow release
  - Specifications
    - Diameter: Ranging from 1/2 inch to 1 inch depends on the size of the area to be irrigated and the flow rate of the water source
    - Flow rate: The flow 2 liters per hour based on the water requirements of the plants and the spacing of the emitters



# Irrigation Network : Drip Line

- This network comprises a series of interconnected pipes, hoses, and drippers/sprinklers/other emitters type
  - Emitter spacing: 30 cm
  - Pressure: The pressure of the water source should be between 10 and 20 psi
  - Materials: Polyethylene or Polypropylene
- Advantages
  - Water efficiency: Driplines can save up to 70% of water compared to traditional sprinkler systems
  - Weed control: Driplines deliver water directly to the plant roots, which can help to suppress weed growth
  - Erosion control: Driplines deliver water slowly and evenly, which can help to prevent soil erosion
  - Labor savings: Driplines are a low-maintenance irrigation system that requires little labor to operate



# Irrigation Network : Drip Line

- This network comprises a series of interconnected pipes, hoses, and drippers/sprinklers/other emitters type
  - Filters: Removes debris and sediments to prevent clogging, especially crucial for drip irrigation systems



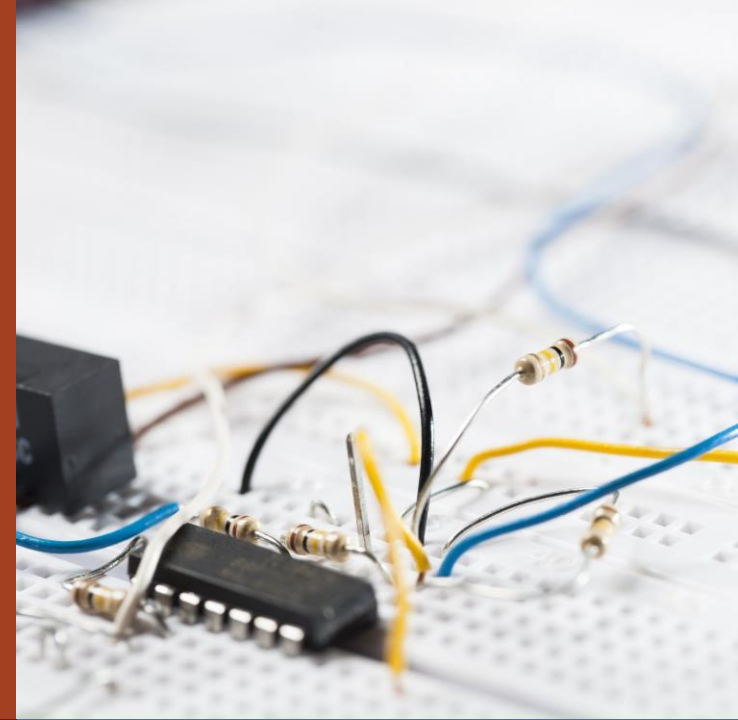
# Actuators 1 : Irrigation

- Actuators 1 are devices that perform actions based on the commands they receive from the RTU or command computer, which consists of irrigation pumps which is shown in Figure 0
  - Power Control : Power control is a tool used to deliver power to an actuator with commands from the RTU
  - Pumps: Ensure the flow of water from the source to the irrigation network
    - Flow Rate : Given the size of the land and water requirements for chili plants, the pump should provide a flow rate of about 2,000 - 2,500 liters per day
    - Head : The head requirement will depend on the land's topography and the distance between the water source and the irrigation area



# Actuators 1 : Irrigation

- Actuators 1 are devices that perform actions based on the commands they receive from the RTU or command computer, which consists of irrigation pumps which is shown in Figure 0
  - Pump Power: Based on the required flow rate and head, a pump with a power rating of about 0.5 to 1 HP should meet these needs
  - Irrigation Valves: Solenoid valves that control the amount and direction of water flow within the irrigation system to the respective irrigation unit , turning on/off based on soil moisture levels and other parameters. Number off irrigation valves depend on the number of irrigation units



# Actuators 2 : Fertilizer Injection System



The fertilizer injection system is a mechanism that mixes liquid fertilizer with irrigation water at a specified rate



Venturi Fertiliser Injectors: Utilize pressure differences to draw and mix fertilizer into the irrigation flow



Mixing Tanks: Location where water and fertilizers are pre-mixed before being released to the field



Fertigation and venturi control valve



Power control : similar to actuator 1, power control device is required

**Central Computer :**  
The central computer is a powerful processing unit that gathers data from multiple RTUs in different fields.



**Data Analysis:** Evaluates data trends and determines irrigation and fertilization needs



**Command Issuance:** Sends commands to RTUs based on analysis and user input



**Data Storage:** Maintains a database of historical data for better decision-making



**Internet connectivity** ensures seamless communication between the RTU and the central computer

**User Interface:**  
The user interface, usually software or a web portal.



**Monitor:** View real-time data from the fields



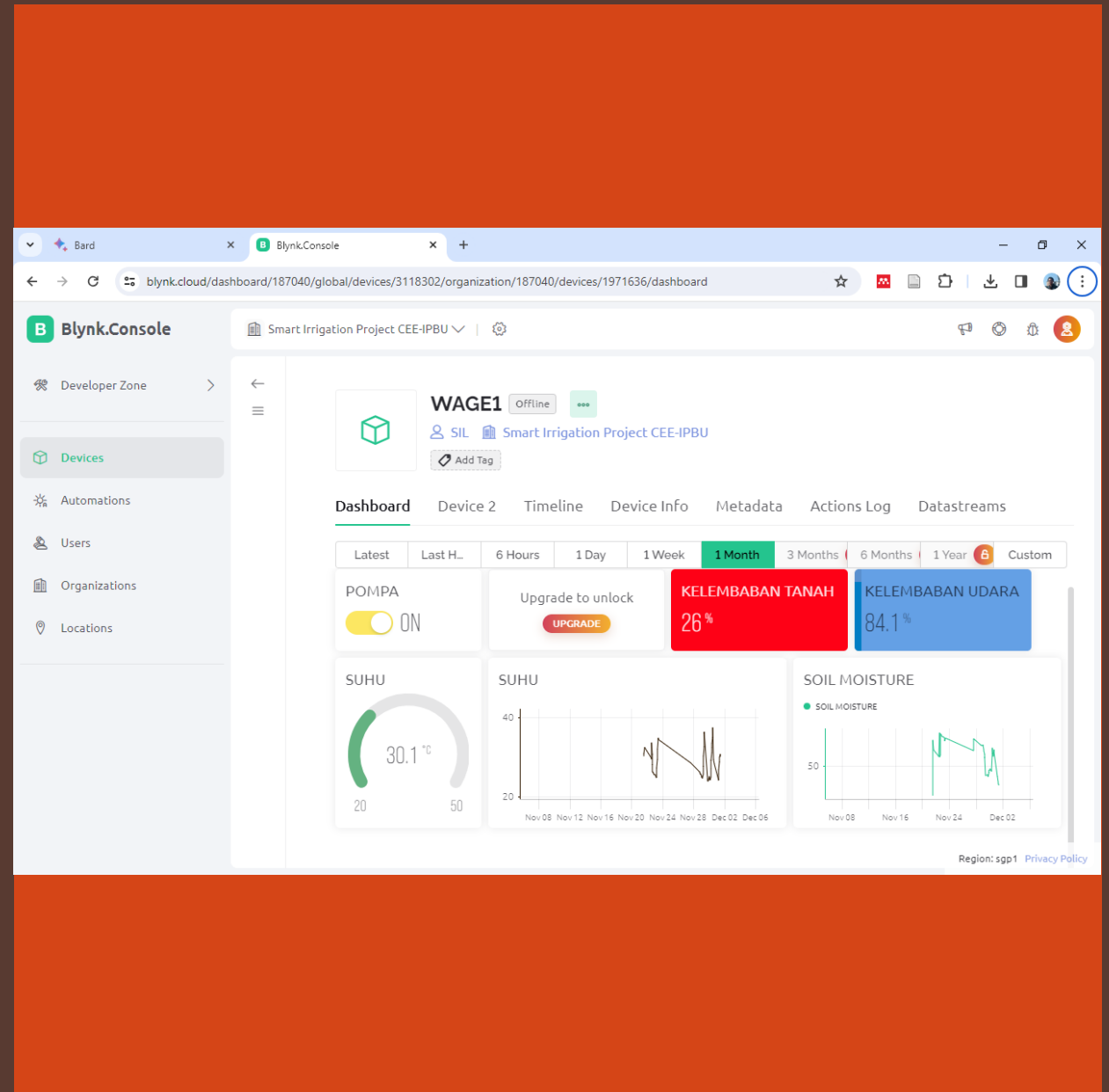
**Control:** Manually override or adjust the automatic commands of the system



**Analyse:** Access historical data, generate reports, and make informed decisions about irrigation and fertilization

# User Interface: The user interface, usually software or a web portal, allows users to

- The system works with electrical power that can be obtained from various sources according to availability in the field: electricity on-grid , solar panels and fossil fuel electric generators



# Gapoktan in Cipanas





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# CSA Integrated Irrigation System and Financial Analysis

## Training Module 3

# Modules Overview

## **Module 1:** Introduction to CSA and its Implementation in Indonesia

This module equips participants to implement CSA practices in Indonesia, fostering climate resilience and gender equality

- Module 1.1. Introduction to Climate-Smart Agriculture
- Module 1.2 CSA Implementation in Indonesia
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## **Module 2:** Soil monitoring, Automatic Irrigation Technology and Fertigation :

This module equips participants with essential CSA technologies for sustainable farming, covering soil analysis, irrigation, fertilization, and product solutions

- Module 2.1 Identification of Water Content and Soil Chemistry
- Module 2.2 Automatic Irrigation and Fertilization Applications
- Module 2.3 Presentations by Technology Suppliers

## **Module 3:** CSA Integrated Irrigation System and Financial Analysis :

This module explores integrated soil sensor and irrigation-fertilization systems

- **Module 3.1 Introduction to Implementation of Integrated System Soil Monitoring, Automatic Irrigation with Fertilizer Application**
- Module 3.2 Feasibility Analysis of Agricultural Businesses in Climate Smart Agriculture

# Module 3

## Learning Objectives

3.1. Participants understand the component of integrated system of soil sensor technology and automatic irrigation-fertilization

3.2. Participants understand how to analyze the business and financial feasibility of an agricultural business using modern technology

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# Introduction to Implementation of Integrated System of Soil Monitoring, Automatic Irrigation with Fertilizer Application

# Learning Objective 3.1

Participants understand the component of integrated system of  
soil sensor technology and automatic irrigation-fertilization

# Introduction



An agricultural irrigation system emphasizing Climate-Smart Agriculture principles utilizes advanced on-site, field-implemented soil sensors

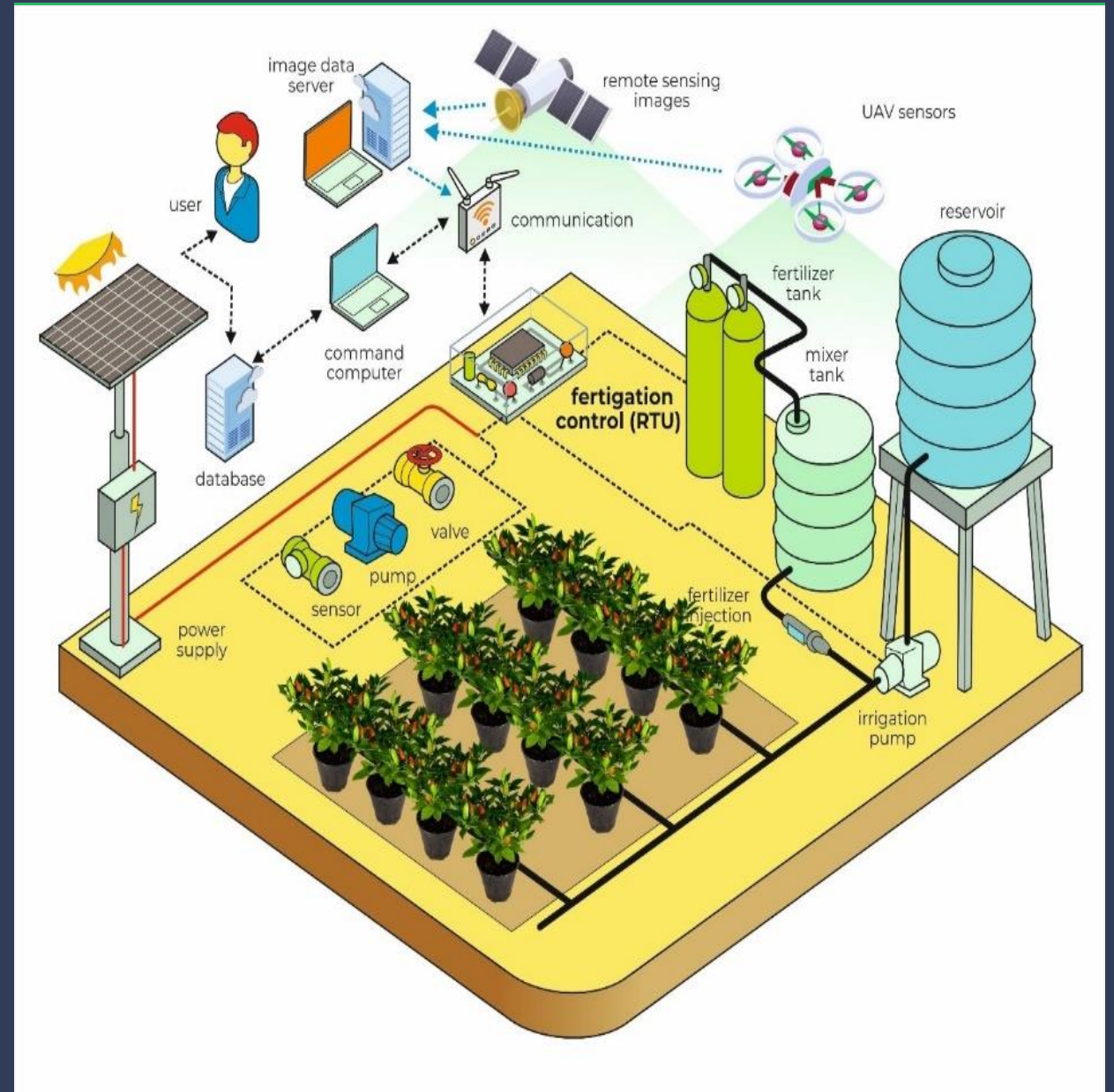


The system adopts drip irrigation, selected for its water efficiency and suitability for farmer self-management, reflecting CSA's commitment to sustainable water use



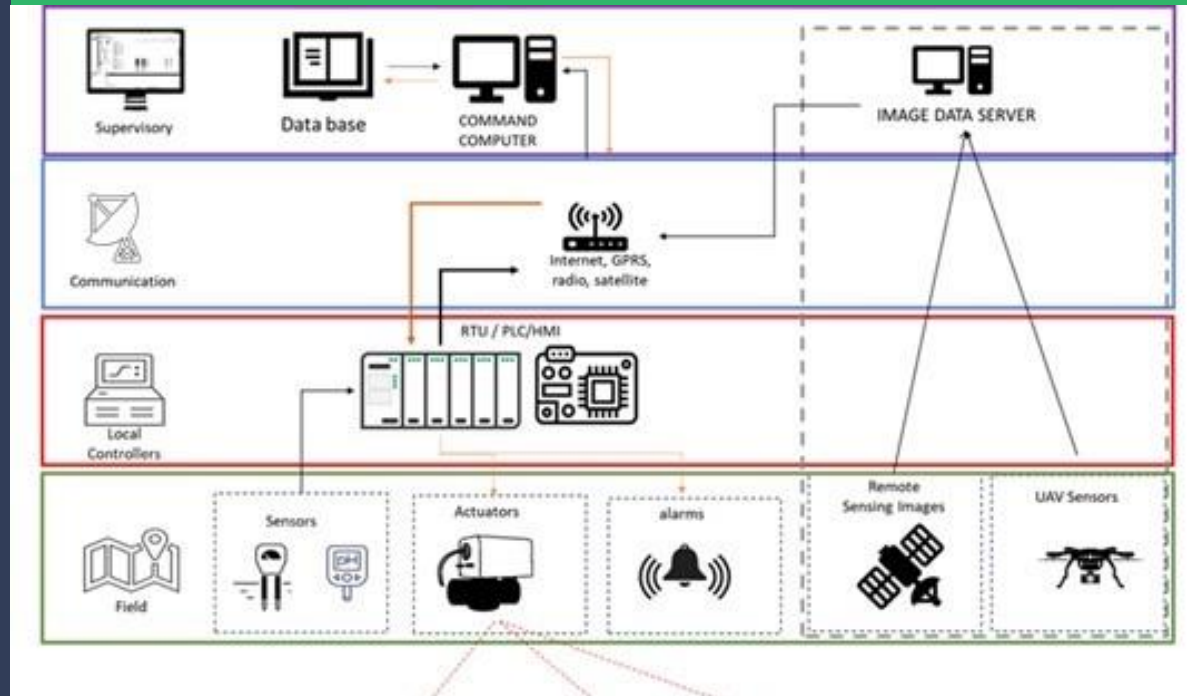
By concentrating on on-site sensor technology, the system showcases a precision agriculture approach that aligns with CSA's sustainability, efficiency, and environmental stewardship objectives

# Integrated System : Soil Monitoring and Automatic Irrigation with fertigation



# Component of integrated system

- The architecture of the primary system is designed to optimize agricultural practices through the integration of advanced technology, focusing on efficient irrigation and fertilization



# Component of integrated system

- Field Sensors: Positioned directly within the agricultural fields, these sensors are critical for real-time monitoring of soil moisture levels, nutrient content, and other essential environmental parameters

**Microthings**  
Sensor to Cloud



# Component of integrated system

- Field Controller/Remote Terminal Unit : The RTU acts as the command center for the field sensors, collecting and processing data from the sensors



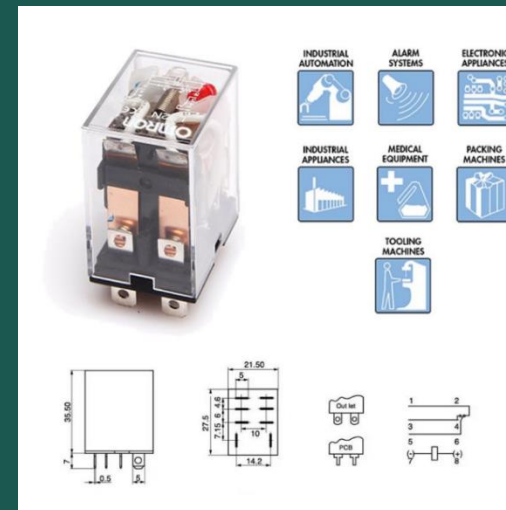
# Component of integrated system

- Irrigation Network: Drip Line: The drip line system is a key component of the irrigation network, designed to deliver water directly to the root zone of plants



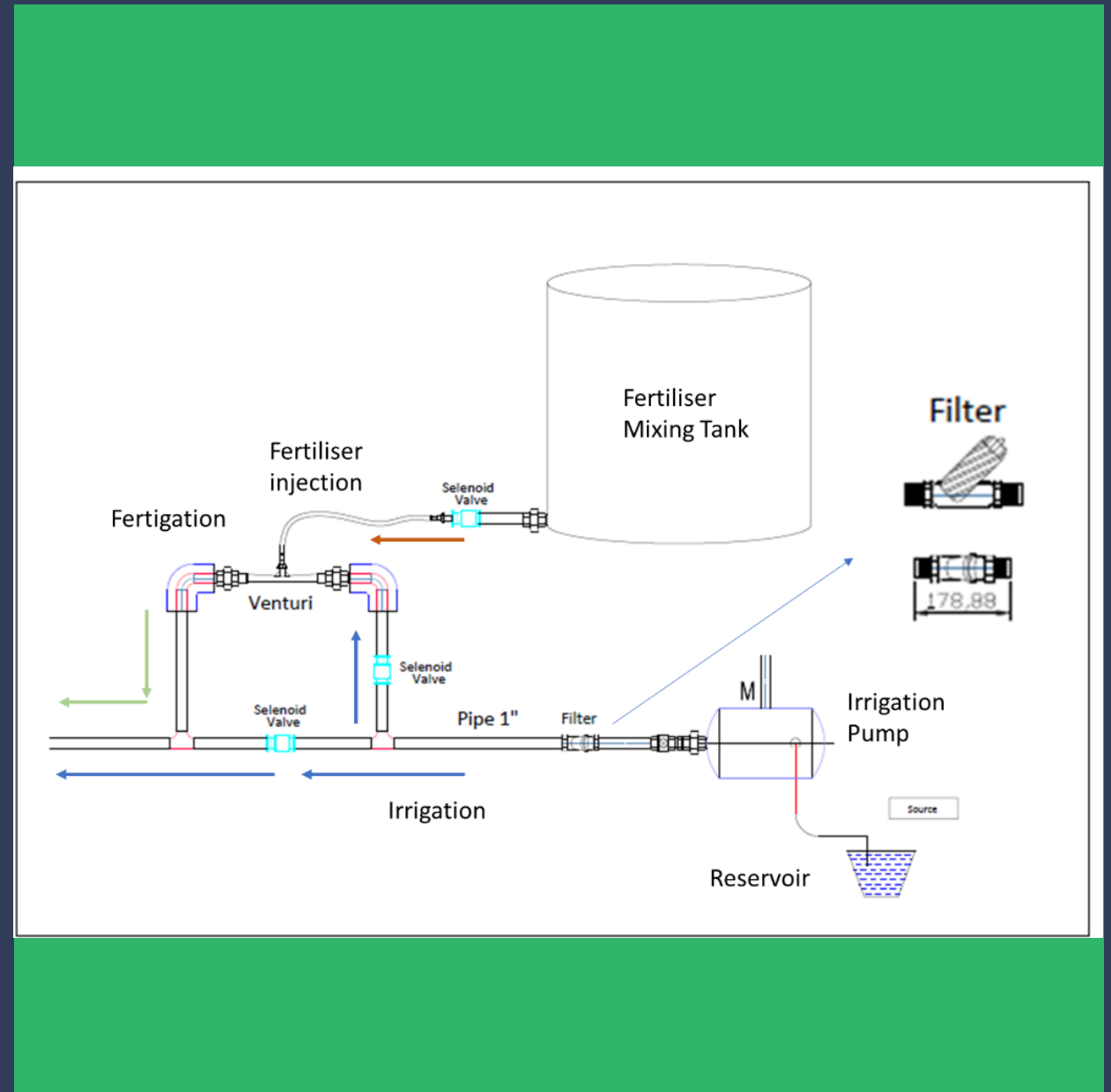
# Component of integrated system

- Actuators 1: Irrigation: Actuators in the irrigation system are responsible for the physical operation of valves and pumps



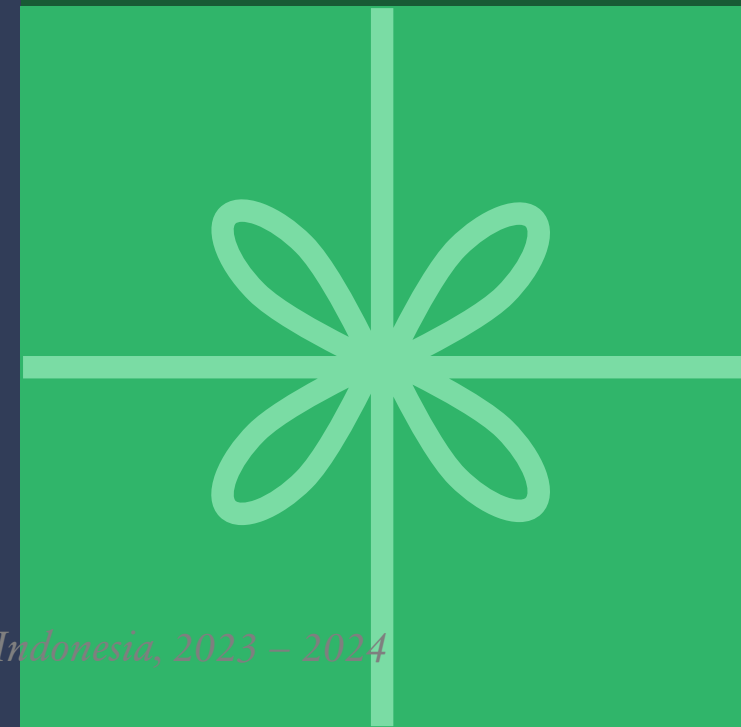
# Component of integrated system

- Actuators 2: Fertilizer Injection System: Similar to the irrigation actuators, these actuators control the delivery of fertilizers through the system



# Component of integrated system

- Central Computer: The central computer serves as the brain of the operation, receiving data from the RTU and using it to make informed decisions about irrigation and fertilization schedules



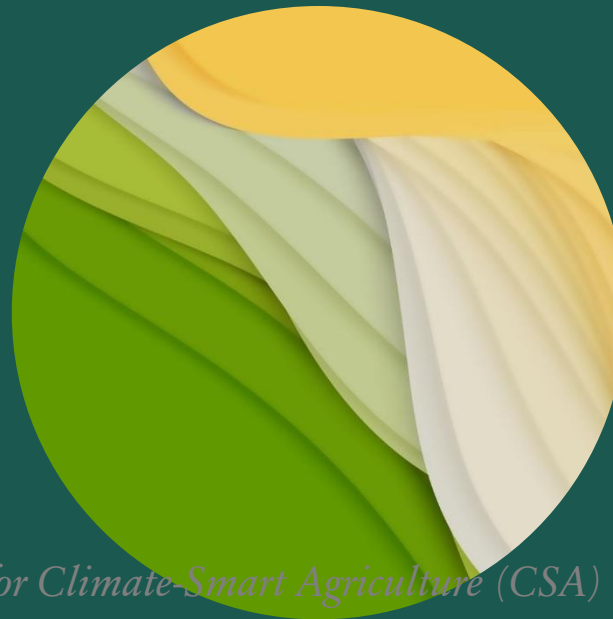
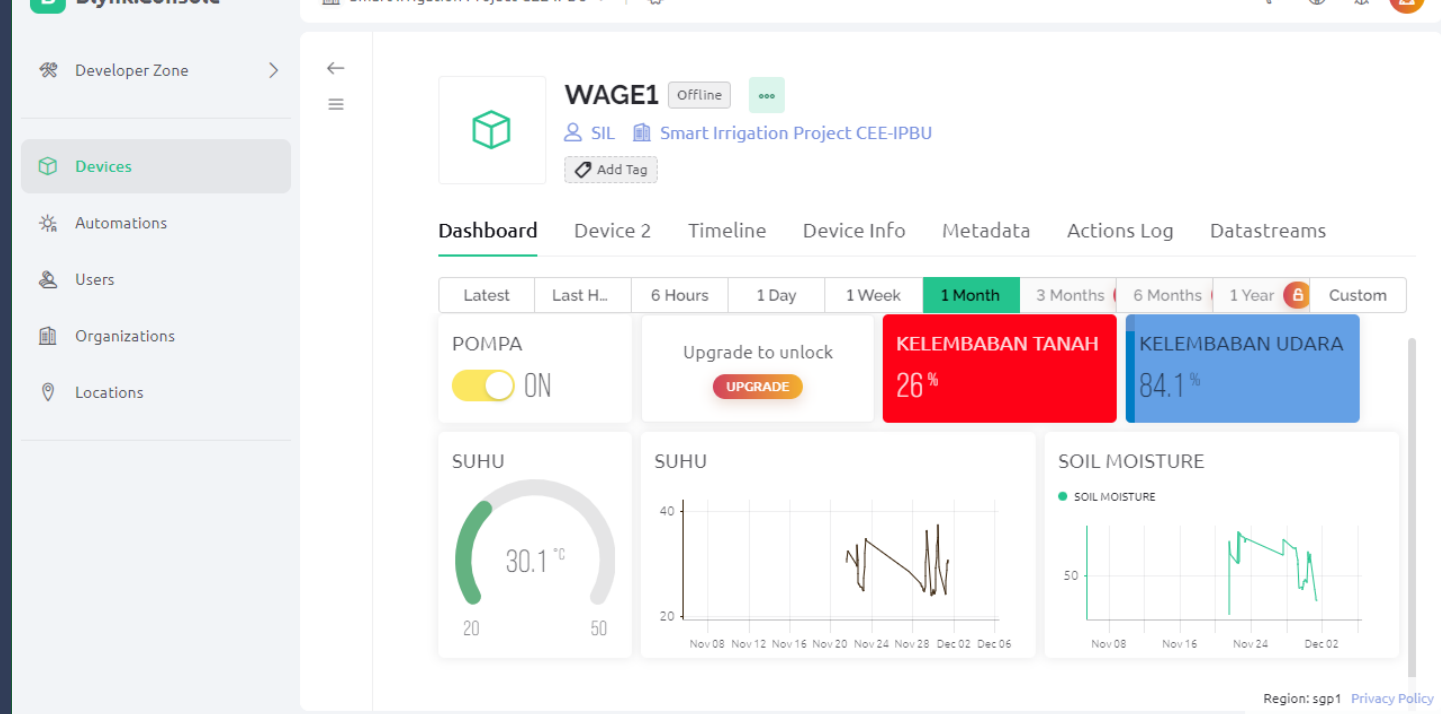
# Component of integrated system

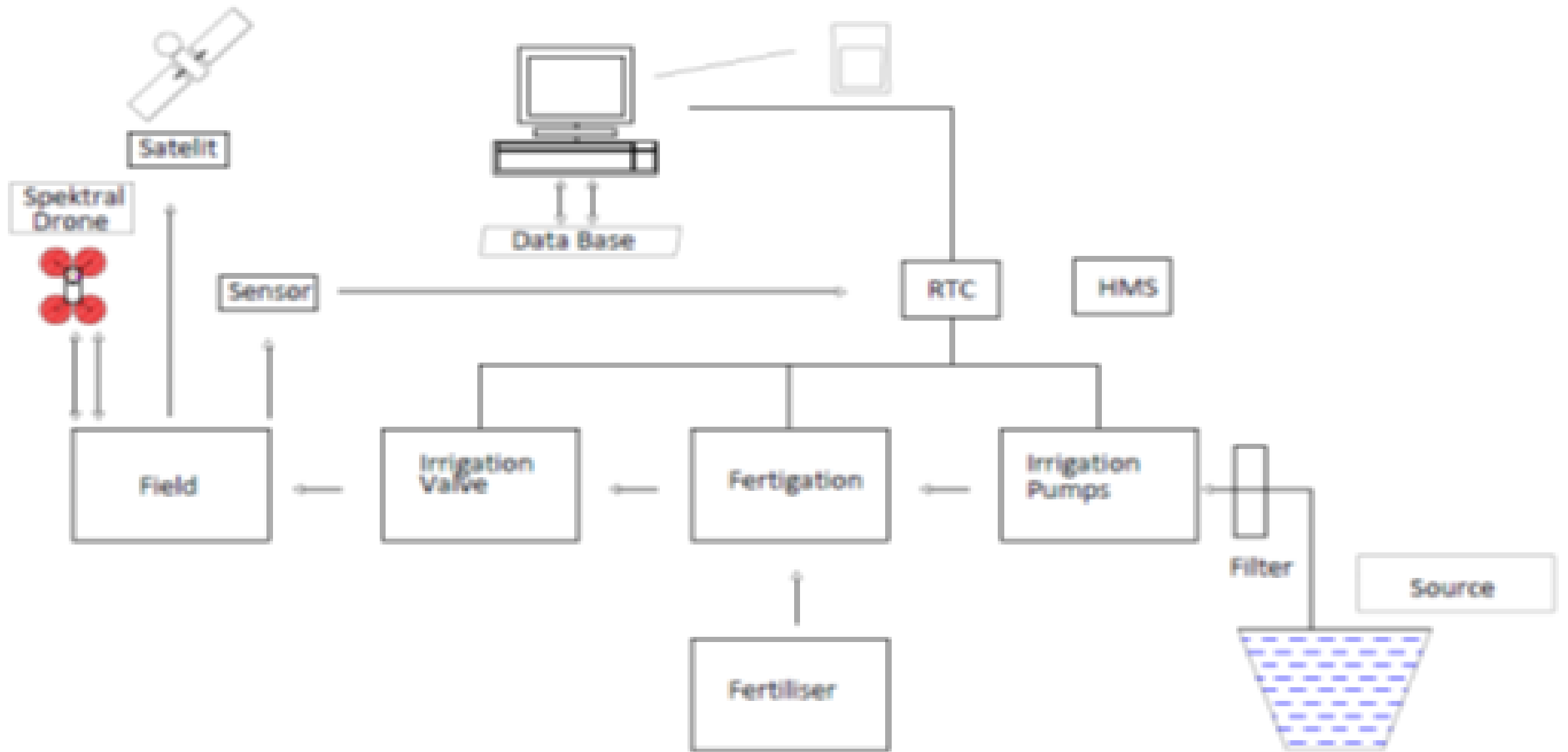
- Internet Connectivity: This component ensures that the system is connected to the internet, enabling remote monitoring and control

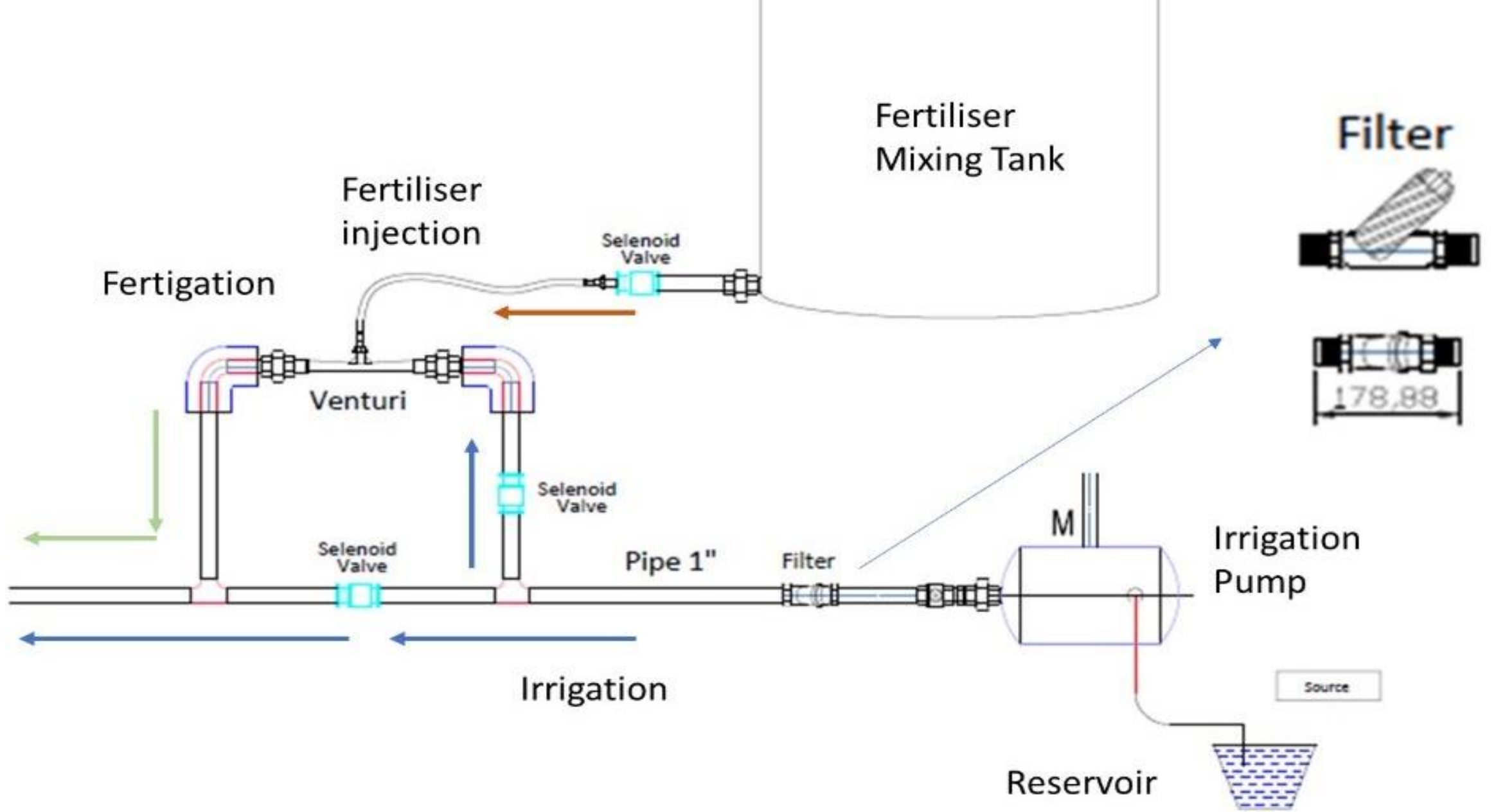


# Component of integrated system

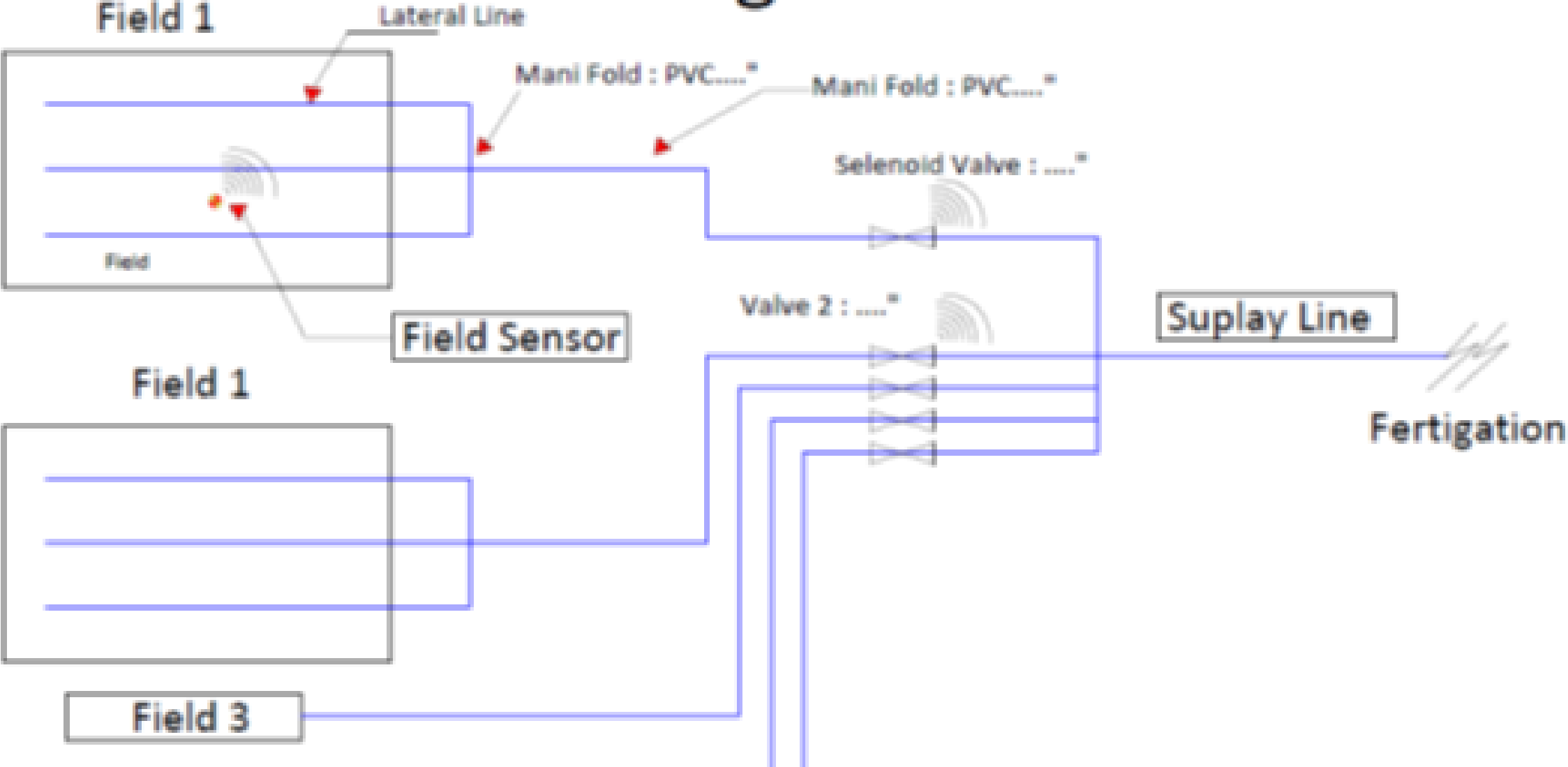
- User Interface: The user interface is designed for ease of use, allowing farmers to interact with the system, view data, and make informed decisions about their agricultural practices







# Irrigation Unit



# The components of the system to be developed

Reservoir dan accessories: water tank 2200 liter, connectors complete system

Pompa dan accessories: pompa, panel pompa, cable pompa accessories, suction & delivery sistem

Mainline dan Submain: pipa pvc 1 inchi, valve 1 inchi, disc filter 1 inchi, water meter, fittings complete system, connectors complete system

Lateral dan accessories: selang HDPE 16mm, selang LDPE 5 mm, valve 16 mm, drip stick 5 mm, flow meter ½ inchi, fittings complete system, connectors complete system

Dosing system: ventury injector ¾-½ inchi, manifold system ventury, mixing tank 1000 liter, nutrient tank, disc filter ¾ inchi, fittings complete system

Control panel dan server: microcontroller, soil moisture sensor dan chemical monitoring, connectors complete kontrol system, power supply, charge controller, inverter, baterai

# Component and cost

- Examples of components and prices in one integrated system of soil monitoring, automatic irrigation and fertigation

connectors complete system	complete set socket drat dalam ¼ – ½ inchi	3.500–4.500
Pompa dan accessories		
water pump	Shimizu PS-230 bit.output (W): 200. Input (kW): 0.55. Max suction power(m): 9. Total head max(m): 36. Head (m): 10 29. Capacity (liters/min): 28 11. Suction pipe(inch): 1. Thrust pipe(inch): 1. Weight(kg): 16.5	1.200.000–1.600.000
panel pompa	relay LY2 12V omron	35.000–45.000
cable accessories	pompa set cable pompa accessories	500.000–700.000
Mainline dan Submain		
pipe pvc	pipe pvc 1 inchi AW	40.000–45.000
valve	ball valve 1 inchi	25.000–150.000
disc filter	disc filter 1", kerapatan filtrasi (filtration grade) 120 mesh, max pressure 8 bar, flow rate 6 m <sup>3</sup> /h	120.000–170.000
water meter	water meter 1"	500.000–750.000
fittings complete system	set fittings complete system	100.000–200.000
connectors complete system	set connectors complete system	100.000–200.000

# Component and cost

- Examples of components and prices in one integrated system of soil monitoring, automatic irrigation and fertigation

Lateral dan accessories		
selang HDPE 16mm	selang HDPE 16mm panjang 50 meter per Roll	250.000–350.000
valve 16 mm	valve 16 mm	8.000–15.000
drip stick 5 mm	drip stick 5 mm	700–1.500
water meter	water meter ½"	180.000–350.000
fittings complete system	set fittings complete system	100.000–200.000
connectors complete system	set connectors complete system	100.000–200.000
Dosing system		
ventury injector ¾–½ inchi	set ventury injector ¾–½ inchi	150.000–250.000
manifold system ventury	pipa ¾ inchi, filter mesh, check valve, selang injektor	150.000–400.000
disc filter ¾ inchi	disc filter ¾", kerapatan filtrasi (filtration grade) 120 mesh, filtration area 90 cm <sup>2</sup> , max pressure 6 bar, flow rate 4 m <sup>3</sup> /h	65.000–130.000
mixing tank	tank capacity 1000 liters	1.700.000–2.300.000
nutrient tank	tank capacity 60 liters	130.000–250.000

# Component and cost

- Examples of components and prices in one integrated system of soil monitoring, automatic irrigation and fertigation

Kontrol panel dan server		
microcontroller	RTCU LX4 pro, wireless communication, internal flash drive 64 Mbyte, li-ion battery 2Ah,	
soil moisture sensor	sensor RK520-02	
solenoid valve	solenoid valve kuningan ½"	145.000–260.000
connectors complete control system	set connectors complete kontrol system	150.000–250.000
power supply	solar panel 150 WP	1.200.000–2.300.000
inverter	power inverter pure sine wave 2000 watt dc 12v to ac 220v psw sunyima - 12volt 1600watt	560.000–750.000
baterai	Baterai 12v-60 ah	980.000–1.500.000
charge controller	solar charge controller 10A 20A 30A	150.000–350.000



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# Feasibility Analysis of Agricultural Businesses in Climate Smart Agriculture : Funding sources and strategies for CSA projects

# Learning Objective 3.1

Participants understand understand how to analyze the  
business and financial feasibility of an agricultural business  
using modern technology

# OUTLINE

01

**Introduction**

02

**Climate Change Agriculture**

03

**Methodologists**

04

**CSA Local Wisdom**

05

**CSA Drip Irrigation Technology**

06

**CSA Precision technology**

07

**Example Case**

08

**Funding Sources**

09

**Conclusion**

01

# INTRODUCTION



# INTRODUCTION

- CLIMATE SMART AGRICULTURE CAN BE DONE BOTH USING MODERN TECHNOLOGY AND TECHNOLOGY THAT ALREADY EXISTS IN THE COMMUNITY.
- CSA TECHNOLOGY: USING LOCAL WISDOM FROM THE COMMUNITY AND MODERN TECHNOLOGY.
- MODERN TECHNOLOGY: DEPENDING ON THE TOOLS AND FIELD CONDITIONS.
- CONVENTIONAL TECHNOLOGY, IN THE IMPORTANT SENSE OF IRRIGATION
- PRECISION TECHNOLOGY: EXISTING EQUIPMENT ALREADY USES MORE ADVANCED IOT TECHNOLOGY.
- HIGH COST FOR THE USE OF MODERN TECHNOLOGY COMPARED TO CONVENTIONAL
- LIMITED FARMER CAPITAL

# OVERVIEW OF FARMING IN INDONESIA

IN INDONESIA, FARMING IS CATEGORIZED AS A SMALL FARM BECAUSE IT HAS THE FOLLOWING CHARACTERISTICS: FARM IN AN ENVIRONMENT OF INCREASING LOCAL POPULATION PRESSURE

HAVING LIMITED RESOURCES THUS CREATING A LOW LEVEL OF LIVING

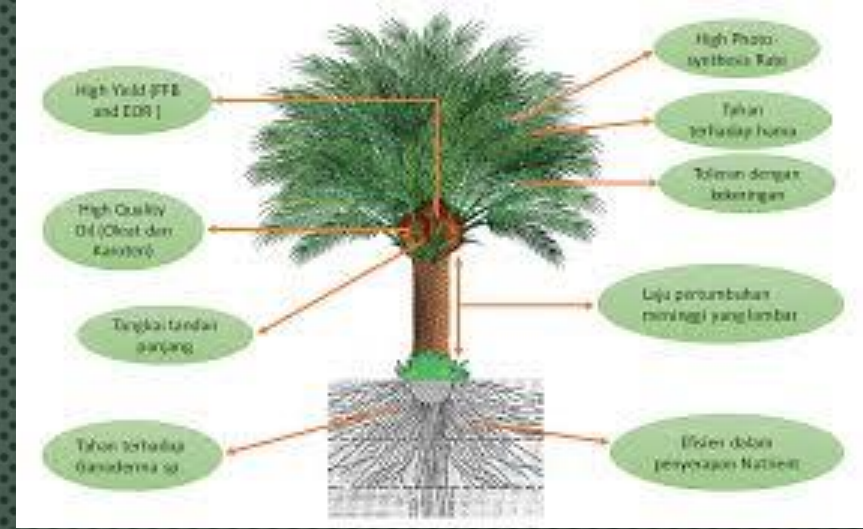
DEPENDS WHOLLY OR PARTLY ON SUBSISTENCE PRODUCTION

LACK OF HEALTH, EDUCATION AND OTHER SERVICES

THE AVERAGE AREA OF FARMER LAND IS 0.3 HECTARES

DIFFICULT TO GET ACCESS TO FINANCING





- WHAT ABOUT OIL PALM FARMERS?
- INDONESIAN OIL PALM INDEPENDENT SMALLHOLDERS ARE FARMERS OF PRODUCTIVE AGE, TRANSMIGRANTS, HAVE AN ELEMENTARY SCHOOL EDUCATION, HAVE AN INCOME OF Rp. 2,000,000-Rp. 5,000,000 PER MONTH, HAVE A SIDE BUSINESS TO INCREASE INCOME, ARE VERY DEPENDENT ON THE PRICE OF FFB TO BUY BASIC NECESSITIES, LIVE IN VILLAGES AROUND THE PLANTATIONS THEY MANAGE, HAVE NOT JOINED THE ORGANIZATION / ASSOCIATION OF OIL PALM FARMER GROUPS, LAND COMES FROM SHRUBS AND FORMER FIELDS / RICE FIELDS, THE STATUS OF OWNERSHIP RIGHTS IS HCS, LAND AREA  $\leq 4$  HECTARES PER FARMER, LAND WITH FLAT TOPOGRAPHY, DOES NOT APPLY SOIL CONSERVATION PRINCIPLES, DOES NOT HAVE CERTIFICATES OR SEED DOCUMENTS, AND HAS NOT IMPLEMENTED INTEGRATED PEST AND DISEASE CONTROL, DOES NOT HAVE SUFFICIENT CAPITAL, AND HAS PALM OIL PRODUCTIVITY OF  $\leq 2000$  KG / HA / MONTH AND PALM OIL FFB PRODUCTS ARE SOLD TO MIDDLEMEN.

# PURPOSE

FUTURE AGRICULTURAL DEVELOPMENT FACES TWO MAIN CHALLENGES, NAMELY (A) CLIMATE CHANGE AND VARIABILITY, AND (B) DEGRADATION AND LIMITATION OF LAND RESOURCES. THROUGH CSA, IT IS EXPECTED TO MITIGATE THE IMPACT OF BOTH CHALLENGES.

THEREFORE IN THIS STUDY:

- WANT TO SEE AND COMPARE CONVENTIONAL AGRICULTURE AND AGRICULTURE THAT USES PRECISION TECHNOLOGY.
- PROVIDE AN OVERVIEW OF CONVENTIONAL AND PRECISION FARMING ANALYSIS CALCULATION MODELS
- PROVIDE INFORMATION ON FUNDING SOURCES RELATED TO CSA-RELATED AGRICULTURAL MODELS

02

# CLIMATE-SMART AGRICULTURE



# BASIC PRINCIPLES OF CLIMATE SMART AGRICULTURE

1. PRODUCTIVITY: INCREASE AGRICULTURAL PRODUCTIVITY AND FARMERS' INCOME SUSTAINABLY FROM CROPS, LIVESTOCK AND FISH, WITHOUT NEGATIVE IMPACT ON THE ENVIRONMENT
2. ADAPTATION: REDUCE FARMERS' VULNERABILITY TO SHORT-TERM RISKS, WHILE STRENGTHENING FARMERS TO ADAPT IN THE FACE OF LONG-TERM SHOCK.
3. MITIGATION: HELP REDUCE AND/OR ELIMINATE GHG EMISSIONS

# IOT (INTERNET OF THINGS)



- INTERNET OF THINGS IS A TECHNOLOGICAL CONCEPT WHERE AN OBJECT CAN BE CONNECTED TO OTHER OBJECTS WITHOUT REQUIRING HUMAN-TO-HUMAN INTERACTION, NO MATTER HUMAN TO COMPUTER DEVICES CONNECTED TO THE INTERNET.
- THE DEVELOPMENT OF IOT CAN BE SEEN STARTING FROM THE LEVEL OF CONVERGENCE OF WIRELESS TECHNOLOGY, MICRO-ELECTRO-MECHANICAL (MEMS), INTERNET, AND QR (QUICK RESPONSES) CODE. IOT IS ALSO OFTEN IDENTIFIED WITH RFID (RADIO FREQUENCY IDENTIFICATION) AS A COMMUNICATION METHOD.



# ELEMENTS THAT MAKE UP THE INTERNET OF THINGS

- ARTIFICIAL INTELLIGENCE
- INTELLIGENCE SYSTEMS OWNED BY HUMANS ARE IMPLEMENTED OR PROGRAMMED IN MACHINES SO THAT MACHINES CAN THINK AND BEHAVE LIKE HUMANS.
- SENSOR
- WITH THIS SENSOR, THE MACHINE IS ABLE TO DETERMINE INSTRUMENTS THAT CAN CHANGE IOT MACHINES FROM THOSE THAT WERE ORIGINALLY PASSIVE TO MACHINES OR TOOLS THAT ARE ACTIVE AND INTEGRATED.
- CONNECTIVITY
- CONNECTIVITY IS ALSO COMMONLY REFERRED TO AS A CONNECTION BETWEEN NETWORKS.

# APPLICATION OF LOCAL WISDOM IN CSA



1. INCREASE AGRICULTURAL PRODUCTIVITY AND CROP QUALITY.
2. REDUCE THE USE OF SYNTHETIC CHEMICALS THAT ARE HARMFUL TO THE ENVIRONMENT AND HUMAN HEALTH.
3. IMPROVE FOOD SECURITY AND REDUCE VULNERABILITY TO CLIMATE CHANGE.
4. IMPROVE THE WELFARE OF FARMERS AND LOCAL COMMUNITIES.

03

# METHODS

# FARM ANALYSIS



- **ADIWILAGA (1982)** AGRICULTURAL SCIENCE IS A SCIENCE THAT INVESTIGATES EVERYTHING RELATED TO THE ACTIVITIES OF PEOPLE DOING AGRICULTURE AND PROBLEMS THAT ARE REVIEWED SPECIFICALLY FROM THE POSITION OF THEIR OWN ENTREPRENEURS OR AGRICULTURAL SCIENCE, WHICH INVESTIGATES THE WAYS OF A FARMER AS AN ENTREPRENEUR IN COMPILING, ORGANIZING AND RUNNING THE COMPANY.
- **MOSHER (1968)** FARMING IS A PLACE OR PART OF THE SURFACE OF THE EARTH WHERE AGRICULTURE IS HELD BY A PARTICULAR FARMER, WHETHER HE IS AN OWNER, CATCHER OR MANAGER WHO IS SALARIED THE SET OF NATURAL RESOURCES CONTAINED IN THAT PLACE THAT ARE NECESSARY FOR AGRICULTURAL PRODUCTION SUCH AS LAND AND WATER, IMPROVEMENTS MADE TO THE LAND, SUNLIGHT, BUILDINGS ERECTED ON THAT LAND AND SO ON.
- **SOEKARTAWI (1995)** AGRICULTURAL SCIENCE IS A SCIENCE THAT STUDIES HOW A PERSON ALLOCATES EXISTING RESOURCES EFFECTIVELY AND EFFICIENTLY TO OBTAIN HIGH PROFITS AT A CERTAIN TIME.
- **KADARSAN (1993)** FARMING IS A PLACE WHERE A PERSON OR GROUP OF PEOPLE TRY TO MANAGE ELEMENTS OF PRODUCTION SUCH AS NATURE, LABOR, CAPITAL AND SKILLS WITH THE AIM OF PRODUCING TO PRODUCE SOMETHING IN THE AGRICULTURAL FIELD.

## ANALYSIS OF FARM PROFITS

**INCOME = TOTAL REVENUE = TR**

A CERTAIN AMOUNT OF MONEY VALUE THAT PRODUCERS RECEIVE FROM THE SALE OF OUTPUT (GOODS/SERVICES)

$$\rightarrow \mathbf{TR = Y \cdot P_Y}$$

WHERE:

Y : THE AMOUNT OF OUTPUT PRODUCED

P<sub>Y</sub> : OUTPUT PRICE

IF THE MANUFACTURER PRODUCES N TYPES OF PRODUCTS, THEN:

$$\rightarrow \mathbf{TR\ TOTAL = TR_1 + TR_2 + \dots + TR_N}$$

$$\rightarrow \mathbf{TR\ TOTAL = Y_1 \cdot P_1 + Y_2 \cdot P_2 + \dots + Y_N \cdot P_N}$$

## INCOME = PROFIT

THE DIFFERENCE BETWEEN THE RECEIPT (OUTPUT VALUE) AND THE AMOUNT OF COSTS INCURRED

$$\rightarrow \Delta = TR - TC$$

To increase revenue::

- ❑ increase TR by TC =
- ❑ if TR =, by increase TC
- ❑ increase TR by increase TC, but  $\Delta TR$  should  $\ggggg$   $\Delta TC$



## 1.6. ANALYSIS OF FARM INCOME AND COSTS

### BASED ON THE DECISION OF THE INTERNATIONAL CONGRESS IN BUCHAREST

#### 1. Gross Return

That is, all income earned from all branches and resources in the farm for one year, which can be taken into account from the proceeds of sales, Exchange and Reassessment

#### 2. Cost of outside tools

That is, all payments given by the farmer to earn gross income, except interest  
All assets used and costs for activities the businessman and the wages of his own family labor

### 3. Farm expense

The cost of external equipment plus the wages of the family's own labor which is calculated based on wages paid to outside workers

### 4. Cost of production

Business costs are added with interest on assets that used in farming

### 5. Net return

Can be taken into account by subtracting gross income at the expense of working

## Cash and non-Cash Charges

- Soekartawi et al (1986), income is the difference between revenue and cost.
- Revenue is the result of the multiplication between the selling price of a production and the amount of production.
- Costs are farmers' expenses in cash and non-cash in agricultural activities.
- Costs consist of cash costs and calculated or non-cash charges.
- The combination of cash costs and non-cash costs is the total cost.
- Farm income consists of income on cash costs and income on total costs.
- Revenue on cash costs is receipts minus the amount of cash costs and revenue on total costs is revenue minus the amount of total costs.

## FINANCIAL FEASIBILITY ANALYSIS

- Calculating a business feasibility study helps farmers and business actors to analyze whether or not a business is feasible to run. In a business feasibility study, various factors are considered that will support the success of running a business.
- Feasibility analysis is something related to financial feasibility analysis which includes Net Present Value (NPV), Payback Period (PP), Internal Rate Return (IRR), and Net Benefit-Cost Ratio (Net B/C)



## Net Present Value

The NPV method is a calculation of the difference in cash flows issued by the company, the NPV value is calculated using a certain interest rate, the NPV value generated by generating net income is greater than the current investment value, so that the NPV value is positive, and it can be said that the investment project is feasible.

The NPV calculation formula is:

$$NPV = \sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t}$$

Where:

B<sub>t</sub> = profit for a year

C<sub>t</sub> = cost of investment for a year

i = discount rate used

n = economic life of the investment

t = Year

NPV > 0, investment in business is worth running

NPV < 0, then investment in a business is not worth running

NPV = 0 requires consideration to continue the investment or not

## Internal Rate of Return (IRR)

The rate of return in the Internal Rate of Return determines whether or not an investment project is feasible, by comparing the IRR with the expected rate of return. The calculation of IRR is carried out using the discount rate with the present value. If the IRR value  $> 1$  then  $NPV > 0$  then the business is worth continuing. If the IRR  $< 1$  then  $NPV < 0$  then the business carried out is not worth continuing. If  $IRR = 1$ ,  $NPV = 0$  then the business carried out only bears costs equal to the current interest rate. The formula used is:

$$IRR = i_1 + \frac{NPV}{NPV_1 - NPV_2} \times (i_2 - i_1)$$

Where:

$i_1$  = discount rate resulting in a positive NPV

$i_2$  = discount rate resulting in negative NPV

$NPV_1$  = positive NPV

$NPV_2$  = negative NPV

## Net Benefit Cost Ratio (Net B/C ratio)

Measuring whether or not an investment project is feasible is to compare the present value, if the Net B/C value  $> 1$  then it is said to be feasible and if the Net B/C  $< 1$  then a business is said to be not feasible. can be done. The formula used is:

$$\text{Net } \frac{B}{C} = \frac{\sum_{t=0}^n \frac{B_t}{(1+i)^t}}{\sum_{t=0}^n \frac{C_t}{(1+i)^t}}$$

Information:

B<sub>t</sub> = monthly profit

C<sub>t</sub> = expenses incurred every month (Rp)

I = interest rate

N = number of years

## Payback period

The calculation of the payback period provides an explanation of the amount of investment at present value. By knowing the payback period, farmers will know how long the investment they make can provide benefits for farmers. If the payback period is smaller than the economic life of the investment then the investment is said to be feasible and if the payback period is greater than the economic life then it can be said to be not feasible. The payback period calculation formula is:

$$PP = \frac{I}{Ab}$$

Information:

I = The amount of investment cost

Ab = Net profit earned annually

## Venture Acceptance and Production Model

Component	Information
A. Cash Receipt	Price x Yield sold (kg)
B. Calculated reception	Price x Yield consumed (kg)
C. Total receipts	A + B
D. Cash Charges	Seeds, Cultivation, Out-of-Family Labor (TKLK), Land Rental, UN
E. Costs are taken into account	Labour in the Family (TKDK), Cultivate the enclosure (own), Depletion
F. Total Cost	D + E
G. Income. At cash expense	C – D
H. Revenue On total cost	C – F
I. Cash Income	A – D
J. RCR	C/D
I. B/C	I/D

04

# Implementation of CSA using Local Wisdom

# IMPLEMENTATION OF CSA USING LOCAL WISDOM

- CLIMATE SMART AGRICULTURE IN WAIMANTAN VILLAGE, LEMBATA REGENCY, NTT IS ONE OF THE ACTIVITIES CARRIED OUT IN PLAN INDONESIA'S DAMAMAN VILLAGE UNDER THE LEMBATA AREA IMPLEMENTATION PROGRAM (PIA). THIS ACTIVITY EMPOWERS FARMER GROUPS IN THE VILLAGE TO MANAGE COMMUNAL GARDENS ORGANICALLY AS ONE OF THE ADAPTATION EFFORTS TO CLIMATE CHANGE.
- THE NUMBER OF ACTIVITIES THAT HAVE BEEN CARRIED OUT IN THIS ACTIVITY WITH FARMERS ARE TRAINING ON CLIMATE-RELATED VULNERABILITY AND CAPACITY ASSESSMENTS, NAMELY ACTION PLANS MADE WITH FARMER GROUPS, AGRICULTURAL EXTENSION WORKERS AND VILLAGE GOVERNMENTS, TRAINING ON MAKING FERTILIZERS, PREPARING AGRICULTURAL LAND FOR VEGETABLE CROPS OR HORTICULTURE.



# PLANTING PATTERN

- DURING THE PROCESSING PERIOD, THERE ARE MANY OBSTACLES, SUCH AS PESTS. AS A RESULT OF PEST ATTACKS, A NUMBER OF CROPS, SUCH AS CUCUMBERS AND BITTER MELON, DIE AND CANNOT BE HARVESTED.
- TO PREVENT PEST ATTACKS, FARMERS USE PLANT-BASED PESTICIDES FROM PLANTS, FOR EXAMPLE NEEM LEAVES.
- THE LEMBATA AGRICULTURE AND RESILIENCE OFFICE ALSO ASSISTED AND PROVIDED COUNSELING TO FARMER GROUPS TO OVERCOME PEST PROBLEMS.
- THE RESULTS OF THIS COMMUNAL GARDEN HAVE BEEN ENJOYED SEVERAL TIMES BY FARMERS EITHER FOR SALE OR THEIR OWN CONSUMPTION. REGARDING THE PROCEEDS FROM THE SALE, IT IS INCLUDED IN THE FARMER GROUP'S TREASURY TO BE STORED AND MANAGED TOGETHER.

**05**

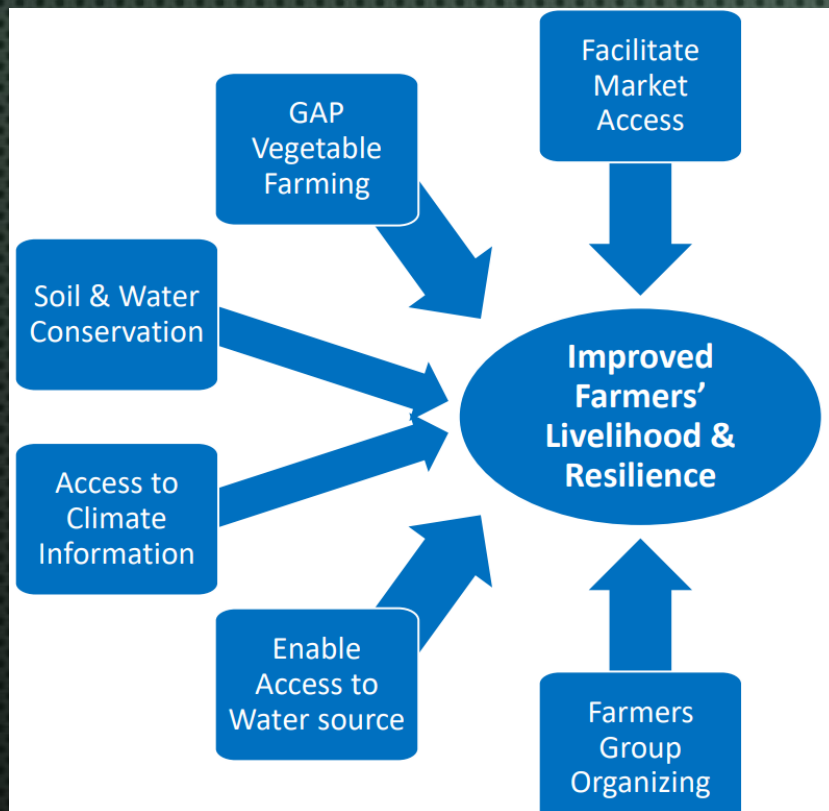
# Application of CSA using Drip Irrigation Technology

# DRIP IRRIGATION TECHNOLOGY

- THE TYPICAL AGROCLIMATE CONDITIONS IN THIS AREA ARE DRY CLIMATE – RATHER DRY SO THIS HAS AN IMPACT ON LOW AIR AVAILABILITY AND SLOW PROCESS OF DECOMPOSITION BECOMES UNCLEAR NUTRIENTS.
- AT THE BEGINNING OF THE RAINY SEASON IT TENDS TO ALWAYS RETREAT.
- THE CONDITION OF THE SOIL AND LAND IS TO HAVE SLOPING TOPOGRAPHY, SHALLOW SOIL DEPTH (30-50 CM), ROCKY SOIL AND SOIL CHEMISTRY THAT LACKS ORGANIC MATTER. IN THIS AREA THE LAND IS LARGE, BUT LITTLE. \_
- IN 2016 - 2020 THERE IS A PROJECT TO STRENGTHEN "INTEGRATED AGRICULTURAL LIVELIHOODS", WHERE THESE ACTIVITIES ARE IN THE FORM OF SOIL AND WATER CONSERVATION, GAP VEGETABLE FARMING, ACCESS TO CLIMATE INFORMATION, ENABLING ACCESS TO WATER SOURCES, ORGANIZING FARMER GROUPS AND FACILITATING MARKET ACCESS.



# PROJECT TO STRENGTHEN "INTEGRATED AGRICULTURAL LIVELIHOODS" ("MATA PENCAHARIAN PERTANIAN TERPADU")



- WITH THESE ACTIVITIES IN THE CLIMATE SMART AGRICULTURE PROGRAM, IT WILL BE ABLE TO IMPROVE THE WELFARE OF FARMERS.

## TEKNIK KONSERVASI



Guludan



terracing beds

The goals of this soil and water conservation are to:  
reduce surface air runoff when it rains;  
reduce soil erosion;  
increase rainwater infiltration into the soil for groundwater recharge; and  
facilitate cultivation activities, especially for seasonal vegetable crops



RECHARGE



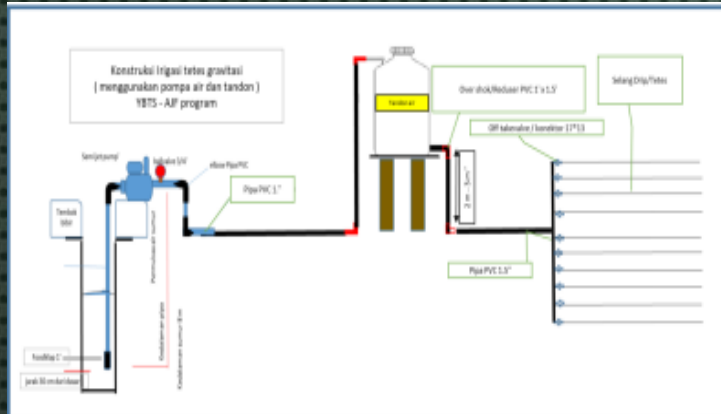
REUSE



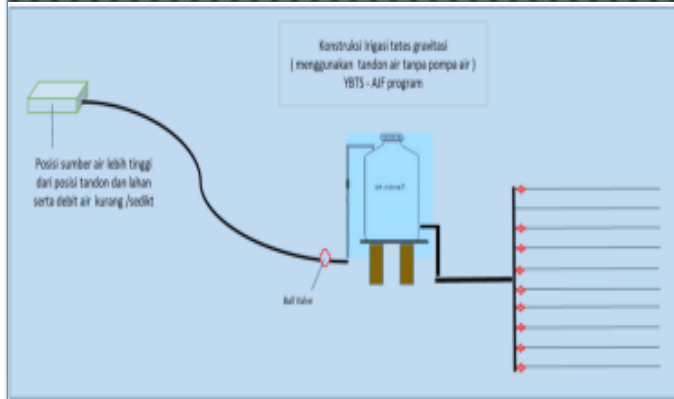
RETENTION

- (1) REFILL, THROUGH REPLENISHMENT OF WATER INTO THE GROUND AND CREATION OF TRENCHES , INFILTRATION HOLES ON SLOPES AND IN THE FIELD;
- (2) RETENTION, THROUGH AIR STORAGE FOR SUBSEQUENT UTILIZATION AND COLLECTING GROUNDWATER AND "RETAINING AIR" (WET BUFFER); AND
- (3) REUSE, THROUGH AIR UTILIZATION ACTIVITIES FOR VARIOUS PURPOSES, REUSE DOMESTIC WASTEWATER FOR YARD GARDENS AND AIR SOURCES DERIVED FROM NATURAL SPRINGS AT THE EDGE OF FORESTS & MAMAR (AGROFORESTRY) AND TAKEN FROM RESERVOIRS BUILT BY THE GOVERNMENT.

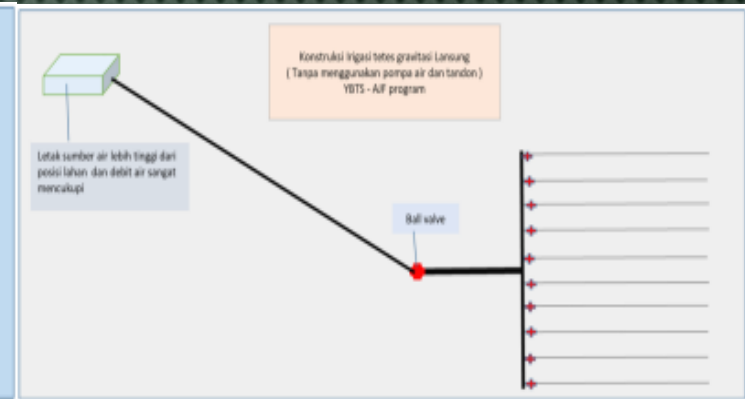
# IRRIGATION DESIGN



Using a pump well



Directly from the source using the reservoir



Secara langsung dari sumber tidak menggunakan Irigasi Designan tandon



Drip Irrigation Installation with simple & small-scale design

# PLANTING PATTERN

<i>Beberapa contoh kalender/rotasi tanam</i>												
Bulan	Okt	Nov	Des	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Aug	Sep
Petani A	Penyiapan lahan	Jagung				Melon			Kangkung + Petsai/Sawi		Bera	
Petani B	Penyiapan lahan	K. panjang+Ketimun			Tomat			Petsai/Sawi		Bera		
Petani C	Penyiapan lahan	Jagung				Paria				Bera		
Petani D	Penyiapan lahan	Kangkung/Bayam			Cabai / Terong			Kangkung/Sawi		Bera		

# EXECUTION OF VEGETABLE DISCRETION

- DEPLOYMENT GAP
- DIVERSIFYING CROPS
- PLANTING CALENDAR IMPLEMENTATION

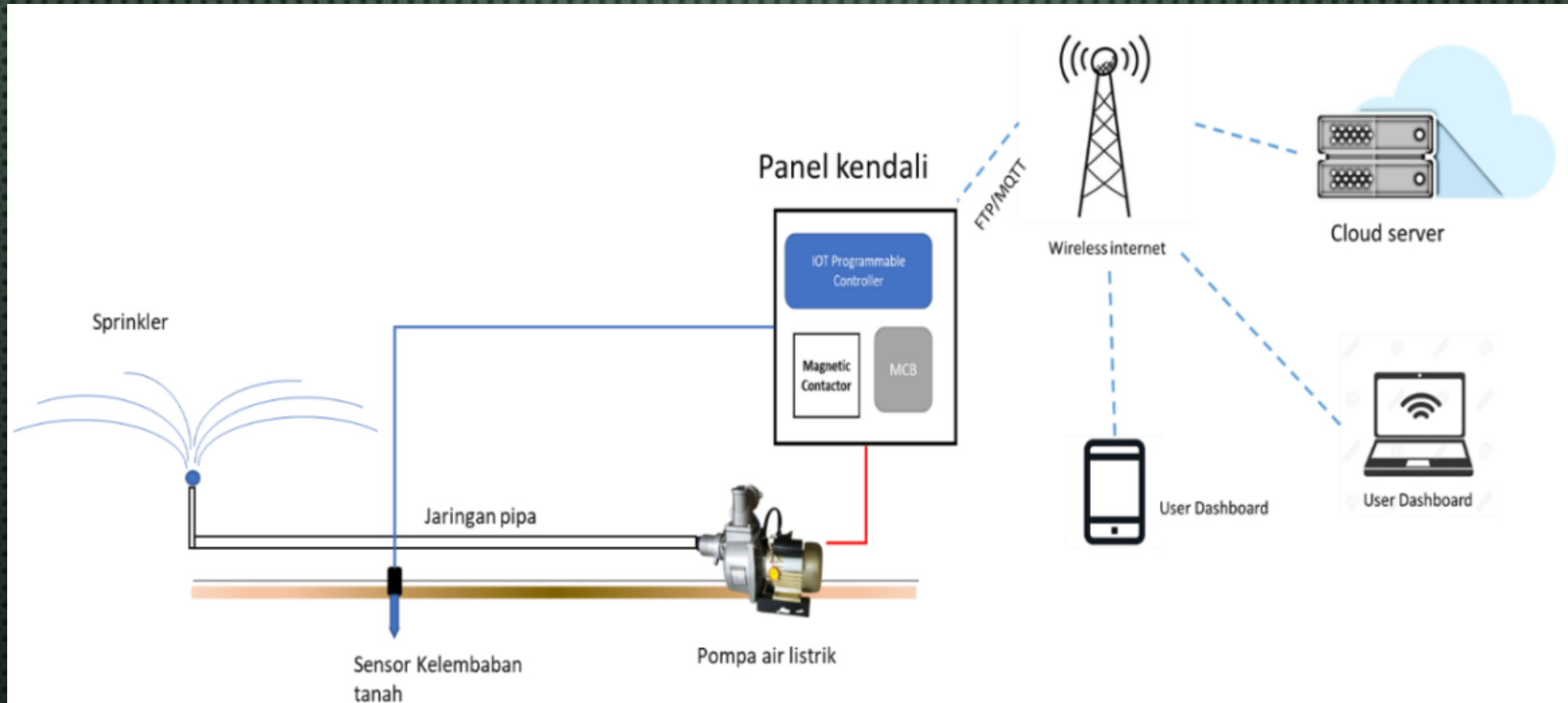
06

# Application of CSA using Precision Technology

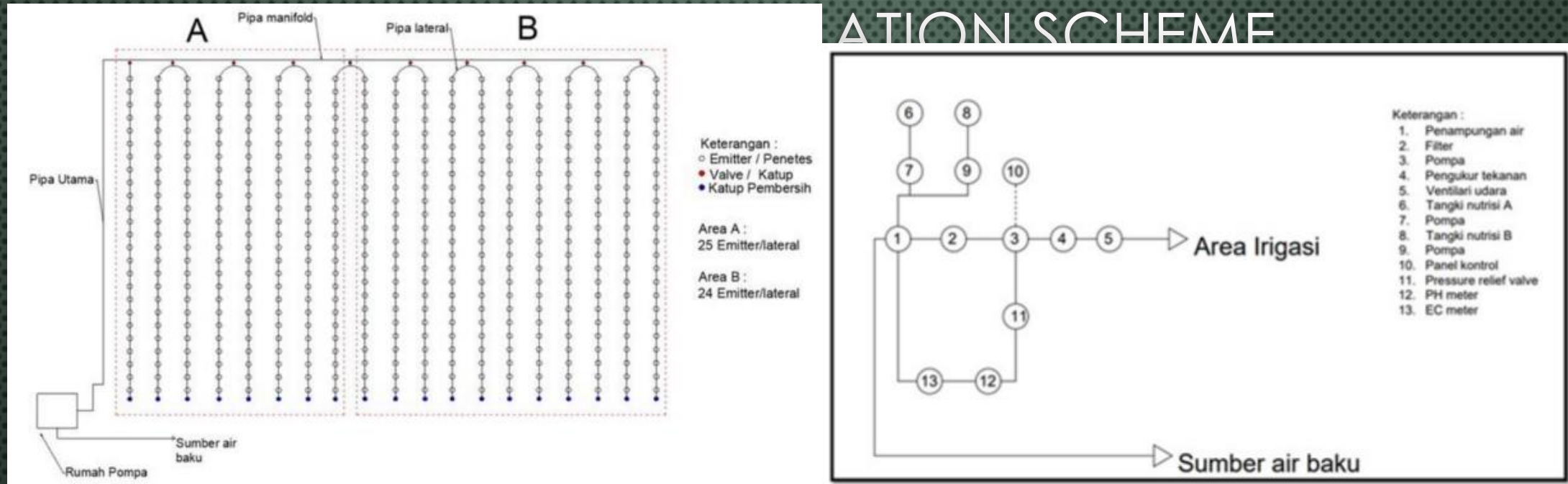
# PRECISION TECHNOLOGY

- IN CSA, IOT CAN BE USED TO MONITOR THE QUALITY OF AGRICULTURAL LAND, SUCH AS IN SIDOREJO VILLAGE.
- WHERE IN ITS USE, RURAL COMMUNITIES USE SOIL PH SENSORS THROUGH THE APPLICATION OF THE INTERNET OF THINGS (IOT).
- THIS IS DONE BECAUSE SMART AGRICULTURE CAN PLAY AN IMPORTANT ROLE IN AGRICULTURAL CULTIVATION, WHICH IS BASED ON RAININESS, FOR THE USE OF APPROPRIATE SPECIFICATIONS AND CONSIDERATIONS FOR PLANTING TIME.
- THE PROBLEM OF DROUGHT BECOMES THE MAIN TOPIC WHEN ENTERING THE DROUGHT IN NGANJUK REGENCY WHICH LEADS TO THE DIFFICULTY OF OBTAINING AND FINDING AIR, BOTH FOR CONSUMPTION AND IRRIGATION THIS SMART IRRIGATION APPLICATION IS CARRIED OUT AT P4S BUANA LESTARI, NGANJUK REGENCY, EAST JAVA MELON CULTIVATION WITH A HYDROPONIC SYSTEM

# SMART IRRIGATION SYSTEM WITH INTERNET OF THINGS FOR MICRO-IRRIGATION



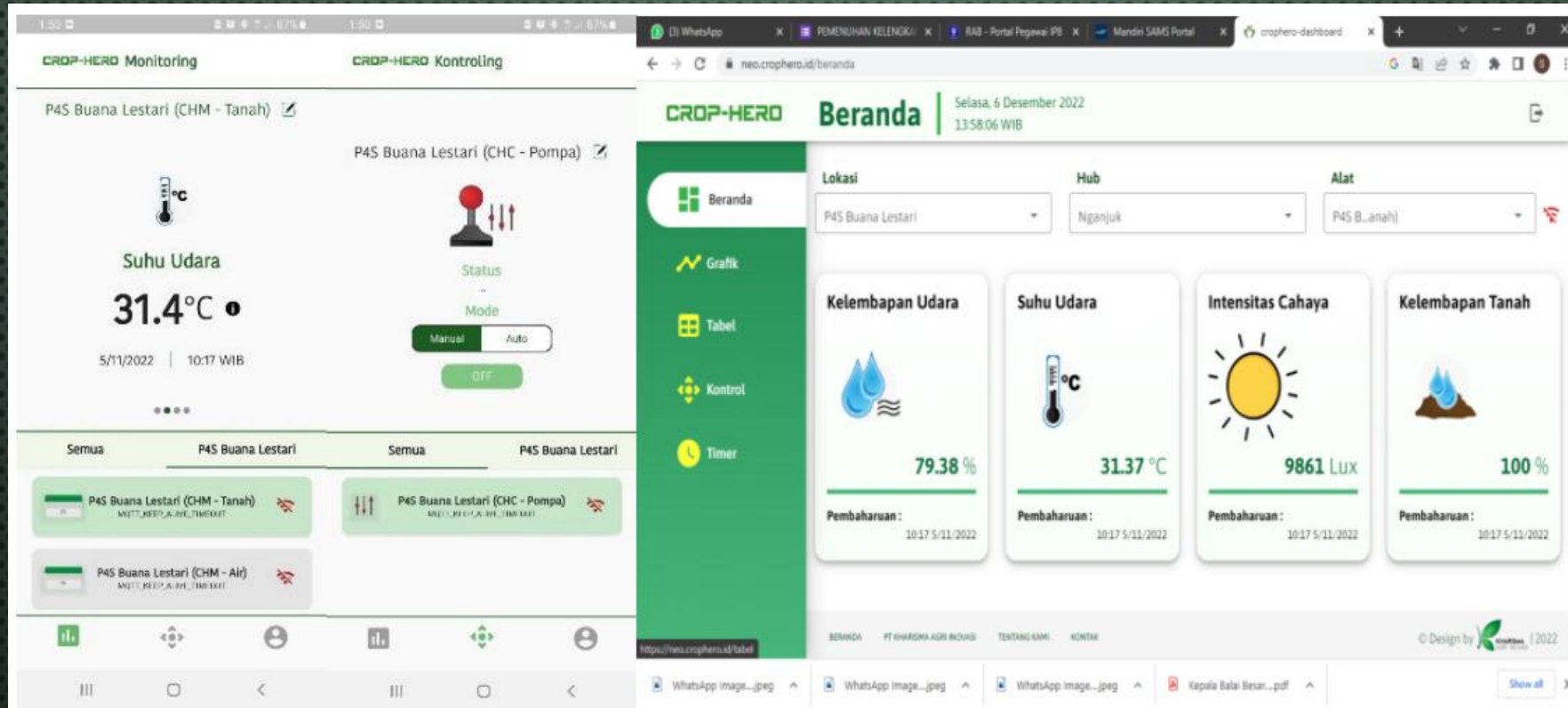
# DRIP IRRIGATION NETWORK SCHEME AND AUTOMATION SCHEME



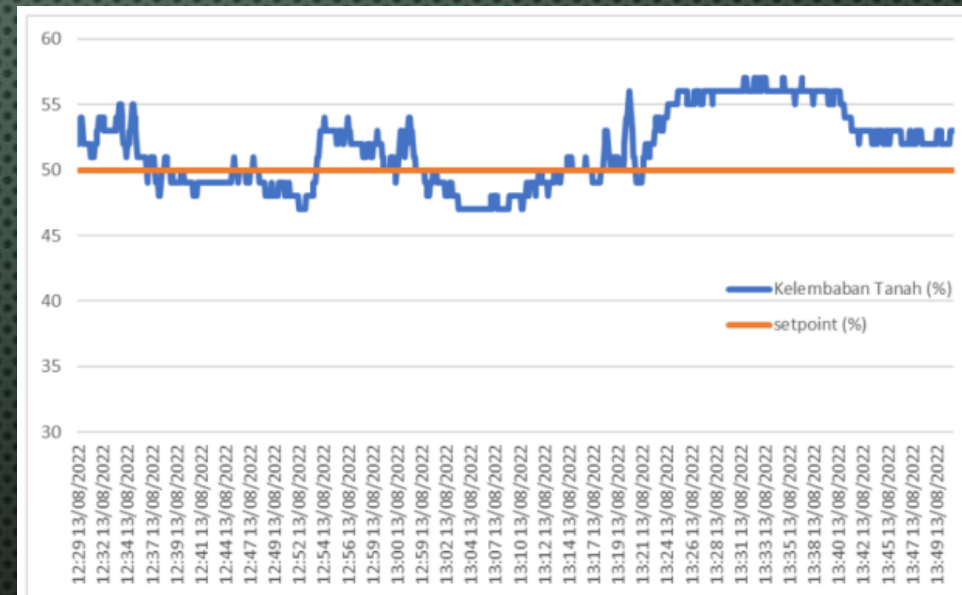
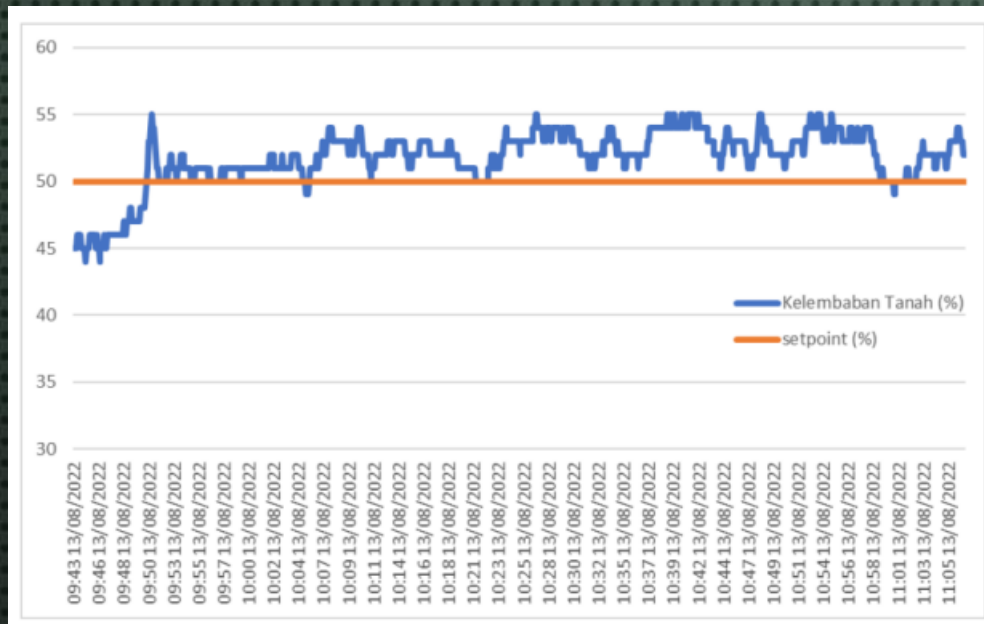
## Network Schema Installation Scheme

The provision of irrigation water and nutrients (fertigation) is regulated using an automation system with the MAD (management allowable depletion) value set at 25%. Through sensor settings and control systems installed, drip irrigation operations are carried out at one-day irrigation intervals with the amount of air and nutrients provided by 800 mL/ plant in the vegetative phase (25 days), 1,500 mL/ plant in the fruiting phase (30 days), and 2,000 mL/ plant in the Drip irrigation network scheme and pumping station installation scheme in the ripening phase (10 days).

# CROPHERO SYSTEM DISPLAY ON MOBILE APPS AND BROWSERS



# FLUCTUATIONS IN THE HUMIDITY OF THE SUBSTRATE IN THE MORNING AND DURING THE DAY



- DURING THE GROWTH PERIOD OF MELON PLANTS THERE HAS BEEN A SAVING OF AIR AND NUTRIENTS BY 6,500 ML / PLANT OR BY 7.64%. OR EQUIVALENT TO Rp183,00/ PLANT. IN THIS TRIAL, A SMART IRRIGATION SYSTEM WAS APPLIED TO ONE GREENHOUSE UNIT MEASURING 15M X 20M WITH A POPULATION OF 1,000 PLANTS, SO THAT THE TOTAL AIR AND NUTRIENT SAVINGS AMOUNTED TO 6,500 L OR EQUIVALENT TO Rp183,000.00 (ONE HUNDRED EIGHTY THREE THOUSAND RUPIAH). FOR ITS DEVELOPMENT, THIS ONE SMART IRRIGATION SYSTEM CAN STILL BE APPLIED TO THE SCALE OF THE GREEN HOUSE BUSINESS UP TO 10 TIMES.

# COMPARISON OF AGRIBUSINESS SYSTEMS FROM CSA MODELS

	Agriculture Using Local Wisdom	Agriculture without IoT	Agriculture using IoT
Land Information Conditions	Limited, through the senses, / the process is time-consuming, and not in real-time	Limited, through the senses, the process is time-consuming, and not in real-time	Using network sensors so as to get agricultural land environmental data quickly, real-time and accurately
Production model	Agricultural production in particular depends on people, livestock, machinery, production capacity on a large scale is still low	Agricultural production mainly depends on people, livestock, machines, production capacity on a large scale already exists	Sensor networks for collecting information are transmitted to data delivery centers, large-scale, management and control are carried out automatically

# COMPARISON OF AGRIBUSINESS SYSTEMS FROM CSA MODELS

	Agriculture Using Local Wisdom	Agriculture without IoT	Agriculture using IoT
Accuracy	Less	Less	Just
Equipment	Instructions	Requires electricity	Requires electricity and internet
SOP	Less	Exist	There are, more details
Engine Performance / Control	Instructions	Semi Automatic	Automatic
Planting Pattern	Exist	Exist	Exist
Human Resources	No need for HR who understands high technology	Requires an HR that understands technology	Requires an HR that understands high technology
Cost	Low	Medium	High
Advantage	Standard	More labor savvy	More labor and air efficient, preferably commodities that have high economic value

07

# CASE EXAMPLE

- FARMING IS CARRIED OUT ON AN AREA OF 400 M<sup>2</sup>. THIS IS DONE BASED ON THE TECHNOLOGY USED, WHERE THIS TECHNOLOGY IS USED FOR AN AREA OF 400M<sup>2</sup>. THE PRICE OF RED CHILI SEEDS IS IDR 360,000 PER PACKAGE. AS FOR FERTILIZER, THE TOTAL FERTILIZER USED IS Rp 900,000 PER PACKAGE. WHILE THE USE OF INSECTICIDES REACHES Rp325,000 PER PACKAGE. IN THE PRODUCTION PROCESS, WITH A LAND AREA OF 400 M<sup>2</sup>, THE AMOUNT OF LABOR USED IS 40 WORKING DAYS.
- WHILE AT THE BEGINNING OF THE ACTIVITY, THE MATERIAL NEEDED WAS MULCH AS MUCH AS 0.5 ROLLS AT A PRICE OF 1 ROLL OF IDR 500,000 PER PACK, THEN WHITING AS MUCH AS 95 KG AT A PRICE OF IDR 2,500, BORATE OF IDR 30,000 WITH A TOTAL OF 0.5 KG. USED, THEN STRAP 1 KG WITH A PRICE PER KG OF IDR 16,000. OTHER MATERIALS NEEDED ARE A 1.2 M LONG SIEVE WITH NUTRIENTS OF IDR 12,500 / M, BAMBOO STICKS AT A PRICE PER STALK OF IDR 15,000 AND 720 PIECES OF AJIR AT A PRICE OF IDR 450 PER STALK. THE COST OF RENTING LAND IS IDR 400,000 AND OTHER EQUIPMENT IS IDR 600,000.
- THE PERIOD OF CHILI PLANTS UNTIL THEY FINISH PRODUCING IS 6 MONTHS, SO IN 1 YEAR IT CAN BE PLANTED 2 TIMES. AFTER PRODUCTION, THE TOTAL PRODUCTION OF THIS CHILI PLANT IS 780 KG AT A PRICE OF Rp 18,000 / KG.

	Component	Spesification	Price (Rp)
A	Fixed Cost A (Investasi)		
	1 Reservoir and accessories		3,704,500
	1.1 water tank	water tank: capacity 2200 liter	3,700,000
	1.2 connectors complete system	set socket drat (inside) ¾ - ½ inchi	4,500
	2 Pump and accessories		2,345,000
	2.1 Water Pump	shimizu ps-230 bit.output (w): 200. input (kw): 0.55. suction power max (m): 9. total head max (m): 36. head (m): 10   29. capacity (liter/min): 28   11. suction pipe (inch): 1. pipe (inch): 1. weight (kg): 16,5	1,600,000
	2.2 Panel Pump	relay LY2 12V omron	45,000
	2.3 cable pomp accessories	set cable Pump accessories	700,000
	3 Mainline and Submain		1,465,000
	3.1 pipa pvc	pipa pvc 1 inchi AW	45,000
	3.2 Valve	ball valve 1 inchi	100,000
	3.3 disc filter	disc filter 1 <sup>2</sup> , filtration grade: 120 mesh, max pressure 8 bar, flow rate 6 m <sup>3</sup> /h	170,000
	3.4 water meter	water meter 1 <sup>2</sup>	750,000
	3.5 fittings complete system	set fittings complete system	200,000
	3.6 connectors complete system	set connectors complete system	200,000

	Component	Spesification	Price (Rp)
A	Fixed Cost A (Investasi)		
	4 Lateral and accessories		
	Sub total cost for Lateral with area 10,000 m <sup>2</sup>		80,901,639
	Sub total cost for Lateral with area 400 m <sup>2</sup>		3,236,066
4.1	Dripline	<u>Rivulis Selang Drip Tape T Tape 16 mm, 1830 m /roll</u>	1,836,066
4.2	Solenoid valve 1 inch		750,000
4.3	drip stick 5 mm	drip stick 5 mm	1,500
4.4	water meter	water meter ½ <sup>2</sup>	250,000
4.5	fittings complete system	set fittings complete system	200,000
4.6	connectors complete system	set connectors complete system	200,000
	5 Dosing system		2,900,000
5.1	ventury injector ¾-½ inchi	set ventury injector ¾-½ inchi	250,000
5.2	manifold system ventury	pipa ¾ inchi, filter mesh, check valve, injector hose	300,000
5.3	disc filter ¾ inchi	disc filter ¾ <sup>2</sup> , filtration grade 120 mesh, filtration area 90 cm <sup>2</sup> , max pressure 6 bar, flow rate 4 m <sup>3</sup> /h	100,000
5.4	mixing tank	Capacity: 1000 liter	2,000,000
5.5	nutrient tank	Capacity: 60 liter	250,000

	Component	Spesification	Price (Rp)
A	Fixed Cost A (Investasi)		
	6 Panel control panel and server		21,300,000
6.1	microcontroller	RTCX LX4 pro, wireless communication, internal flash drive 64 Mbyte, li-ion battery 2Ah (5 tahun)	10,000,000
6.2	soil moisture censor	censor RK520-02 (2 tahun)	5,000,000
6.3	solenoid valve	Brass solenoid valve 1/2" (2 tahun)	200,000
6.4	connectors complete kontrol system	set connectors complete control system	250,000
6.5	power supply, inverter, battery and charge controller	solar panel 150 WP, Inverter 12 V 300 watt Solar charge controller 20A and 10A	5,850,000
	Sub Total A		34,950,566
	Other Fixed Costs (Area: 400 m2)		
	Land rent		600,000
	Sub Total Other Fixed Costs		950,250
	Total Fixed Cost (Area: 400 m2 )		<b>35,900,816</b>
	Other Fixed Costs (Area: 1 Ha)		20,000,000
	Land rent		15.000,000
	Others		5,000,000
	Total Fixed Cost (Area: 1 Ha)		<b>132,616,139</b>

# COMPARISON OF BUSINESS ANALYSIS BETWEEN CONVENTIONAL AND MODERN (400 M2)

No	Item	Red Chilli	Tomato	Eggplant	Total (in a Year)
1	Revenue				
	IDR	9,360,000	3,745,000	1,507,500	14,612,500
	USD	603.87	241.61	97.26	942.74
2	Cost				
	IDR	5,474,480	4,192,000		9,666,480
	USD	353.19	270.45		623.64
3	Income				
	IDR	3,885,520		1,060,500	4,946,020
	USD	250.68		68.42	319.10
4	RCR	1.71		1.25	1.51

No	Criteria	Value	Result
1	NPV	(IDR 12,556,147)	Not feasible
2	IRR	-5.05%	Not feasible
3	NPV POSITIF	35,402,156	
4	NPV NEGATIF	41,789,049	
5	BCR	0.85	Not feasible
6	Payback Period		Not feasible

# COMPARISON OF BUSINESS ANALYSIS BETWEEN CONVENTIONAL AND MODERN (10,000 M2)

Investment costs for 10.000 m<sup>2</sup> for First Year

No	Component	Technology				Lifespan (Year)
		Modern		Conventional		
		Cost (IDR)	Percentage	Cost (IDR)	Percentage	
1	Reservoir and accessories	3,704,500	2.79%			10
2	Pompa and accessories	2,345,000	1.77%			5
3	Mainline and Submain	1,465,000	1.10%			10
4	Lateral and accessories	80,901,639	61.00%			2
5	Dosing system	2,900,000	2.19%			5
6	Panel Control and server	11,300,000	8.52%			2
7	Microcontroller	10,000,000	7.54%			5
8	Land rent	15,000,000	11.31%	15,000,000	60.00%	1
9	Others	5,000,000	3.77%	10,000,000	40.00%	3
	Total					
	IDR	132,616,139	100.00%	25,000,000	100.00%	
	USD	8,555.88		1,612.90		

Table 8. Income Analysis for 1<sup>st</sup> Year (1 Hektar)

No	Item	Modern	Conventional
1	Fix Cost		
	IDR	132,616,139	25,000,000
	USD	8,555.88	1,612.90
2	Operational Cost		
	IDR	194,437,000	241,662,000
	USD	12,544.32	15,591.10
3	Total Cost		
	IDR	327,053,139	266,662,000
	USD	21,100.20	17,204.00
4	Revenue		
	IDR	456,625,000	351,250,000
	USD	29,459.68	22,661.29
4	Income		
	IDR	129,571,861	84,588,000
	USD	8,359.47	5,457.29
5	RCR	1.40	1.32

08

# FUNDING SOURCES



- INVESTMENT FROM AGRICULTURE WITH DRIP IRRIGATION TECHNOLOGY MODELS HAS A VALUE THAT IS NOT SMALL, HIGHER THAN CONVENTIONAL.
- THEREFORE, THE ISSUE OF CAPITAL IS ONE OF THE MAIN PROBLEMS IN IMPLEMENTING THIS AGRICULTURAL MODEL
- THERE ARE SEVERAL FINANCING MODELS IN THE IMPLEMENTATION OF THIS PRECISION TECHNOLOGY MODEL.

# GOVERNMENT



THE GOVERNMENT HAS A VARIETY OF FINANCIAL INSTRUMENTS TO SUPPORT BUSINESSES. VIEWED FROM THE ASPECT OF FINANCIAL ADMINISTRATION, THERE ARE INSTRUMENTS:

A. THE RECIPIENT OF THE ASSISTANCE TASK FUND (TP) IS IN THE PROVINCE, IS THE HEAD OF THE OFFICE IN CHARGE OF AGRICULTURE AT THE PROVINCIAL LEVEL AND THE IMPLEMENTATION OF ACTIVITIES IN THE REGENCY / CITY IS THE HEAD OF THE OFFICE IN CHARGE OF AGRICULTURE IN THE DISTRICT / CITY. / CITY LEVEL IS RESPONSIBLE IN THEIR RESPECTIVE WORKING AREAS.

B. DECONCENTRATION FUND (DK) DOMICILED IN THE PROVINCE IS THE HEAD OF THE OFFICE IN CHARGE OF AGRICULTURE AT THE PROVINCIAL LEVEL AND IS RESPONSIBLE IN THEIR RESPECTIVE WORK AREAS

C. CENTRAL FUND IS AT THE DIRECTORATE GENERAL OF AGRICULTURAL INFRASTRUCTURE AND FACILITIES

# COMPANY



IN ADDITION TO THE GOVERNMENT, PRIVATE BUSINESSES ALSO HAVE AN OBLIGATION TO PROVIDE FINANCIAL ACCESS TO AGRICULTURAL TECHNOLOGISTS. INSTRUMENTS THAT CAN BE USED ARE: ENVIRONMENTAL SOCIAL RESPONSIBILITY (TJSL). LAW NUMBER 40 OF 2007, REQUIRES COMPANIES TO SET ASIDE PROFITS TO HELP COMMUNITY BUSINESSES. CURRENTLY, SEVERAL REGIONAL GOVERNMENTS (PEMDA) HAVE ISSUED REGIONAL REGULATIONS (PERDA) THAT CHALLENGE THE MANAGEMENT OF CSR CSR CSR MADANI INVESTMENT (PNM). PT PNM IS A GOVERNMENT-OWNED COMPANY THAT AIMS TO HELP THE BUSINESS WORLD. PT PNM NOT ONLY PROVIDES FINANCIAL ASSISTANCE, BUT PROVIDES ASSISTANCE TO ENTREPRENEURS, SO THAT THEIR BUSINESS ACTIVITIES CAN BE MORE ADVANCED. NETAFIRM AND HABIBIE GARDEN PARTNERSHIP

# FINANCIAL TECHNOLOGY INNOVATION

FINANCIAL TECHNOLOGY (FINTECH) ITSELF IS DEVELOPING DUE TO THE DEMANDS OF CHANGING PEOPLE'S LIFESTYLES WHICH ARE DOMINATED BY TECHNOLOGY-BASED USE. WITH THE PRESENCE OF FINTECH, PROBLEMS FACED BY THE COMMUNITY SUCH AS BUYING AND SELLING TRANSACTIONS, NOT HAVING TIME TO GO TO BANKS / ATMS FOR FUND TRANSFERS, AND OTHERS CAN BE MINIMIZED.

THE TYPES OF FINTECH IN INDONESIA ARE:

1. PEER TO PEER LENDING SERVICE. THIS TYPE PROVIDES LOAN FUNDS FOR BUSINESS CAPITAL OR FULFILLING NEEDS. FINTECH IS USUALLY USED TO HELP BUSINESS PEOPLE OBTAIN CAPITAL QUICKLY.
2. ELECTRONIC WALLETS. THE MOST COMMON FINTECH TODAY IS A DIGITAL WALLET THAT PLAYS A ROLE IN PROVIDING ELECTRONIC MONEY STORAGE FOR ITS USERS. THE GOAL IS TO MAKE IT EASIER FOR USERS TO DISBURSE FUNDS FOR TRANSACTIONS IN MARKETPLACES, MERCHANT APPLICATIONS, AND THE LIKE. EXAMPLES SUCH AS DANA, OVO.
3. FUNDRAISING. THIS TYPE OF FINTECH BRINGS TOGETHER PARTIES WHO NEED FUNDS AND DONORS WITH A GUARANTEE OF SAFE AND EASY TRANSACTIONS. CROWDFUNDING IS NOT ONLY USED TO COLLECT DONATIONS / DONATIONS, BUT CAN ALSO FIND INVESTORS AND BUSINESS PEOPLE SOCIAL, SAFE, AND PROFITABLE AGRICULTURAL FUNDING (IGROW.ASIA), CROWDE - P2P LENDING PLATFORM FOR FARMER CAPITAL

# FINANCIAL TECHNOLOGY INNOVATION

4. PAYMENT GATEWAY. A PAYMENT GATEWAY IS A FINTECH SYSTEM THAT AUTHORIZES PAYMENTS THROUGH ONLINE TRANSACTIONS. AN EXAMPLE IS PAYPAL
5. INVESTMENT. IN ADDITION TO DIGITAL WALLETS, THERE ARE ALSO INVESTMENT INSTRUMENTS THAT MIGRATE THROUGH ONLINE APPLICATIONS SO THAT INVESTORS CAN EASILY INVEST THEIR CAPITAL, DUE TO THE RAPID CHANGES IN THE ERA IN THE FIELD OF TECHNOLOGY. AN EXAMPLE IS SEEDLING, MIRACULOUS.
6. DIGITAL BANKS. THE LAST AND RISING TYPE OF FINTECH LATELY IS A DIGITAL BANK, WHICH IS A BANK WHOSE TRANSACTIONS ARE 100% CARRIED OUT DIGITALLY, FROM ACCOUNT REGISTRATION TO ASSET MANAGEMENT. AN EXAMPLE IS THE ALLO BANK

# NON-GOVERNMENTAL ORGANIZATIONS



1. IFAD (INTERNATIONAL FUND FOR AGRIBUSINESS DEVELOPMENT). IFAD IS AN INTERNATIONAL FINANCIAL INSTITUTION AND SPECIALIZED AGENCY OF THE UNITED NATIONS BASED IN ROME, THE FOOD AND AGRICULTURE CENTER OF THE UNITED NATIONS. SINCE 1978, THEY HAVE PROVIDED GRANTS AND LOW-INTEREST LOANS TOTALING \$23.2 BILLION. IFAD INVESTS IN RURAL COMMUNITIES, TO IMPROVE FOOD SECURITY, IMPROVE FAMILY NUTRITION, AND INCREASE INCOMES. THEY. IFAD HELPS COMMUNITIES BUILD RESILIENCE, DEVELOP BUSINESSES, AND CONTROL THEIR OWN DEVELOPMENT.
2. RIKOLTO. RIKOLTO IN INDONESIA BEGAN IN FLORES AROUND 1960 UNDER THE NAME FLORES COMMITTEE FOUNDED BY A BELGIAN MISSIONARY, FATHER RENE DAEM. THEN IN 1973, FATHER RENE DAEM CHANGED IT TO "VERENIGING ZONDER WINSTOOGMERK" OR VZW WHICH IS EQUIVALENT TO FOUNDATION. RIKOLTO INDONESIA OPERATES IN 25 REGENCIES AND 4 CITIES IN 8 PROVINCES IN INDONESIA (JAMBI, WEST JAVA, CENTRAL JAVA, EAST JAVA, BALI, WEST SULAWESI, SOUTH SULAWESI, EAST NUSA TENGGARA). RIKOLTO IS CURRENTLY FOCUSED ON ACHIEVING SUSTAINABLE SOURCES OF COFFEE, COCOA, RICE, AND CINNAMON WHERE THE PRIVATE SECTOR INVOLVES SMALLHOLDERS IN JAVA, SULAWESI, FLORES, AND SUMATRA IN THE AGRICULTURAL VALUE CHAIN. SUSTAINABLE RICE PRODUCTION WITH GOOD QUALITY PROVIDES BENEFITS FOR SMALLHOLDERS AND CONSUMERS
3. ALLIANCE OF INDONESIAN ORGANIZATIONS (AOI). AOI AIMS TO STRENGTHEN AND ADVANCE THE ORGANIC AGRICULTURE AND FAIR TRADE MOVEMENT IN INDONESIA. ESPECIALLY IN EMPOWERING SMALLHOLDERS THROUGH STRENGTHENING INSTITUTIONAL CAPACITY AND PRODUCTION QUALITY MANAGEMENT TO BE ABLE TO ACCESS BETTER MARKETS. WITH THIS SUPPORT, SMALLHOLDERS WILL BE MORE SOVEREIGN AND ABLE TO HAVE BETTER LIVELIHOODS. THE INDONESIAN ORGANIC ALLIANCE HAS 122 MEMBERS SPREAD ACROSS VARIOUS REGIONS IN INDONESIA AND PARTNERS WITH VARIOUS INSTITUTIONS IN INDONESIA
4. ENVIRONMENTAL FUNDS, SUCH AS THE GCF (GLOBAL CLIMATE FUND)

# CONCLUSION

- IN THE CSA CONCEPT, THERE ARE VARIOUS TECHNOLOGIES THAT CAN BE USED IN DOING AGRIBUSINESS TO REDUCE THE IMPACT OF CLIMATE CHANGE THERE ARE VARIOUS KINDS, FOR EXAMPLE PRECISION TECHNOLOGY, SEMI-AUTOMATIC AND USING LOCAL WISDOM.
- WHEN VIEWED FROM THE COMPARISON OF EXISTING TECHNOLOGIES, THE USE OF PRECISION TECHNOLOGY GETS THE MOST ACCURATE RESULTS COMPARED TO OTHERS, BUT HAS A HIGH INVESTMENT COST.





**UN Climate Technology Centre & Network**  
**UNFCCC Technology Mechanism**

**Thank You**  
**Terima Kasih**

CTCN Technical Assistance on Identification of  
Technical Practices for Climate-Smart  
Agriculture (CSA) in Indonesia, 2023 - 2024

**UN**  
environment  
programme



**UNEP-DHI CENTRE**



GROW MORE  
WITH LESS™



# GROW MORE WITH LESS™

**Alghienka Defaosandi**  
**Commercial Manager Indonesia**



**Netafim is a global  
precision agriculture leader  
and today we are the world's largest  
irrigation company.**

# Advancing Life Around The World

**100+ Countries**

Commercial footprint



**18** R&D facilities



**137**  
Factories

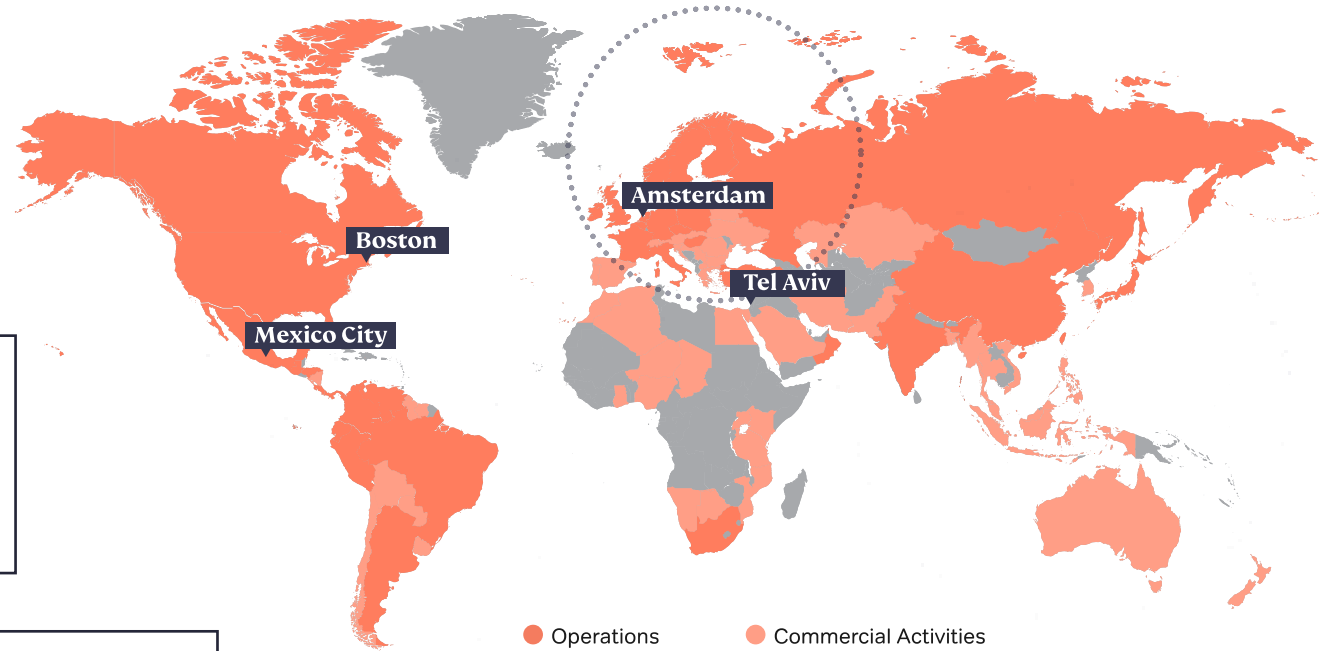


**22,350**  
Employees

## 5 Business Groups

**V** vestolit   alphagary   **WAVIN**   **NETAFIM**™   **dura-line**   **koura**

Polymer, Building and Infrastructure, Precision Agriculture, Connectivity and Fluorinated Solutions



● Operations   ● Commercial Activities  
⊙ 2021 Revenues   ■ Four Global Strategic Headquarters

# Our Portfolio Offer



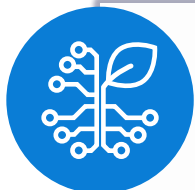
Services



Precision irrigation & fertigation products and solutions



Agro knowledge



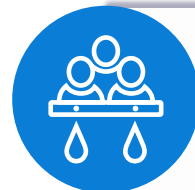
**Digital farming**



Greenhouse projects



Agriculture projects



Community agriculture



Positive environmental impact

/ Precision irrigation  
is a game-changer for farmers.  
Helping them  
**Grow more with Less™**



CROP  
QUALITY

CROP YIELD

FLEXIBILITY

SUSTAINABLE +  
PREDICTABLE

WATER  
FERTILIZERS  
RESOURCES  
(LABOR, ENERGY)  
ENVIRONMENTAL  
FOOTPRINT



# / In a dynamic environment, growers still face many challenges in achieving the optimal irrigation results



“Am I over or under fertigating?”



“How can I avoid under or over irrigating?”



“How can I avoid crop damage caused by failed valve opening?”



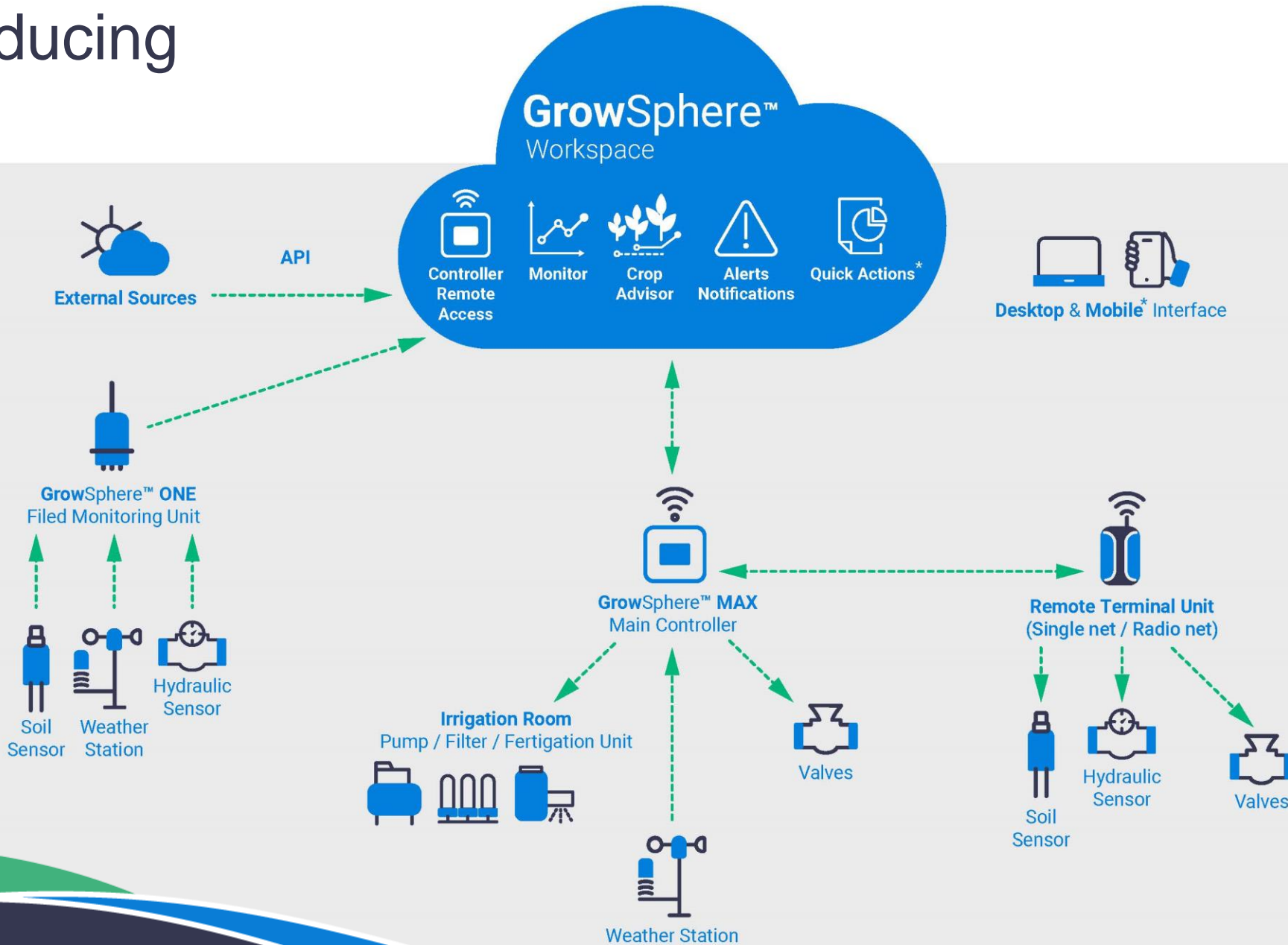
“Am I using too much energy/too much water pressure?”



“How do I know what’s actually happening in the field – without sending someone to check?”



# /Introducing



/ **GrowSphere™** uniquely integrates 3 core **spheres** in one platform:

Delivering **optimal irrigation/fertigation outcomes** by joining the dots between what your crop, irrigation system and agribusiness needs.



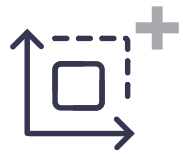




# / GrowSphere™ makes your agribusiness more productive and profitable



## MORE VALUE PER HECTARE



- Higher yields
- Higher crop quality
- Prevent crop damage from under/over irrigation

## PEACE OF MIND



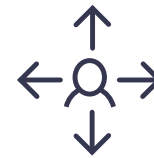
- Visibility of true irrigation status
- Awareness of system health
- Data-driven decision-making
- Traceability & Sustainability

## OPTIMIZE RESOURCE USAGE



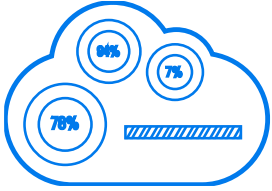
- Energy
- Water
- Fertilizers
- Labor

## SIMPLIFY OPERATIONS



- System transparency
- Automation
- Intuitive, farmer-friendly interface
- Offline or remote control
- Modular – grow as you go.

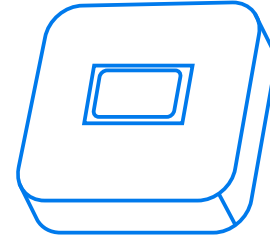
# / GrowSphere™ Component Overview



✓ Cloud-based Software



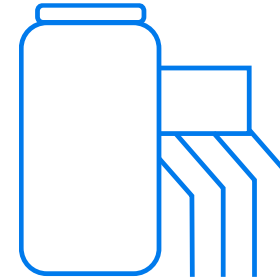
✓ Crop Advisor Model



✓ Main Controller



✓ Sensors



✓ Dosing Systems

# / GrowSphere™ Hardware Family



## IoT Family



### ONE

- 2 sensors
- Rain sensor
- Water Meter



### ECO ACT

- ✓ 6 valves
- ✓ 4 sensors



### FLEX 16

- ✓ 16 valves
- ✓ 4 sensors



### ECO RTU

- ✓ 6 valves
- ✓ 4 sensors



### NetRTU\*

- ✓ 16 valves
- ✓ 5 sensors



### RadioNet

- ✓ 9 valves
- ✓ 10 sensors



## Control Family

RTU – Remote Terminal Unit acting as “slaves” of the main controller



Main controller – MAX

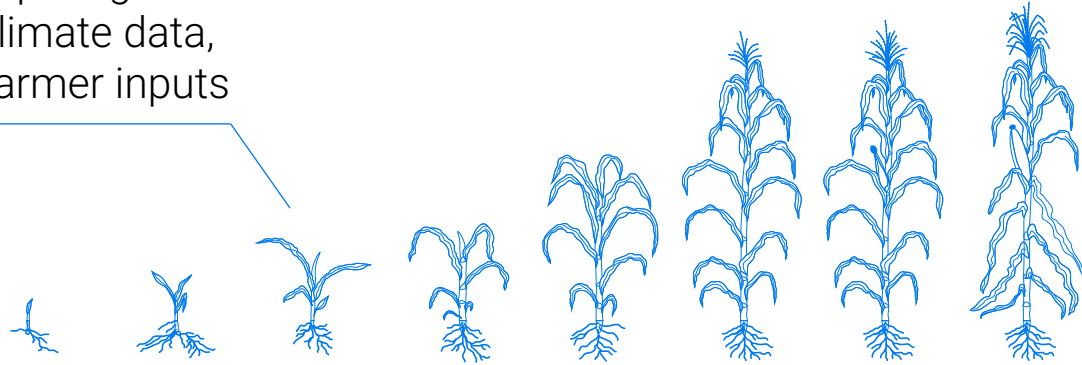
- ✓ 256 valves
- ✓ 104 sensors

Backward compatibility

# / Crop Advisor Features



Follows the crop stage according to climate data, sensors, and farmer inputs



Gives clear recommendations for irrigation and fertigation

Configurable models that allow machine learning

# / Crop Advisor Models > 30 Crops



## Orchards



Almonds



Avocado



Peach



Apple



Citrus



Wine grapes



Table grapes



Pomegranate



Coffee



Hazelnut



Olive oil



Blueberry



Kiwi

And more...

## Open field



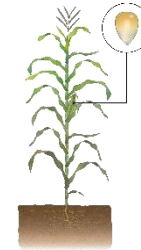
Cotton



Onion



Rice



Corn



Romaine Lettuce



Sugarcane



Potato



Tomato

And more...

# / Sensors Group



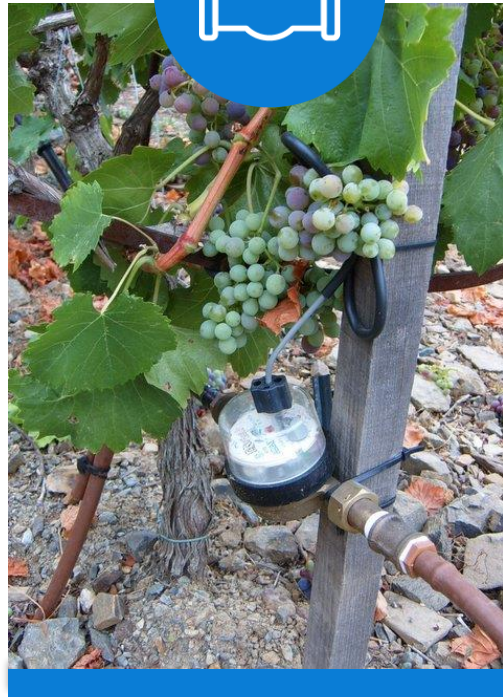
Soil Moisture



Plant



Environmental



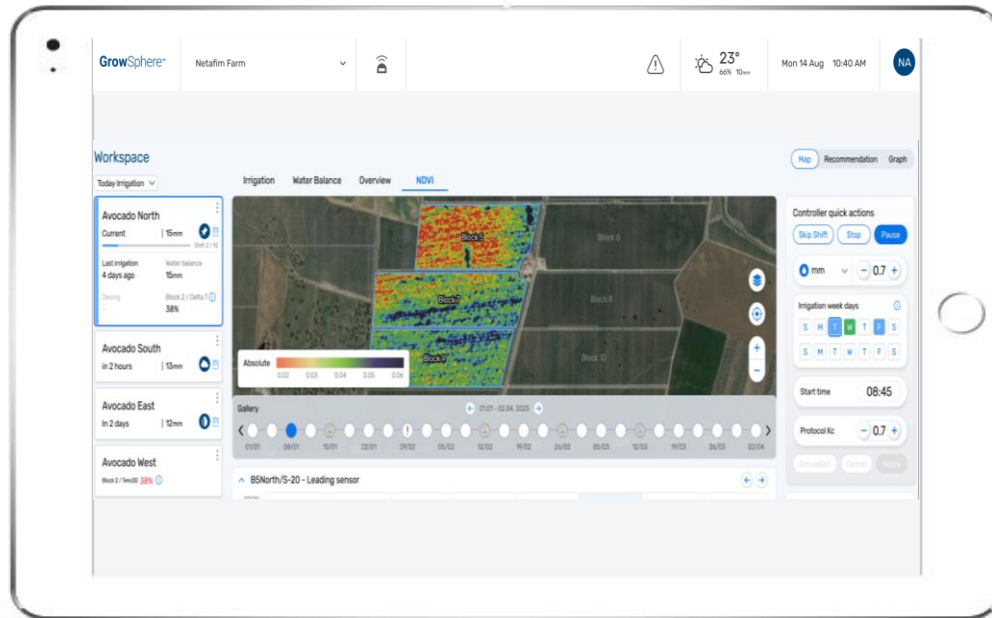
Hydraulic

# / GrowSphere™ lets you see the big picture

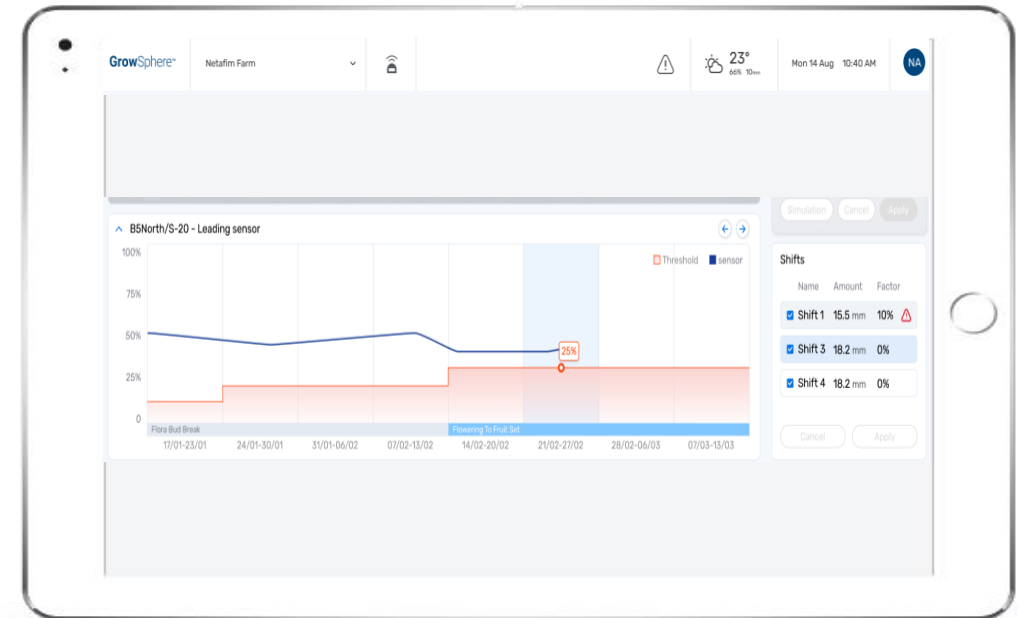
by combining remote sensing and ground sensing to enable optimal irrigation and fertigation management



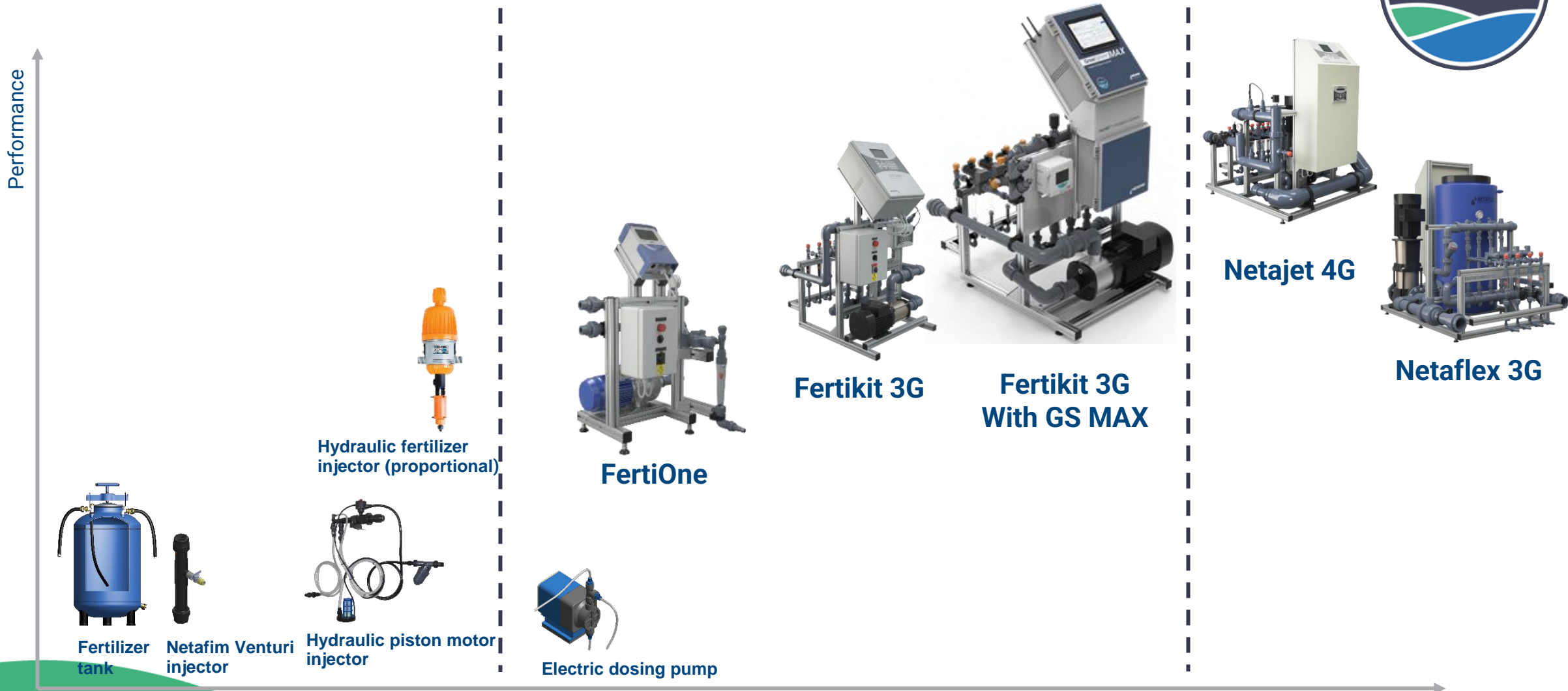
**Remote sensors**  
Spatial view



**Ground sensors**  
Specific measurement points



# Dosing Product Portfolio Positioning



Open field crops, Orchards & Net Houses

Green house Soil & Soilless segments



Sales.Indonesia@Netafim.com



Netafim Indonesia



www.netafim.co.id



Customer Service:0811-1032-2442

**Thank You**



# Penerapan Climate Smart Agriculture (CSA) di Indonesia

by Ashif Hujjatul Islami

Contact:

+62 815 4804 8722 / [ashif@mertani.co.id](mailto:ashif@mertani.co.id)



MERTANI

# BUSINESS MATCHING & BELANJA PRODUK BER-TKDN/ DALAM NEGERI (P3DN)



Pak Dirjen: Eko S.A. Cahyanto, SH, LL.M



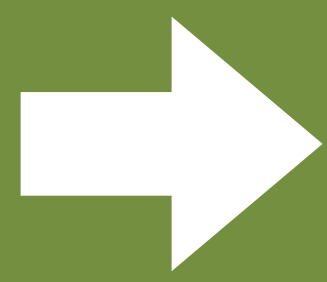
Pak Menteri Perindustrian:  
Dr. Agus Gumiwang Kartasasmita



Sertifikat TKDN Mertani



# Background



Climate Change

Agriculture Condition

## The Risk

- Uncertainty
- Crop failure
- Natural disaster such drought and flood
- etc

A hand holding a black remote control with several buttons, including a red one and a green one, against a bright blue sky with scattered white clouds. The hand is positioned on the left side of the frame, pointing the remote towards the right.

**Generally,  
We Cannot Control the  
Weather or Climate**



# The Essence of Climate Smart Agriculture (CSA)

## To Adapt!

Previously manual



\*Human error risk, time and labor, space limitation, delay in action



# CSA Implementation



## Realtime Monitoring

Microclimate data collection,  
water availability, operational  
decision efficiency



## Early Warning

Avoid sunburn, drought,  
pest & disease outbreak



## Forecasting

Production, yearly  
evaluation, planning  
adjustment

## Study Case

# Rice Farmer Group + Agriculture Extension + BUMN

- Realtime monitoring
- Climate change adaptation
- Cultivation adjustment

 Prambanan, Yogyakarta

 Automatic Weather Station (AWS)



## Study Case

# PT Perkebunan Nusantara XII (Sugar)

- Realtime monitoring
- Climate change adaptation
- Cultivation adjustment

 East Java

 Automatic Weather Station (AWS)



## Study Case

# Research Company (Cacao)

- Realtime data collection
- Pest & disease control
- Operational adjustment

 Prambanan, DI Yogyakarta

 Automatic Weather Station (AWS)



## Study Case

# Wilmar Group (Palm Oil Plantation)

- Realtime monitoring
- Water management
- Production forecasting
- Operational adjustment
- Comply with government regulation (KLHK)

 Prambanan, DI Yogyakarta

 Automatic Water Level Recorder (AWLR)



## Study Case

# Kementerian Lingkungan Hidup & Kehutanan (Peatland Conservation)

- Land monitoring
- Water conservation
- Avoid forest fire

 Riau, Central Kalimantan, West Kalimantan (15 devices)

 Alat Pemantau Tinggi Muka Air (APTMA)



## Study Case

# Kementerian Pekerjaan Umum dan Perumahan Rakyat

- Irrigation & drainage
- Flood Early Warning System (FEWS)
- Onlimo
- Water Quality Monitoring System (WQMS)

 Central Java, East Java South Sulawesi  
(>30 devices)

 Automatic Water Level Recorder (AWLR),  
Water Quality Monitoring System -  
Onlimo, CCTV

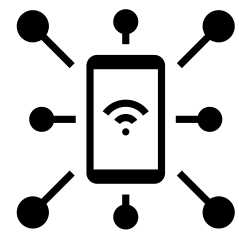


“Bukan tentang seberapa canggih, namun seberapa jauh kebermanfaatan yang dihasilkan”

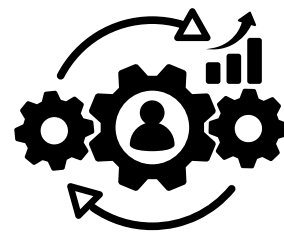


# INTRODUCING MERTANI

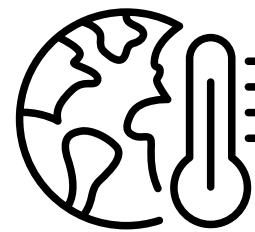
“ Berkolaborasi dengan pemerintah dan industri, kami mengambil peran dalam perkembangan zaman dengan tetap menjaga keseimbangan antara kemajuan teknologi dan kelestarian lingkungan. ”



Connected Device for  
real-time data



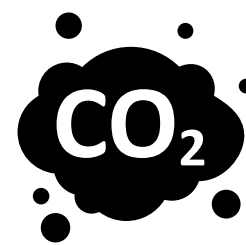
Operational Efficiency



Resilience to Climate  
Change



Water Conservation



Air Quality  
Monitoring



Support both Industry and  
Ecosystem



# Our Achievement

**3000+**

Sensors have been used for industrial needs

**350+**

Devices have been applied in Indonesia

**50+**

Companies and institutional users like you are happier



# Get Your Better Support System

*After Sales Support*  
di Indonesia

Garansi & Ketersediaan  
Suku Cadang

Produk ber-TKDN  
> 40%





[mertani.co.id](https://mertani.co.id)



[mertani\\_indonesia](https://www.instagram.com/mertani_indonesia)



[Mertani Official](https://www.youtube.com/MertaniOfficial)



+62 813-2603-3325

+62 858-8080-7990





# PT Meteo Nusantara Instrumen

- Berdiri pada tahun 2013
- Berlokasi di Bogor
- Bergerak dibidang: Instrumentasi Meteorologi/Klimatologi, Agroklimatologi, Sumber Daya Air, kualitas udara, kualitas air

Weather Station	SPAS
Rain Recorder	Iklim mikro
Water level	dll
Monitoring Debit	
Kualitas Udara	
Kualitas Air	

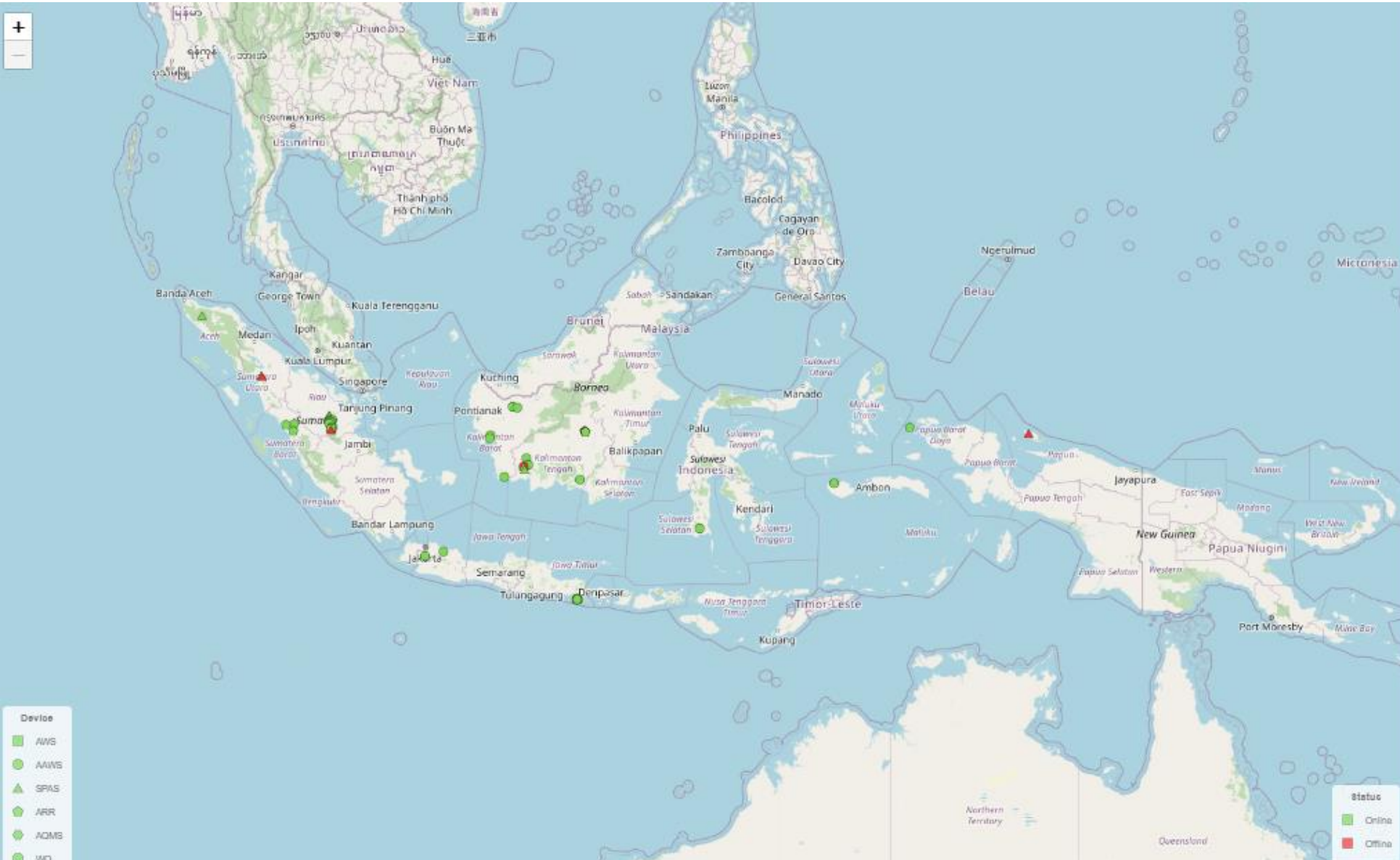
- MNI dapat menawarkan solusi custom system pengukuran pada kasus / kondisi tertentu
- MNI menjadi distributor merk METER Group, Ecowitt, Solinst dan Logic IO
- Website : [www.meteonusantara.com](http://www.meteonusantara.com)
- Server 1: [www.dataonline.co.id](http://www.dataonline.co.id) (AWS, Agroklimat, Monitoring Debit)
- Server 2: [www.kendali-irigasi.com](http://www.kendali-irigasi.com) (irigasi)

# Distributor dan Penyedia

- METER (Environment)
- Logic IO (RTCU)
- Solinst (Water Level)
- SENTEK (Soil Instrument)
- Ecowitt (Weather Station)
- DAVIS (Agricultural Automatic Weather Station)
- Campbell Scientific (Datalogger dan environment sensor)
- Onset HOBO (Water Level)
- Delta T (Soil Instrument)
- RIKA (Environment Sensor)
- WNK (Water Level Sensor)

# Telemetry System

- Monitoring  
[dataonline.co.id](http://dataonline.co.id)
  
- Control  
[kendali-irigasi.com](http://kendali-irigasi.com)



## Login

Monitoring tools for weather, agroclimate, rain, air quality

Remember Me

Created With [Meteo Nusantara Instrumen](#)

## DATAONLINE

### DASHBOARD

Dashboard

### USER

My Profile

### MANAGEMENT

Users >

Devices >

### DATA

Dashboard

Tables

Charts

## AAWS E-Asia 1

Latest Data : 2024-03-04 14:10:00

Temperature  
25.39 °C



Humidity  
92 %



Solar Radiation  
46 W/m<sup>2</sup>



Rainfall  
21.8 mm



Air Pressure  
1006.77 mb



Wind Speed  
2 m/s



Wind Direction  
326 °



ET  
2.74 mm



Sunshine  
5.85 h/d



Index UV  
0 index



DASHBOARD

Dashboard

USER

My Profile

MANAGEMENT

Users >

Devices >

DATA

Dashboard

Tables

Charts

### Table

02/04/2024 - 03/04/2024

Excel Print Copy

Search:

Time	Date	Temperature (°C)	Humidity (%)	Solar Radiation (W/m²)	Rainfall (mm)	Air Pressure (mb)	Wind Speed (m/s)	Wind Direction (°)	ET (mm)	Sunshine (h/d)	Index UV (index)
14:10	03/04/2024	25.39	92	46	21.8	1006.77	2	326	2.74	5.85	0
14:00	03/04/2024	25.28	92	30	19.4	1006.81	0	254	2.74	5.85	0
13:50	03/04/2024	25.78	92	18	13.8	1007.08	5	243	2.72	5.85	0
13:40	03/04/2024	25.78	90	12	5.8	1007.01	6	231	2.72	5.85	0
13:30	03/04/2024	27.67	83	5	0.2	1006.64	17	237	2.72	5.85	0
13:20	03/04/2024	30.17	75	7	0	1006.94	1	156	2.72	5.85	0
13:10	03/04/2024	32.61	74	74	0	1006.74	0	256	2.72	5.85	0.8
13:00	03/04/2024	33.17	74	459	0	1006.67	3	325	2.72	5.85	4.4
12:50	03/04/2024	33.17	70	1027	0	1006.98	1	33	2.18	5.68	10.3
12:40	03/04/2024	32.78	71	840	0	1007.21	2	43	2.18	5.51	8.5

Showing 1 to 10 of 100 entries

Previous **1** 2 3 4 5 ... 10 Next



## AAWS E-Asia 1

Charts

### Temperature



### Humidity



## Monitoring & Kendali Irigasi

 Remember Me

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[Login Sebagai Pengunjung ?](#)

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[www.meteonusantara.com](http://www.meteonusantara.com)

USER

- My Profile
- Edit Profile

---

AUTOIRIGASI

- Dashboard
- Kontrol**
- Tabel

---

Logout

<

## Device

Interval

Koefisien Kontraksi (Cc)

Lebar Pintu (cm)

Tinggi Pintu (cm)

Elevasi Dasar Pintu (msl)

Save

Status Pintu :

...

Bukaan Pintu:

...

WL Hulu :

...

WL Hilir :

...

Waktu :

Status :

Connecting....

Reload

## Select Mode

Mode :

Choose one ...



# Pintu Otomatis Irigasi

Cloud



GSM 2G/3G/LTE

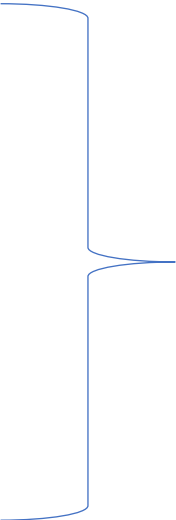


Remote

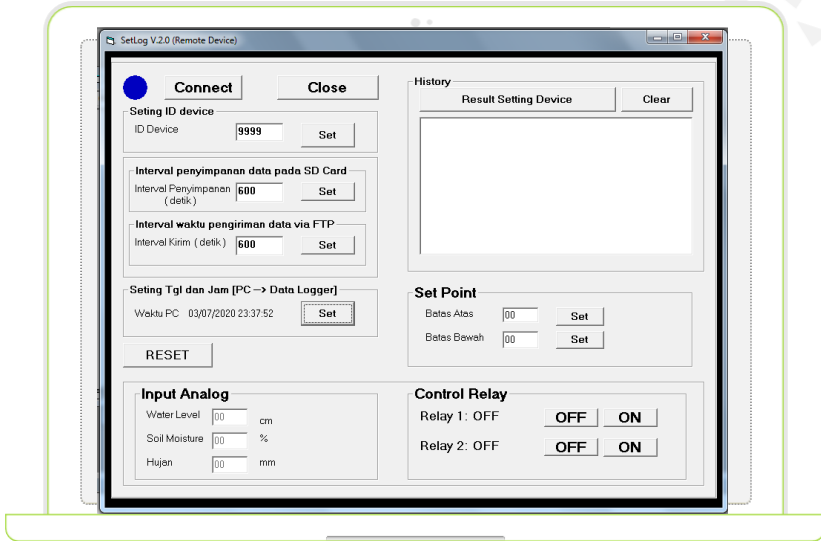


GSM 2G/LTE  
Local LAN/WIFI

Sensor

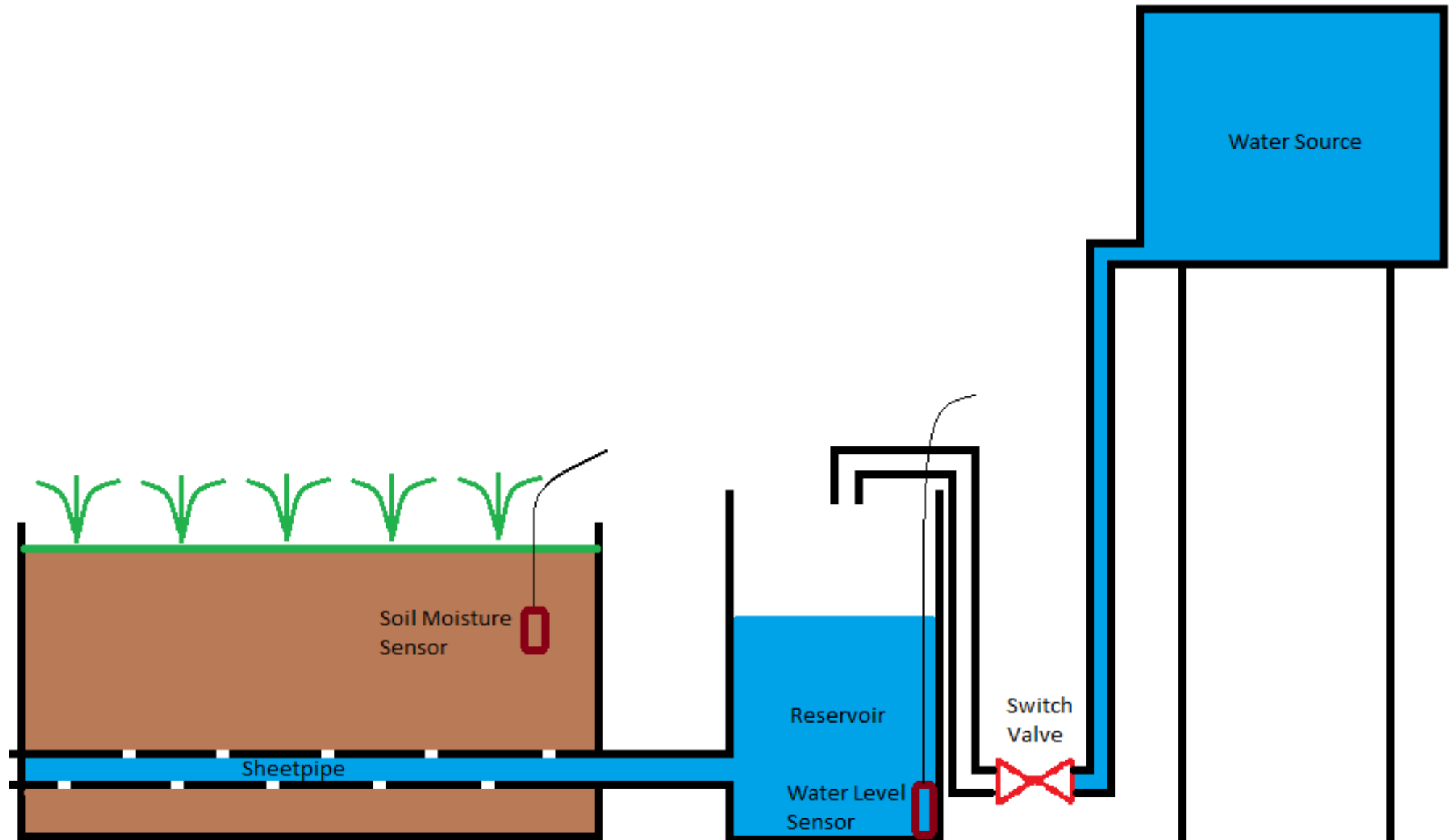


Pintu Irigasi





# Illustration



# Monitoring Irigasi

<http://kendali-irigasi.com>

KENDALI IRIGASI

USER

- My Profile
- Edit Profile

IRIGASI

- Dashboard
- Tabel**
- Kontrol
- Charts

Logout

Kendali Irigasi IPB 

Tabel

Filter

2021-09-27 - 2021-10-03 [Filter](#)

Tabel

[Excel](#)

Search:

No	Tanggal	Jam	Soil Moisture (%)	Batas Atas SM (%)	Batas Bawah SM (%)	Valve SM (On/Off)	Water Level (cm)	Batas Atas WL (cm)	Batas Bawah WL (cm)	Valve WL (On/Off)	Catu Daya (V)
971	2021-09-27	12:11:36	74	0	-1	Off	404	300	290	Off	12.9
972	2021-09-27	12:10:28	74	0	-1	Off	404	300	290	Off	12.8
973	2021-09-27	12:09:17	74	0	-1	Off	404	300	290	Off	12.8
974	2021-09-27	12:08:06	74	0	-1	Off	404	300	290	Off	12.8
975	2021-09-27	12:06:55	74	0	-1	Off	404	300	290	Off	12.8
976	2021-09-27	12:05:45	74	0	-1	Off	404	300	290	Off	12.8
977	2021-09-27	12:04:33	74	0	-1	Off	404	300	290	Off	12.8
978	2021-09-27	12:03:23	74	0	-1	Off	404	300	290	Off	12.8
979	2021-09-27	12:02:12	73	0	-1	Off	404	300	290	Off	12.8
980	2021-09-27	12:00:58	74	0	-1	Off	404	300	290	Off	12.8

Showing 971 to 980 of 1,000 entries

[Previous](#) [1](#) ... [96](#) [97](#) [98](#) [99](#) [100](#) [Next](#)

# Automatisasi Hidroponik (IoT)

Cloud



Remote



GSM 2G/3G/LTE

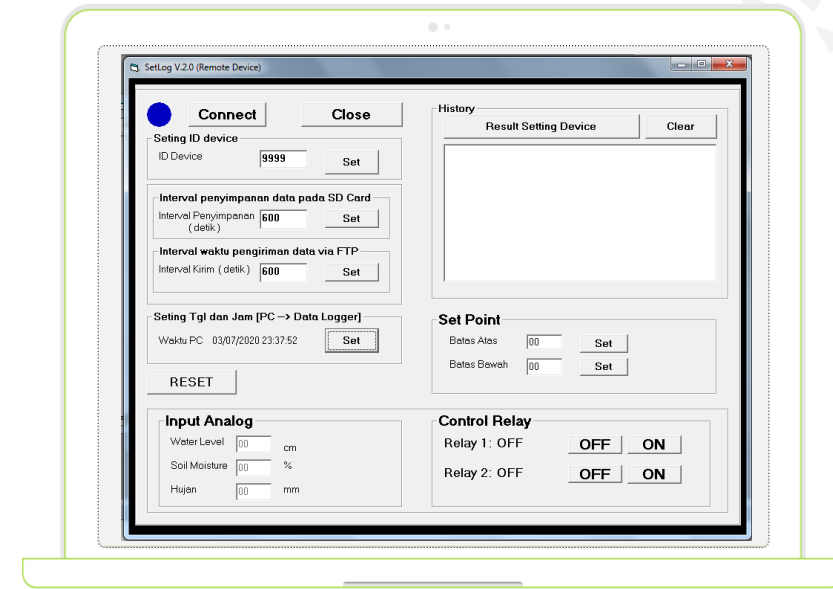


## Sensor

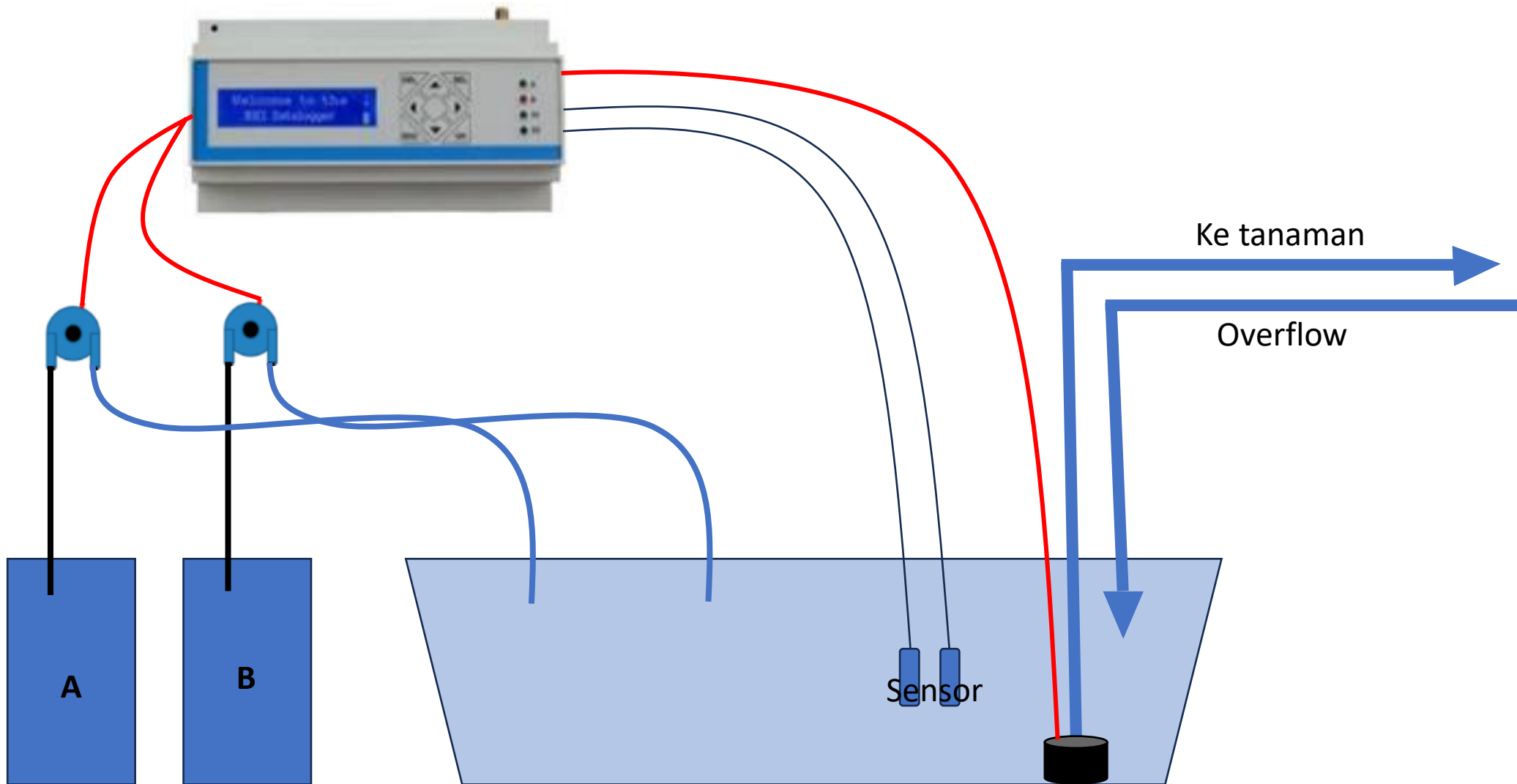
- pH
- EC/TDS
- Suhu Air
- Suhu dan kelembaban Udara

## Pompa

- Pupuk A
- Pupuk B
- Distribusi



# Automasi Hidroponik (IoT)



# Sensor - Sensor

1. Sensor Tinggi Muka Air
2. Sensor Kadar Air Tanah
3. Sensor Suhu Tanah
4. Sensor EC Tanah
5. Sensor pH Tanah
6. Sensor Potensial Air Tanah



THANK YOU

### Platform:

- Based on the **RTCU M2M Platform**.
- **NX32L (NX32 for Linux) execution architecture**.
  - RTCU IDE development tool.
  - Operates under a full and highly optimized Linux variant.
  - Secure communication with TLS and hardware assisted encryption/authentication.
  - Open and extendable with Platform SDK.

### Wireless Communication:

- **Worldwide LTE Cat. 4 Multi-Band Cellular Engine**.
- Internal **SIM-card reader** with support for **embedded SIM**.
- Optional: **Wireless M-Bus** according to EN 13757-4/7 OMS EU/CE.



### Wired Communication:

- **Ethernet** LAN interface with 10/100 Mbps.
- **Wired M-bus** (EN 13757 2/3) with support for up to 20 slave devices.
- **1-Wire bus** for accessories such as ID-button reader, temperature sensors, etc.
- **2 x RS485** channels and **1 x RS232** channel.

### I/O Interfaces:

- **8 x digital inputs** and **8 x high-power solid-state digital outputs**.
- Up to 4 digital inputs can be configured as **IEC62053-31 Class A** compliant.
- **4 x analog inputs** with 0..10 volt / 0..20 mA with **12 bit precision**.
- **2 x analog outputs** with 0..10 volt / 0..20 mA.
- **Expandable I/O** with standard Modbus modules.

### User Interaction:

- **Graphical 144x32 pixels display** with black-on-green back-lit text/graphics.
- **Keypad** with 8 keys for sophisticated user interaction and control.
- **DTMF** support for Interactive Voice Response applications.
- High-speed **Mini-USB service-port** connector.

### Storage:

- Internal **flash drive** with up-to 64 MByte capacity.
- **Persistent memory** and circular **datalogger**.
- Standard **SD-Card** reader.



### Services Available

Technical Support.  
Application development support.  
Maintenance.  
Hardware support.  
Warranty services.

### Accessories

Modbus IO extension modules.  
Antennas.  
Cable parts,  
1-Wire parts,  
...and more.





# BIOPS AGROTEKNO

*Bringing the new era of agriculture in Indonesia*



[www.biopsagrotekno.co.id](http://www.biopsagrotekno.co.id)

TECHNOLOGY-BASED COMPANY

**MORE PRECISE, MORE  
PRODUCTIVE!**

*Providing Agricultural Solution and Becoming Profitable  
Partners for Farmers*



# CLIMATE SMART AGRICULTURE

“Approach to help the people who manage agricultural systems respond effectively to climate change” (FAO, 2024)

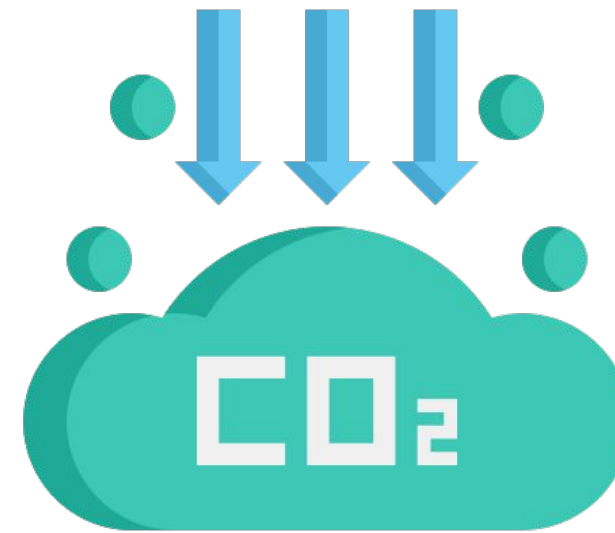


# CLIMATE SMART AGRICULTURE

“Approach to help the people who manage agricultural systems respond effectively to climate change” (FAO, 2024)



**Sustainable  
production**



**Reduce  
greenhouse gas**



**Climate change  
adaptation**

***Tjintapuri Durian Farm*** located in Banjar, South Kalimantan, planted more than 3,000 durian trees covering 25-hectare area of a former coal mining site as part of a reclamation program. As El niño hits, as well as operation inefficiency (manual irrigation using hose), it has lost more than 600 trees. ***It takes 3 days to irrigate 8-hectare area with 3 people working simultaneously.***





**ON AVERAGE, FARMERS SPEND  
±5 HOURS A DAY ONLY FOR  
IRRIGATION**  
*(with traditional irrigation)*



*“In the past 3 years, we have **lost almost half of our members**”*

**Wilarto**  
Head of Sukarasa Tani Farming Group





**ON AVERAGE, FARMERS SPEND  
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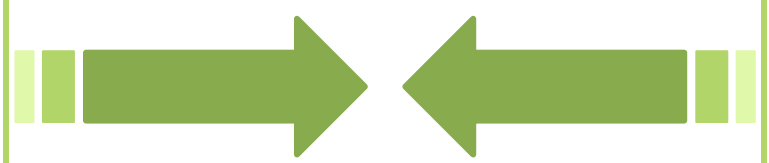


*“In the past 3 years, we have **lost almost half of our members**”*

**Wilarto**  
Head of Sukarasa Tani Farming Group



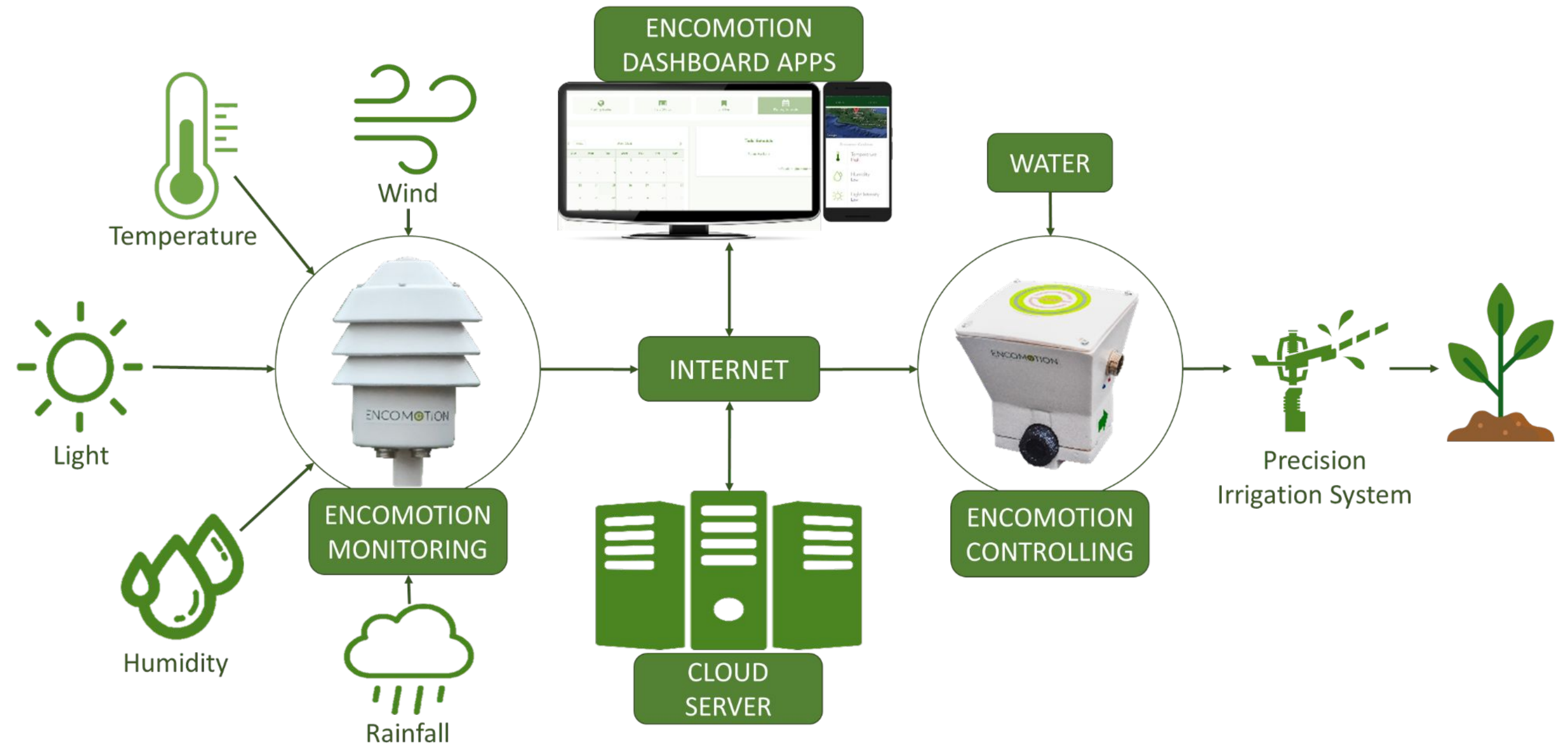
*Inefficient Irrigation and  
Human Dependent*



*Reduced Number of Farmers*

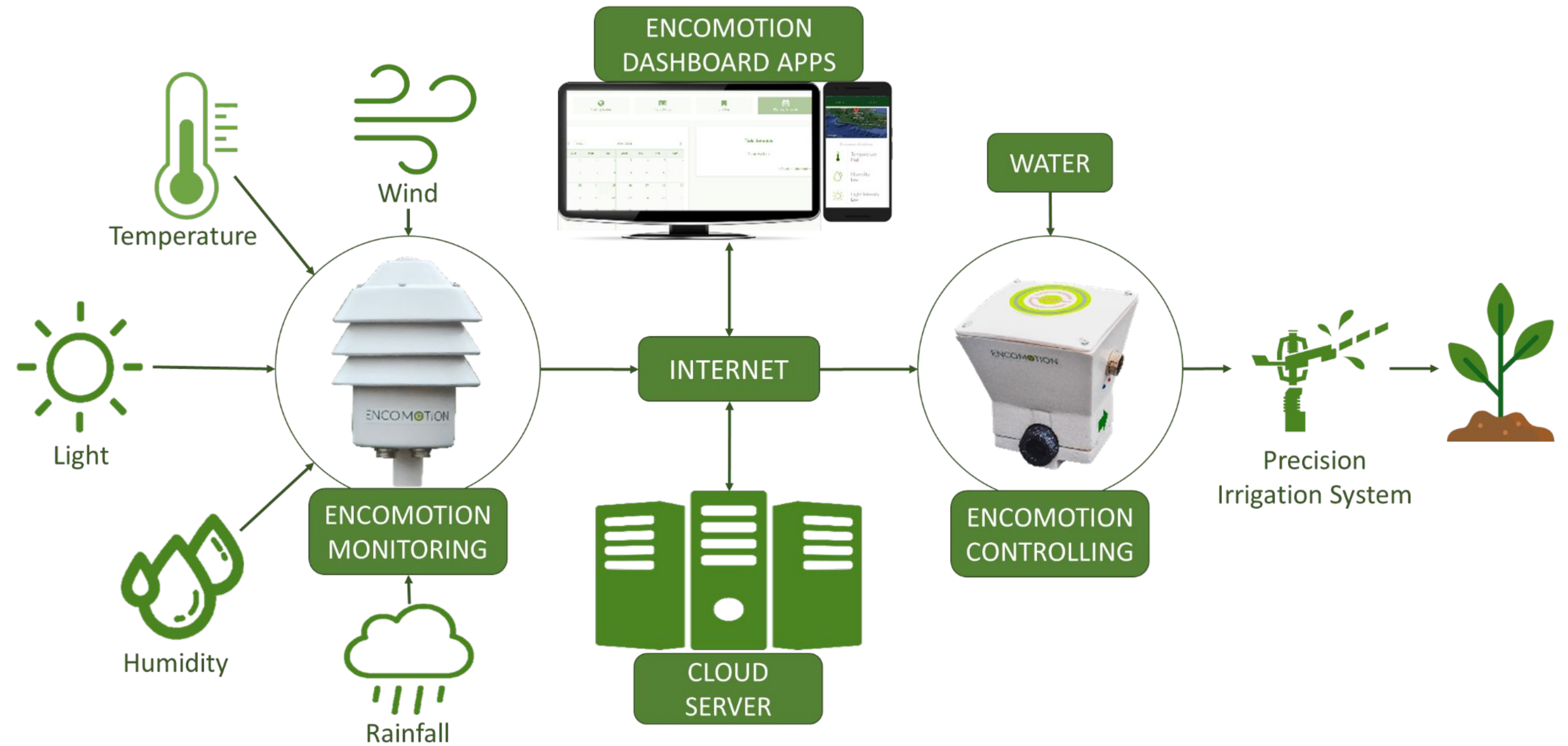
# Solution

*Mechanization and IoT-based products to provide precise and automated irrigation system*



# Solution

*Mechanization and IoT-based products to provide precise and automated irrigation system*



# Products & Services

## *ENCOMOTION Smart Irrigation*



Weather Sensor



Smart Valve Actuator



Dashboard Apps

# Products & Services

## *Irrigation Infrastructure*



Design



Procurement



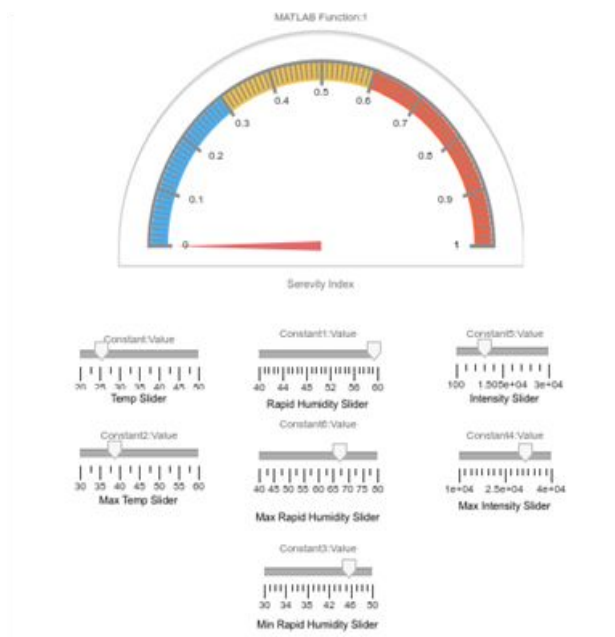
Construction



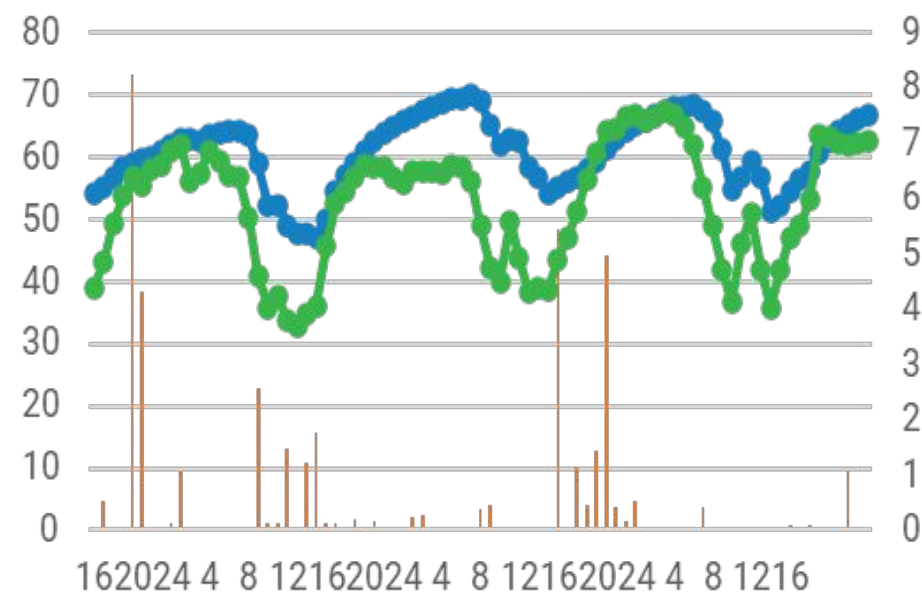
Training & After Sales Service

# Products & Services

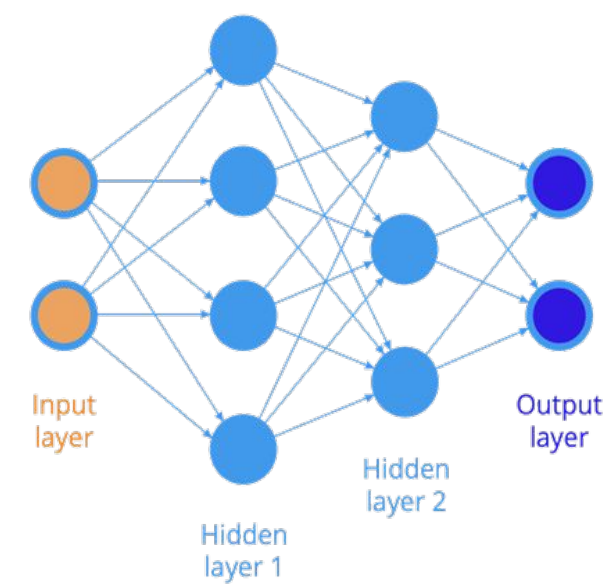
## *AI-based prediction and agricultural drone services*



Pest & Diseases  
Early Warning  
system



Rainfall Prediction



Harvest  
Prediction



Farm Condition  
Monitoring

# Meet Our Team

Dally C. Shaffar



CEO



Nugroho Hari Wibowo



CTO



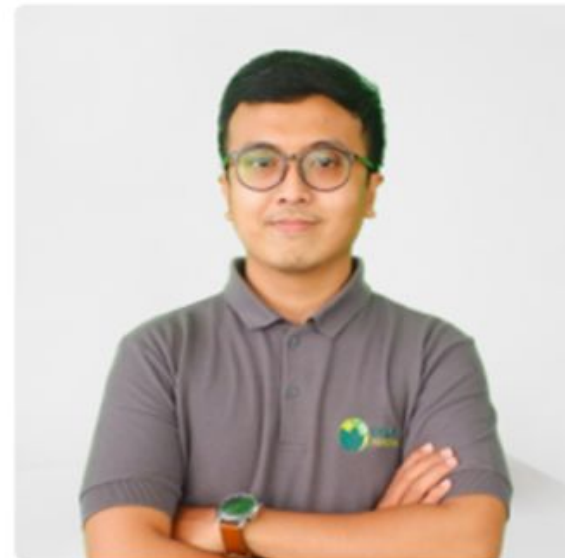
Gendipatih



COO



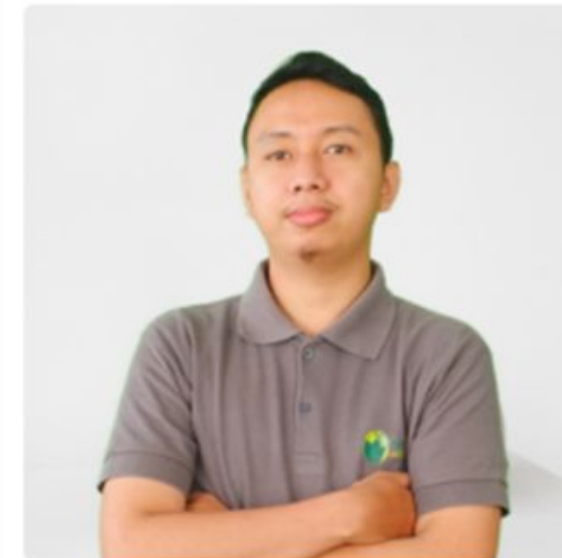
M. Ihsan Novandika



CMO



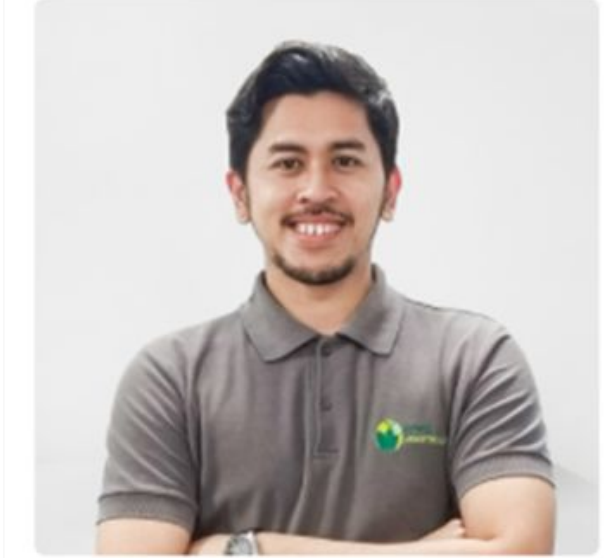
Muhammad Fahri Riadi



CFO



M.M. Malikul Ikram



CRO



# Current User

80+

**Devices installed**  
in Java, Kalimantan, Sulawesi,  
Sumatera, and Nusa Tenggara

*with various commodity especially horticulture (fruits and vegetables) such as: bell peppers, durian, melon, leafy greens, tomato, chili, shallot, etc.*



**Smallholder farmers**  
*that already open to technology and consider farming as a business (having entrepreneurial spirit)*



**Corporation farmers**  
*that having difficulty in managing vast area of land*



**Organization**  
*(Government or Non-government) that pursue similar purpose in helping farmers adopting technology*



# Our champion



## Durian farm, South Kalimantan

Implementation of smart irrigation system  
in 25 ha of durian farm

### **Effect:**

*Human-dependent irrigation → Mechanization*

*Irrigation every 3 days for 1 plant → Daily irrigation*

## Shallot farm, East Nusa Tenggara

Implementation of solar pump irrigation system  
in 0.25 ha of shallot farm

### **Effect:**

*Human-dependent irrigation → Precise irrigation*

*Petrol-based energy → Solar-powered system*





# Project Highlight *Implementation of Solar Cell Pump for Irrigation in Kaledupa, South East Sulawesi*



**Baseline**

- *Inefficient farm operation*
- *Climate dependent*
- *Limited resource to expand*



**Current Condition**

- *>80% Land occupied → Increased farmers' income*
- *>50% Operational efficiency increased*
- *Crops diversification increased*



**BIOPS**  
AGROTEKNO

***Let's join us to bring  
more impact to food  
production sector  
in Indonesia***



# MONITORING SYSTEM



Arable Mark 3:

# Total Crop Intelligence One Simple System



# ARABLE

Irrigation Management

Labor Planning

Spray Timing

Early Pest & Disease Identification

Weather & Crop Monitoring

Research Trials

Sustainability Initiatives



## MONITORING

AGUS SETYO W

[WWW.DSRIRRIGATION.COM](http://WWW.DSRIRRIGATION.COM)

## Arable Mark 3: Lebih dari Sekedar Weather Station

### Simple

- Instalasi kurang dari 5 menit, dengan aktivasi satu tombol
- Ringan dan portabel
- Bebas perawatan tanpa bagian harus rutin diganti
- Penyimpanan data berbasis cloud; Tidak diperlukan data logger

### Handal

- Sumber Listrik dengan tenaga surya dengan baterai tahan lama meskipun kondisi sinar matahari rendah
- Antena bertenaga tinggi dan konektivitas seluler yang kuat untuk menjangkau remote area
- Alat yang tahan dan tangguh; Dengan Proteksi rate IP67 untuk perlindungan terhadap masuknya air dan debu

### Complete /Lengkap

- Sensor bawaan untuk memberikan data lingkungan dan tanaman yang komprehensif
- 22 narrow-band spectrometer untuk memonitor Kesehatan tanaman
- Built-in camera 5MP, untuk pengambilan foto kontekstual sehari-hari
- Ultrasonic wind anemometer
- Seamless integration with third-party sensors

**Acoustic Disdrometer**

Accurately measure precipitation without maintenance.

**Cellular Connectivity (4G LTE-M, 2G)**

Connect at a range 7x greater than a cell phone.

**Solar Powered with Long-Lasting Battery**

Operate up to 2 months without sunlight.



**22 Narrow Band Spectrometer**

Continuously monitor crop NDVI and chlorophyll levels with high precision and accuracy.

**4-Component Net Radiometer**

Identify plant stress before it's visible to the human eye.

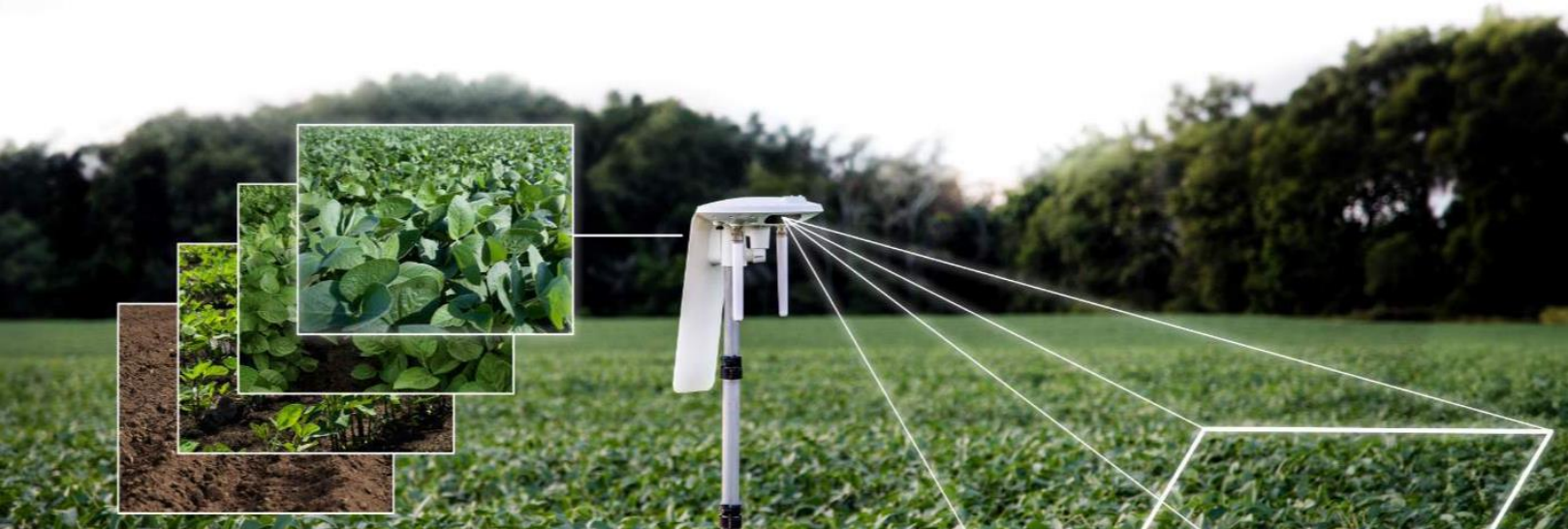
**Environmental Sensor Suite**

At the push of a single button (and without a technician), monitor in real-time the full complement of in-field conditions, including temperature, humidity, pressure, solar radiation, and more.

**5MP Camera**

Gain in-field visibility — from anywhere — with fully contextualized daily crop images.

## Arable Vision See everything. Miss nothing.

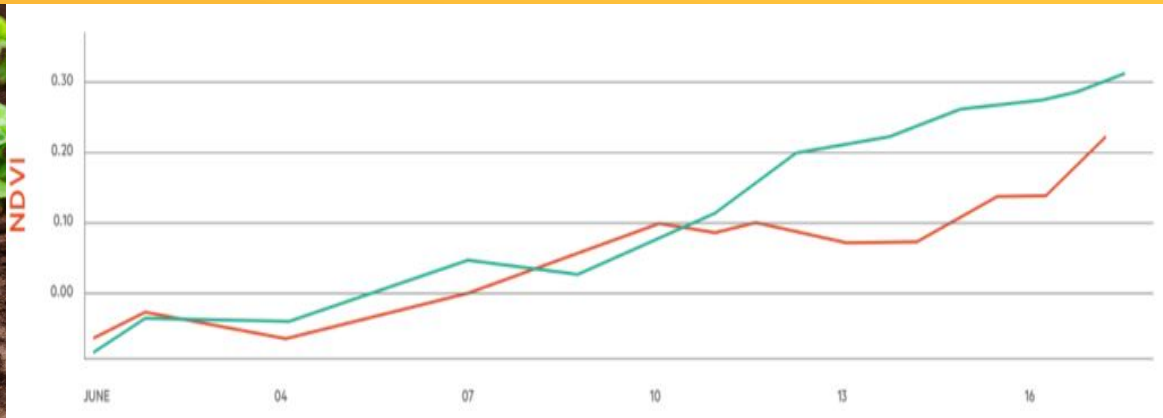


### Arable Vision :

Didukung oleh kamera 5MP yang terintegrasi ke dalam Mark 3, Arable Vision memberi gambar harian dari tanaman yang dapat dibandingkan/mengkorelasikan dengan data kondisi cuaca, tanaman, dan kondisi tanah yang ditangkap Mark 3 secara bersamaan.

# Normalized Difference Vegetation Index (NDVI)

## Indek vegetasi



NDVI adalah pengukuran numerik dari -1 hingga 1, dan nilainya akan meningkat seiring dengan berkembangnya kanopi. Grafik di atas adalah contoh dua lokasi dengan dua perlakuan pupuk berbeda. Kedua lahan tersebut ditanam secara bersamaan, namun tanaman dengan masukan nitrogen yang lebih tinggi (garis hijau) menunjukkan nilai NDVI yang lebih tinggi dibandingkan dengan tanaman yang menerima lebih sedikit pupuk.

NDVI merupakan indikator penting kesehatan dan vitalitas tanaman. Bahkan perubahan kecil pada NDVI dapat mengindikasikan masalah yang akan terjadi pada tanaman Anda, jadi penting untuk memperhatikan kapan angka ini mulai mengalami tren naik atau turun; peringatan ini mungkin menunjukkan bahwa ada sesuatu yang perlu diperhatikan

NO	NILAI INDEKS VEGETASI	TINGKAT KEHIJAUAN
1	0.40 – 1	Tinggi
2	0.25 - < 0.40	Sedang
3	0.03 - < 0.25	Rendah
4	-1 - 0.03	Non Vegetasi



Sumber: Marwoto & Ginting (2009)

# Irrigation Management



Dengan Arable kita bisa menentukan berapa banyak aplikasi irigasi yang diberikan ke tanaman berdasarkan data Etc ( Evapotranspirasi Crop) dan data Presipitation/Curah hujan yang dihasilkan oleh Arable

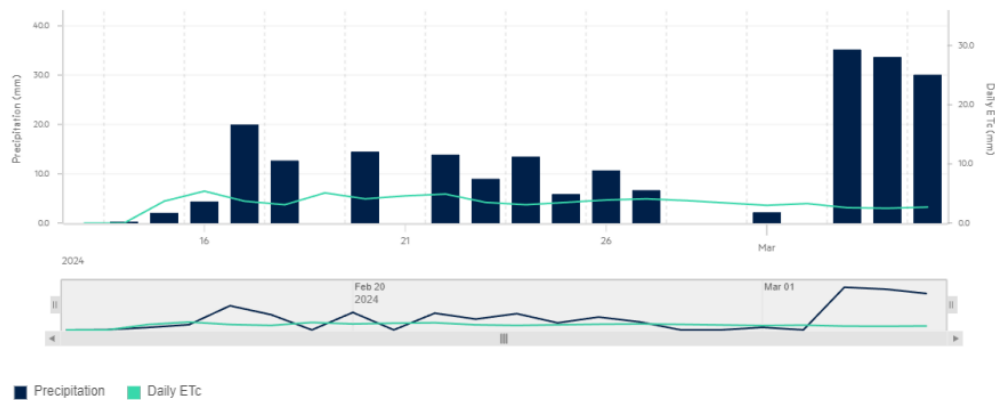
$CWD( \text{Crop Water Demand} ) = \text{Presipitation} - \text{Etc}$



Etc, Precip for Agrifarm 2024

Date Generated:  
06-Mar-2024

Number of Records:  
22



## Leaf Wetness



**Leaf Wetness** adanya air pada permukaan tanaman. Meski kedengarannya tidak berbahaya, justru inilah yang dibutuhkan oleh beberapa mikroorganisme untuk berubah dari patogen yang tidak berbahaya menjadi patogen yang merusak tanaman. Dengan memantau kebasahan daun, dapat mengambil tindakan proaktif untuk melindungi tanaman dari penyakit sebelum penyakit menyerang.

Arable yang menggabungkan pengukuran kelembapan relatif, curah hujan, suhu embun, dan suhu permukaan untuk mengetahui berapa lama suhu daun berada di bawah atau sama dengan suhu titik embun. Model ini diterjemahkan menjadi metrik durasi basahnya daun selama 24 jam.

Data Leaf wetness dapat berfungsi sebagai sistem peringatan kapan harus memantau lahan dengan cermat atau kapan harus merencanakan intervensi pencegahan hama.)

Untuk menggunakan data secara efektif, Agronom perlu mengetahui dasar-dasar tentang OPT yang dimaksud, seperti:

Pada musim atau tahap pertumbuhan tanaman apa infeksi biasa terjadi

Kisaran suhu di mana infeksi umumnya terjadi

Durasi kebasahan daun biasanya diperlukan untuk infeksi

# SATU PERANGKAT UNTUK SEMUA DATA



## Environmental

Temperature  
Precipitation  
Pressure  
Relative Humidity  
Solar Radiation  
Wind Speed\*  
Wind Direction\*  
Vapor Pressure Deficit  
Sunshine Duration  
Dew Point  
Temperature  
Sea Level Pressure

\*Requires auxiliary sensor.



## Plant

Daily Crop Images  
Evapotranspiration (ET<sub>o</sub>, ETC, replacement ETC)  
Growing Degree Days  
Growth Stages  
Leaf Wetness  
Crop Water Balance  
Crop Water Deficit  
Heat Stress  
NDVI  
KCNDVI  
Chlorophyll Index  
Chill Hours  
Canopy Temp



## Soil & Irrigation

Soil Moisture\*  
Soil Temperature\*  
Soil Salinity\*  
Irrigation Start & End Times\*  
Total Irrigation Run Time\*  
Last Irrigation Run Time\*  
Applied Irrigation\*  
Proximity to Refill  
Threshold  
Irrigation to Replace ETC

## The SENTEK Drill & Drop

Sentek Probe Multi sensor dan multi level kedalaman tanah , meliputi pengukuran :

- Soil Moisture
- Salinity
- Temperature

Bagian atas probe lebih lebar daripada di bagian bawah untuk memastikan pemasangan probe yang benar secara agronomis, pas dan super cepat.



Soil Moisture for Agrifarm 2024

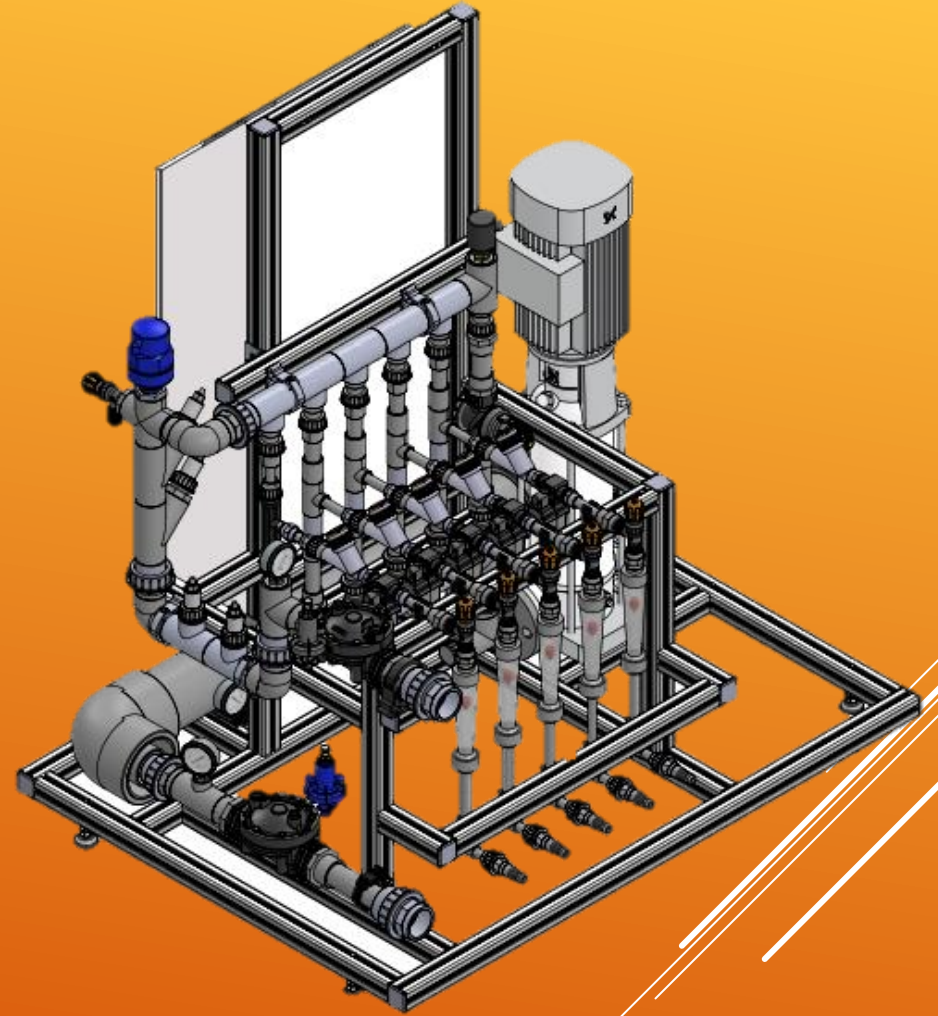
Date Generated:  
06-Mar-2024

Number of Records:  
22

### Soil Moisture

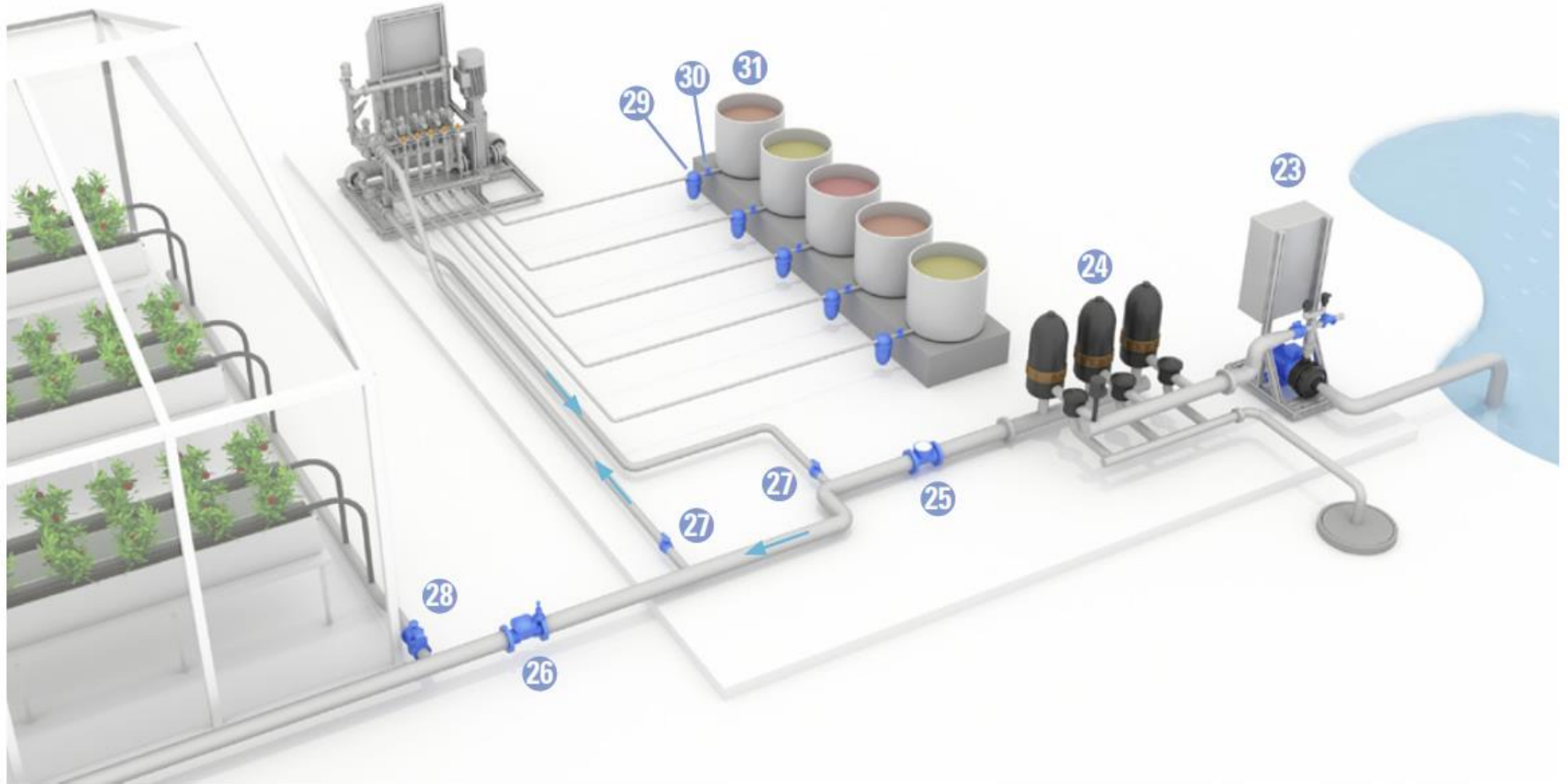
Timestamp	Avg.	10cm	20cm	30cm	40cm	50cm	60cm
05-Mar-2024	32.8	35.0	37.1	36.7	30.7	17.0	40.0
04-Mar-2024	32.8	34.9	37.2	36.8	30.6	17.0	40.0
03-Mar-2024	31.2	33.4	34.4	34.5	29.2	16.4	39.4
02-Mar-2024	30.3	33.2	32.8	32.7	28.2	15.9	38.7
01-Mar-2024	30.7	33.7	34.0	33.2	28.5	16.0	38.7
29-Feb-2024	31.1	34.4	35.1	33.7	28.7	16.0	38.8
28-Feb-2024	31.7	35.2	36.1	34.7	29.1	16.1	38.9

# NETAFIM DOSING MACHINE

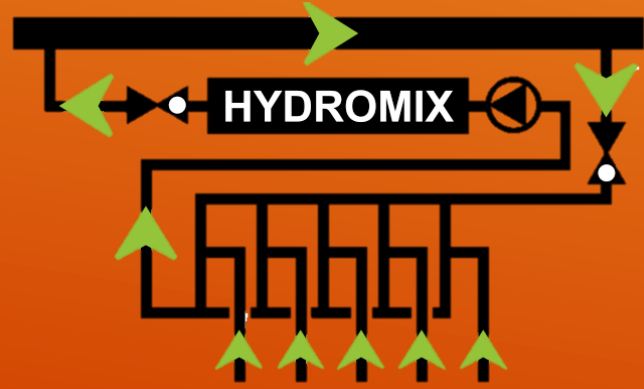
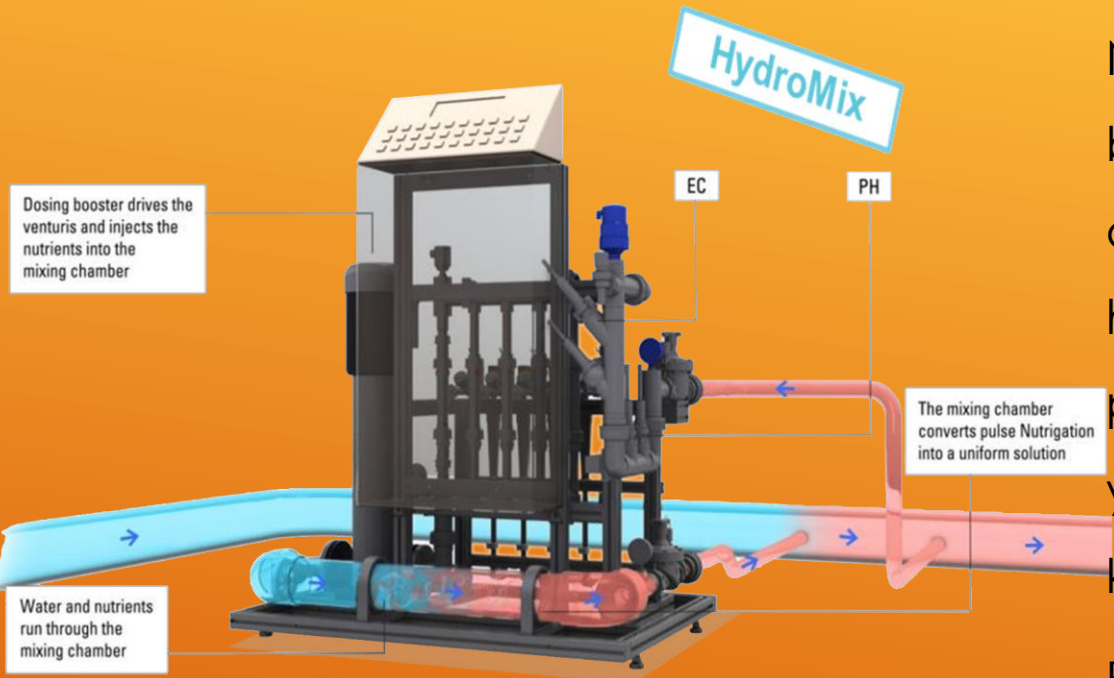


NETAJET

NetaJet™ 4G



# NETAJET™ SYSTEMS WORKING PRINCIPLE



NetaJet™ 4G mencampur berbagai larutan pupuk dan asam menjadi larutan yang homogen, di ruang pencampuran “statis HidroMix” yang unik dan menyuntikkannya ke saluran utama jaringan irigasi. Pengisapan pupuk dan asam di dosing channel didasarkan pada prinsip Venturi. Ini membutuhkan perbedaan tekanan – dibantu dengan adanya pompa NetaJet



### Features

- Berdasarkan teknologi Nutrigasi™ Netafim yang unik, Netafim mengontrol jumlah air dan pupuk yang digunakan, mengoptimalkan pemanfaatan sumber daya untuk setiap jenis tanaman dan tanah / substrat tertentu.
- NetaJet™ 4G sangat akurat dan andal, mencegah limbah air dan pupuk sekaligus mengurangi pencemaran lingkungan.
- NetaJet™ 4G memastikan dosis nutrisi yang sangat tepat dan homogen untuk tanaman di greenhouse
- NetaJet™ 4G selalu menyuntikkan nutrisi dalam jumlah yang seragam sambil melakukan kontrol EC dan pH yang sempurna.
- The NetaJet™ 4G accommodates a wide variety of system pumps, peripherals and accessories to meet a vast range of applications
- NetaJet™ 4G mengakomodasi berbagai macam system pompa, peralatan dan aksesoris untuk memenuhi berbagai aplikasi irigasi dan fertigasi

## Advantages

- Presisi ultra-tinggi
- Operasi hidrolik yang lancar dan stabil
- Tidak ada fluktuasi
- Pencapaian set-point EC/pH yang cepat
- Waktu stabilisasi yang singkat
- Memungkinkan siklus Nutrigasi™ pendek
- Tidak ada risiko kerusakan kavitasi pada booster

## Stabilization time

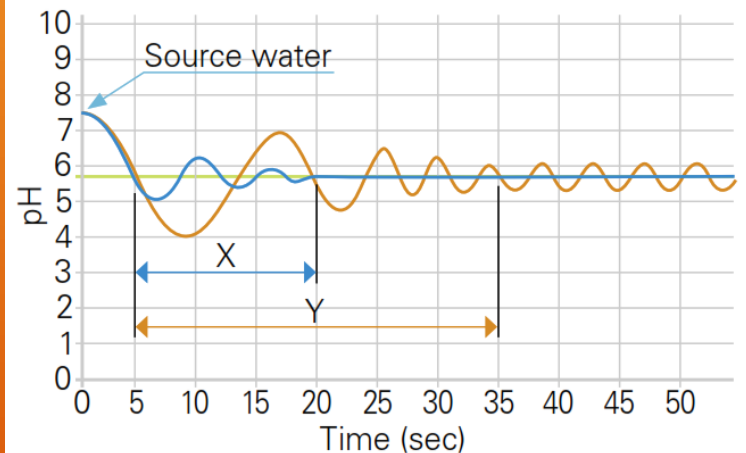
Analog dosing Channel melakukan stabilisasi EC/PH jauh lebih singkat dibandingkan dengan digital dosing channel (hingga 50%). Ini sangat bermanfaat ketika melakukan siklus Nutrisi™ pendek, khas tanaman dalam greenhouse

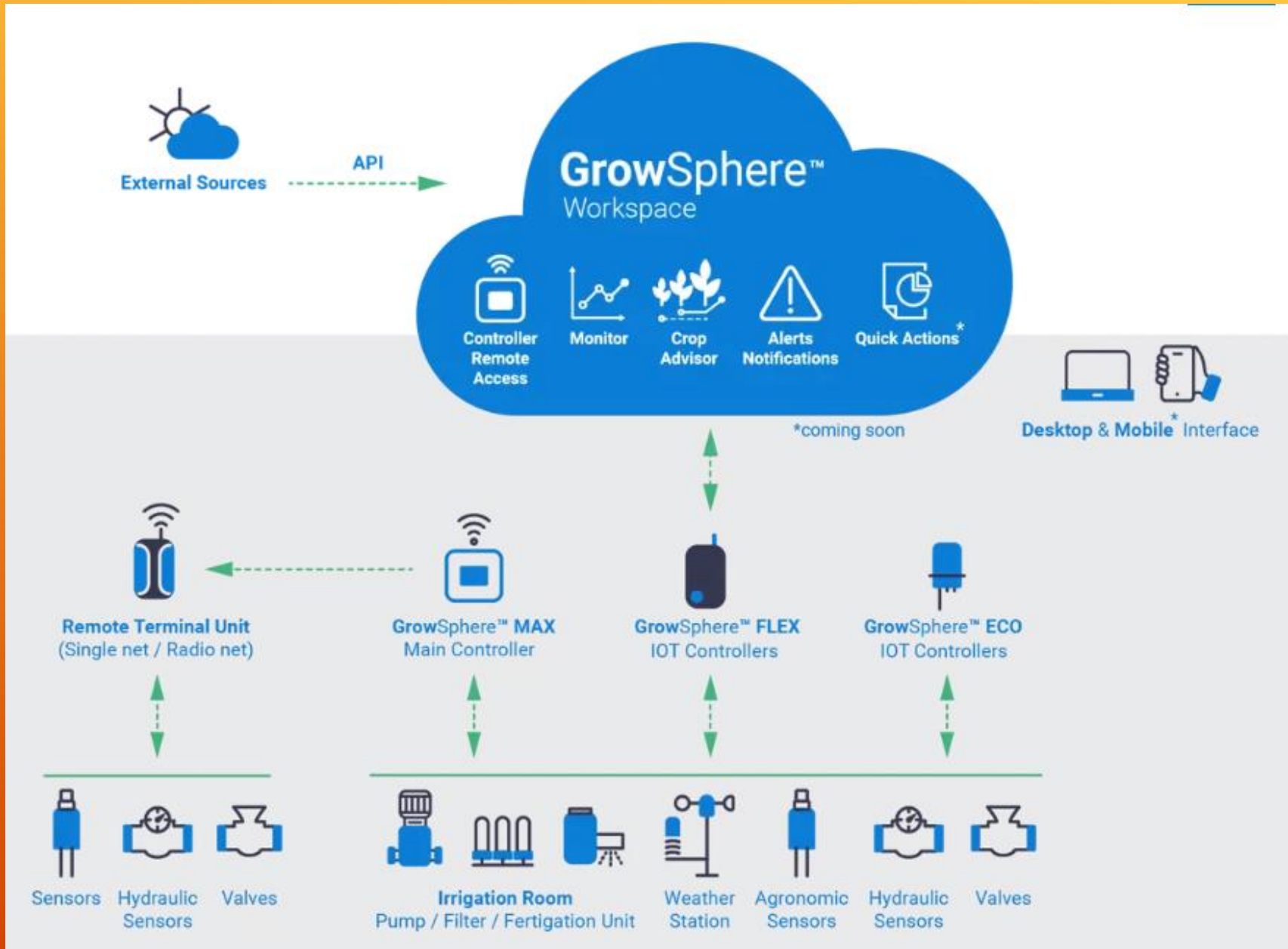
- X = Analog dosing Channel
- Y = Digital dosing channel

## The NetaJet™ 4G

- Dosing channels of 50-600 l/hr (13-156 gal/hr) fertilizer/acid dosing
- Scales to system flow rates from 5m<sup>3</sup>/hr to 400m<sup>3</sup>/hr and up to 8 bar pressure

### Digital (ON/OFF) vs. analog dosing channel performances





Sistem Operasi (OS) Irigasi dan Pemupukan GrowSphere™ adalah solusi revolusioner yang dirancang untuk mengoptimalkan operasi irigasi dan pemupukan di bidang pertanian. Menggabungkan teknologi mutakhir, analisis data, dan otomatisasi untuk memaksimalkan hasil panen, meminimalkan sumber daya yang terbuang, dan meningkatkan efisiensi pertanian secara keseluruhan.

GrowSphere™ menggunakan jaringan sensor yang ditempatkan secara strategis di seluruh ladang untuk mengumpulkan data tingkat kelembapan tanah, kondisi cuaca, dan parameter kesehatan tanaman. Data ini digunakan untuk memberikan informasi dan memungkinkan petani membuat keputusan yang tepat. Sistem ini terintegrasi dengan infrastruktur irigasi yang ada (kontrol pemompaan, penyaringan, pembukaan valve, sistem pemupukan, dll.), yang memungkinkan kontrol yang tepat atas pasokan air dan nutrisi untuk tanaman.

Melalui semua data yang disajikan, petani dapat memantau dan menyesuaikan jadwal irigasi, pengaturan pemupukan yang tepat, sesuai dengan kebutuhan spesifik setiap tanaman dan tahap pertumbuhan.



## GrowSphere™ MAX

The ultimate all-in-one solution, offers maximum operational flexibility. Ideal for complex agriculture operations.

**For medium-large scale applications.**

- 256 valves
- Multiple mainlines
- 100+ sensors
- Advanced fertigation

## Multiple Capabilities



256  
valves



Multiple  
mainlines



Connects with  
varied sensors



Connects with  
remote units



Advanced  
fertigation



## Automated Irrigation Management for small holders

**GrowSphere™ ECO** puts the power of smart irrigation and fertigation control and monitoring in your hands. Experience enhanced productivity with automated valve and pump operation with basic fertigation. Stay ahead of the curve with real-time alerts and data logs. All, in one easy-to-use operating system.



Connects to cloud



6 valves / outputs



Connects with varied sensors



Basic fertigation



Real-time validation

**THANK YOU..**

**PT. DAYA SANTOSA REKAYASA**

**GUNUNGSAHARI CENTER BLOK A2-3,  
JLN INDUSTRI RAYA NO.1 JAKARTA  
PUSAT**

**08113517726**





**PERTANIAN CERDAS IKLIM**

# Tentang MASSGRO.



Berdiri tahun 2013

# Tentang MASSGRO.

## Tropical Greenhouse

### Features

- Ventilasi pada atap greenhouse
- Hot dipped galvanized
- Parts pre-fabrikasi
- Drainase antar greenhouse besar
- Struktur dedesain cocok dengan keadaan tropis
- Desain greenhouse multispans

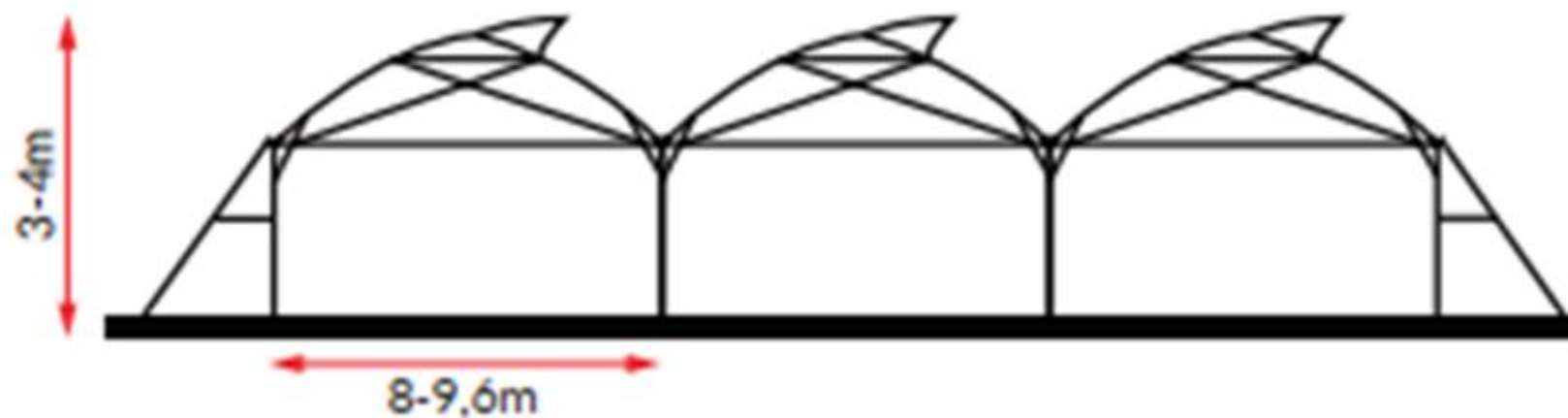
### Variasi Greenhouse

- Greenhouse Pembibitan
- Greenhouse Hidroponik
- Greenhouse Standard

### Ukuran Greenhouse

(P x L x T)

- 20m x 8m x 3m
- 20m x 9,6m x 4m



Desain & Konstruksi  
Greenhouse

# Tentang MASSGRO.



Manufaktur Peralatan  
Perkebunan

# Tentang MASSGRO.



Teknologi Irigasi & Automatisasi

**Mitra MASSGRO.**

# Mitra MASSGRO.



 **ELLEPOT**<sup>®</sup>  
INDONESIA

# Mitra MASSGRO.



Sistem produksi bibit ramah lingkungan dengan menggunakan **polybag yang terbuat dari kertas**

Studi menunjukkan bahwa jejak karbon pada pot kertas lebih rendah 20% dibandingkan dengan pot plastik.

Kertas mudah untuk ditanam dan kertas bersertifikat akan terdegradasi di tanah ketika ditanam di lahan.

**Tidak ada pot plastik atau polybag yang tertinggal untuk dikembalikan.**

# Mitra MASSGRO.

Dukungan Perusahaan kelas dunia yang fokus di bidang irigasi dengan total pengalaman > 80 tahun telah menyiapkan MASSGRO untuk menjadi Solusi penyedia teknologi irigasi yang memiliki jajaran produk yang lengkap.

Kami dapat mendesain dan meng-instalasi

- Irigasi Tetes dalam tanah
- Irigasi Tetes atas tanah
- Misting System
- Micro Sprinkler
- Open-Field Sprinkler
- Boom-Spray system

**NaanDan**  
by **Rivulis**



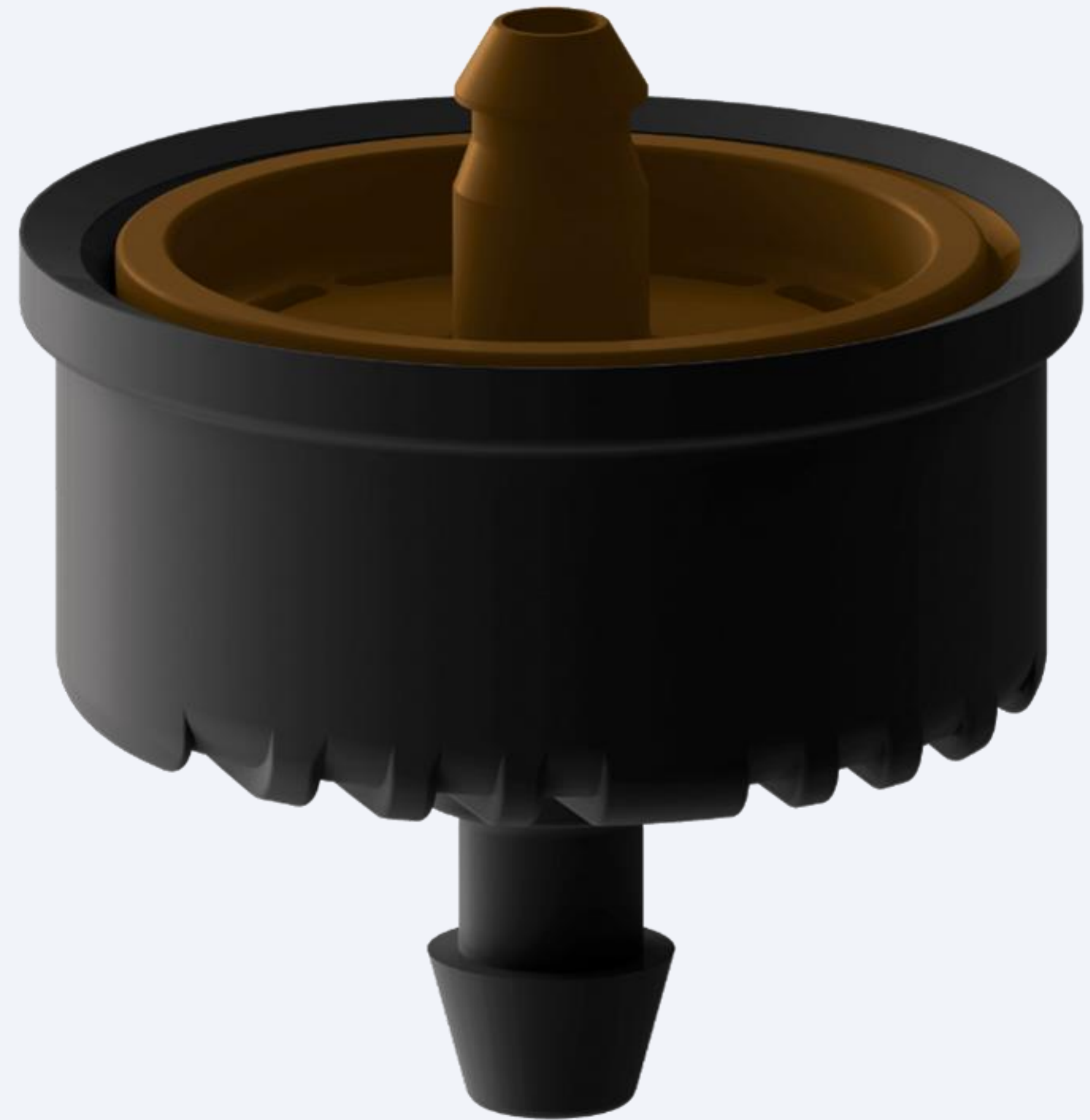
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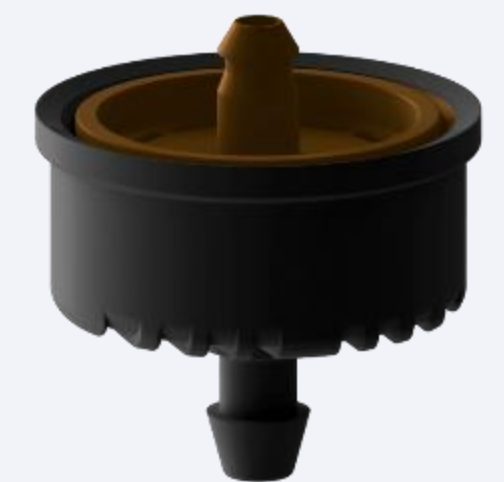
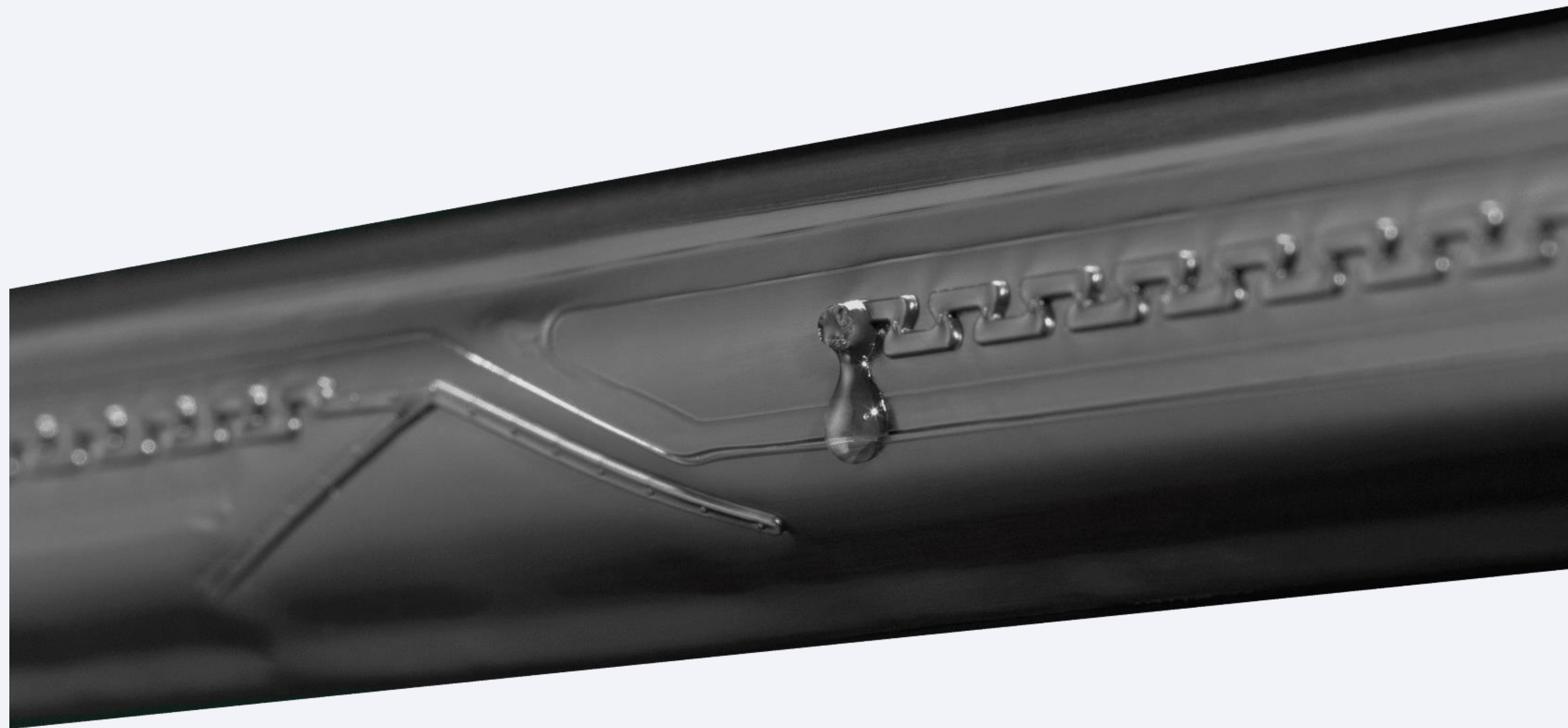


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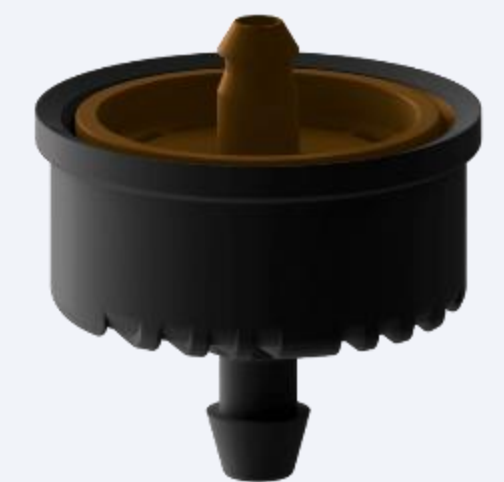
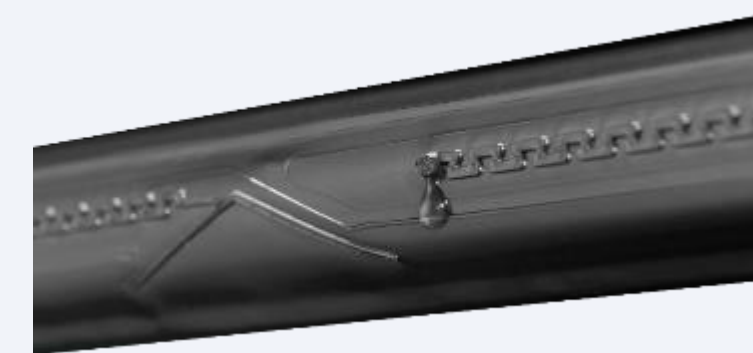
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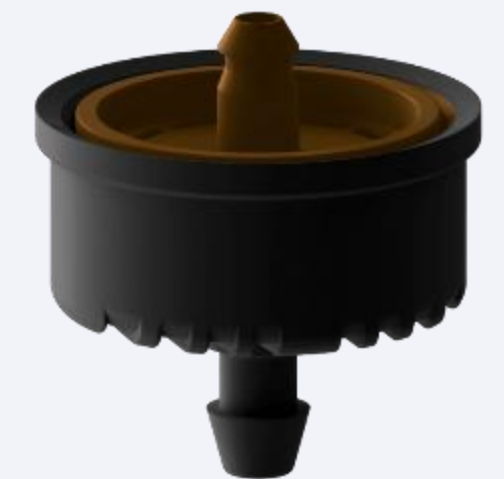
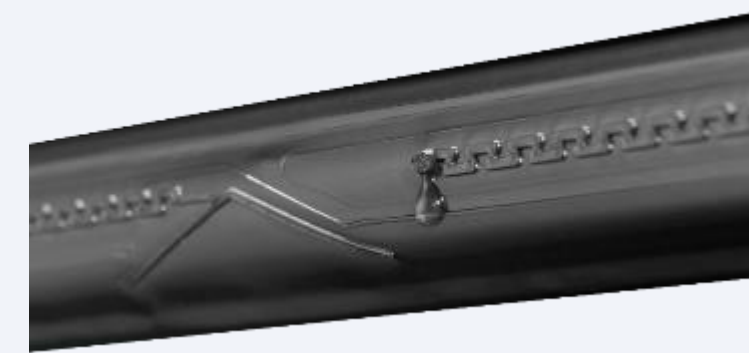
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by Rivulis



# Mitra MASSGRO.

Greenhouse MASSGRO didesain sesuai dengan standard international greenhouse design EN13031-1

Pemilihan material yang sesuai untuk ketahanan masa pakai struktur minimal 15 tahun dan telah mempertimbangkan ketahanan terhadap gempa skala 4 dan angin skala 5 beaufort

Selain itu dapat juga diberikan fitur SMART Greenhouse dimana pengelolaan iklim mikro di dalam greenhouse menjadi flexible karena dikombinasikan dengan Climate Controller



# Mitra MASSGRO.

## Pot & Tray

Didesain & diproduksi oleh MASSGRO dan telah di ekspor ke berbagai negara seperti :

Denmark - Eropa Barat

Australia

Selandia Baru

Malaysia

Korea Selatan

Amerika Serikat

Chili – Amerika Latin

Afrika Selatan



# Mitra MASSGRO.

## Sistem irigasi presisi dan otomatisasi

Dukungan teknologi dari produsen controller ternama di Belanda melengkapi jajaran produk otomatisasi MASSGRO.

Terhubung dengan internet, memudahkan pengelolaan jarak jauh. Dengan fitur-fitur yang dapat disesuaikan dengan kebutuhan.

Otomasi merupakan bagian penting dari teknologi karena itu MASSGRO tidak hanya menyediakan controller terbaik, namun juga menyediakan **basic controller** dengan harga terjangkau untuk mempermudah pengelolaan farm klien kami.



**PRIVA**

# Mitra MASSGRO.

## Tanki air kapasitas besar

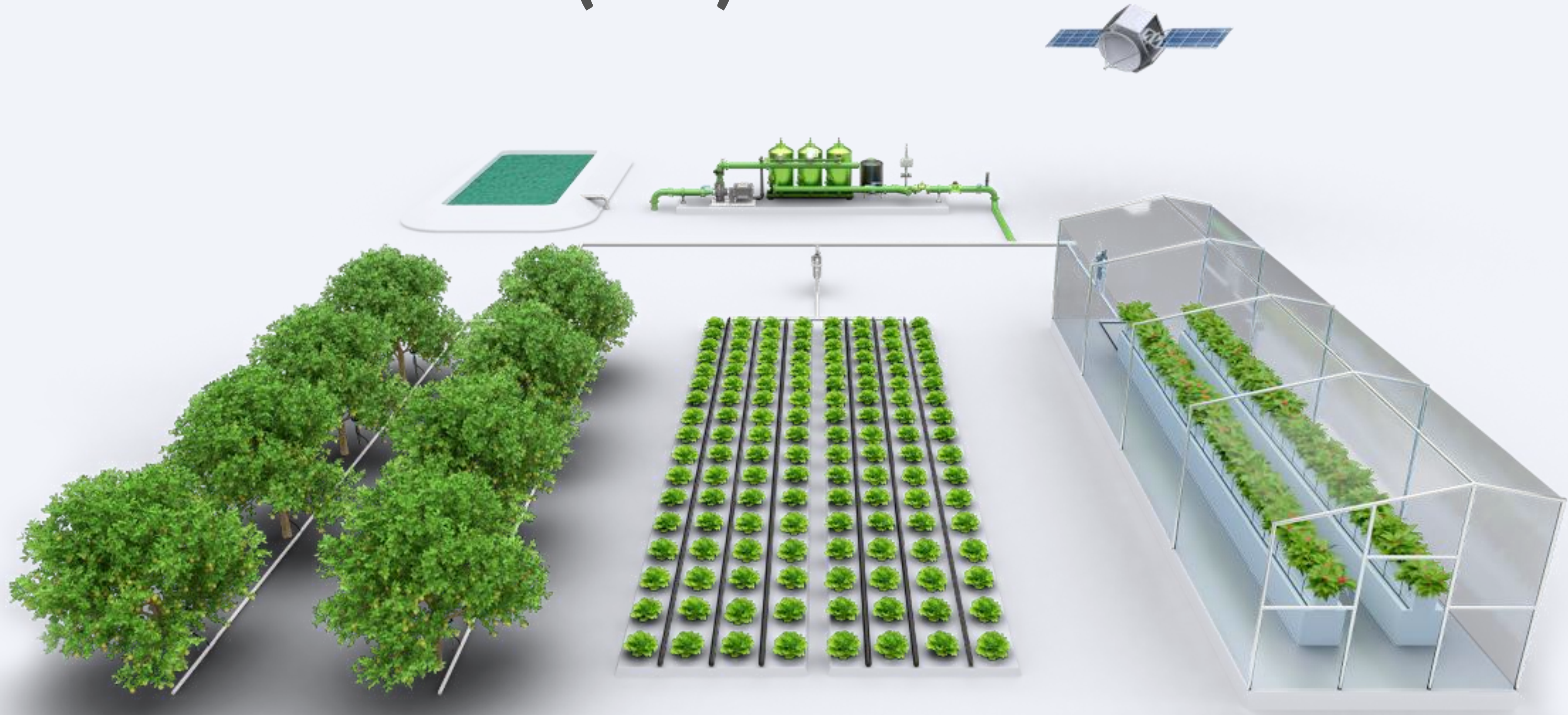
MASSGRO menyediakan tanki air dengan kapasitas hingga 2000 m<sup>3</sup>, dengan dinding yang terbuat dari Zinc-Alume dan dilapisi dengan liner yang terbuat dari PVC untuk pemakaian jangka Panjang.

Penyimpanan air yang baik, terhindar dari matahari dan mudah dibersihkan adalah salah satu factor kunci dalam menjaga kualitas air irigasi.



**Pertanian Cerdas Iklim (CSA).**

# Pertanian Cerdas Iklim (CSA).



Sistem Irigasi Presisi untuk segala jenis farm secara konsisten, terukur, seragam dan tepat sasaran

# Pertanian Cerdas Iklim (CSA).

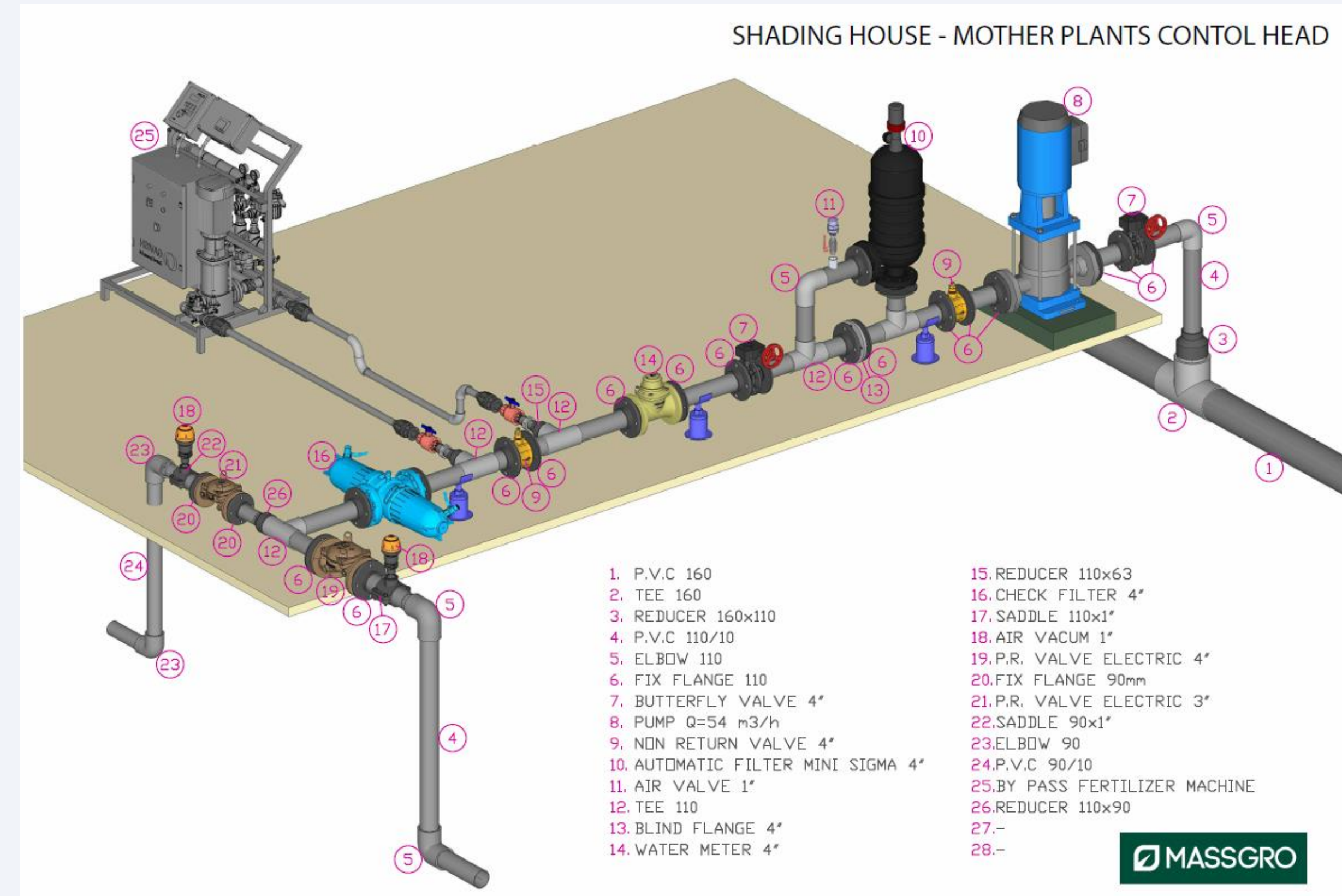
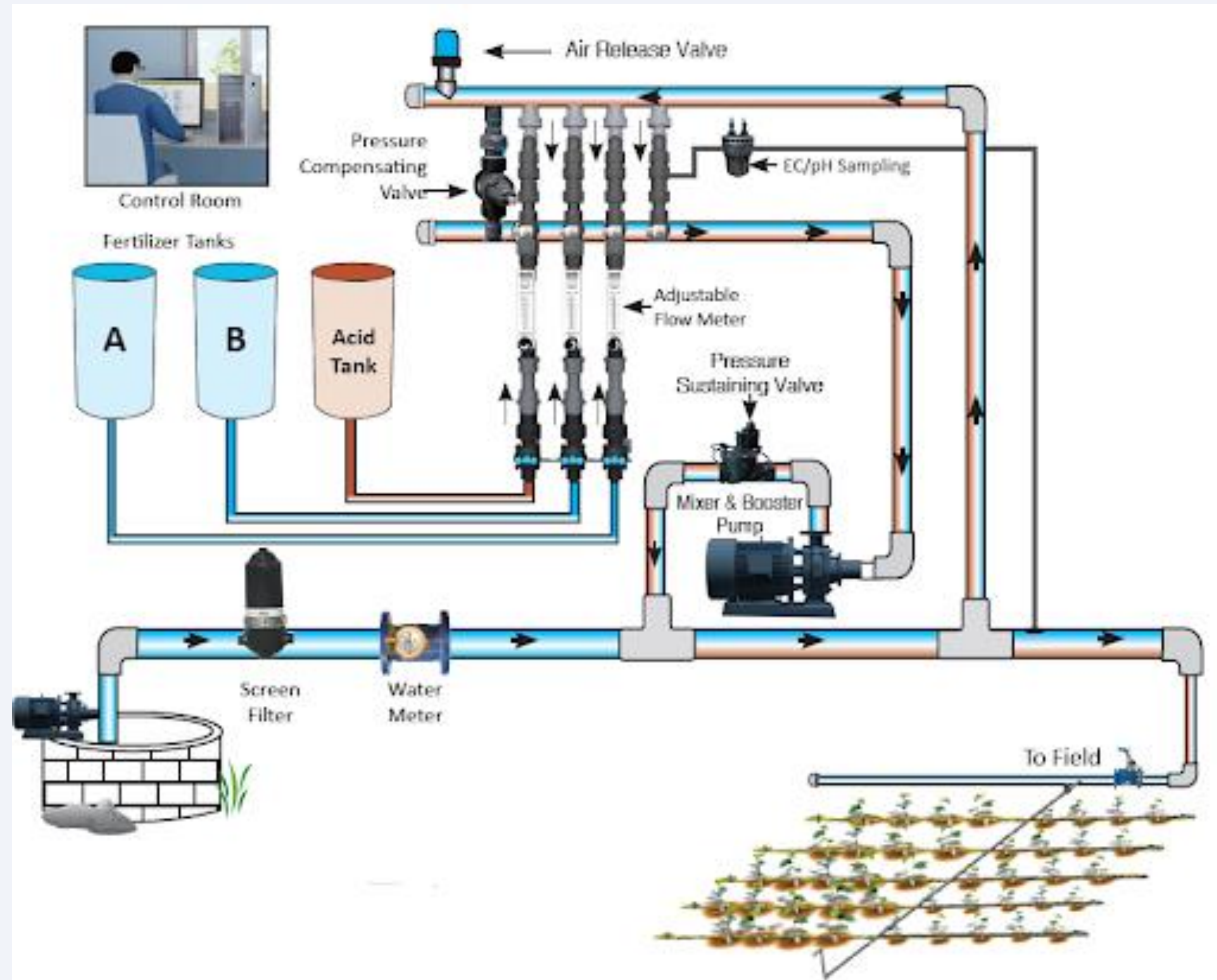
Compared to traditional irrigation methods, the use of drip irrigation systems can lead to water savings of up to

40%



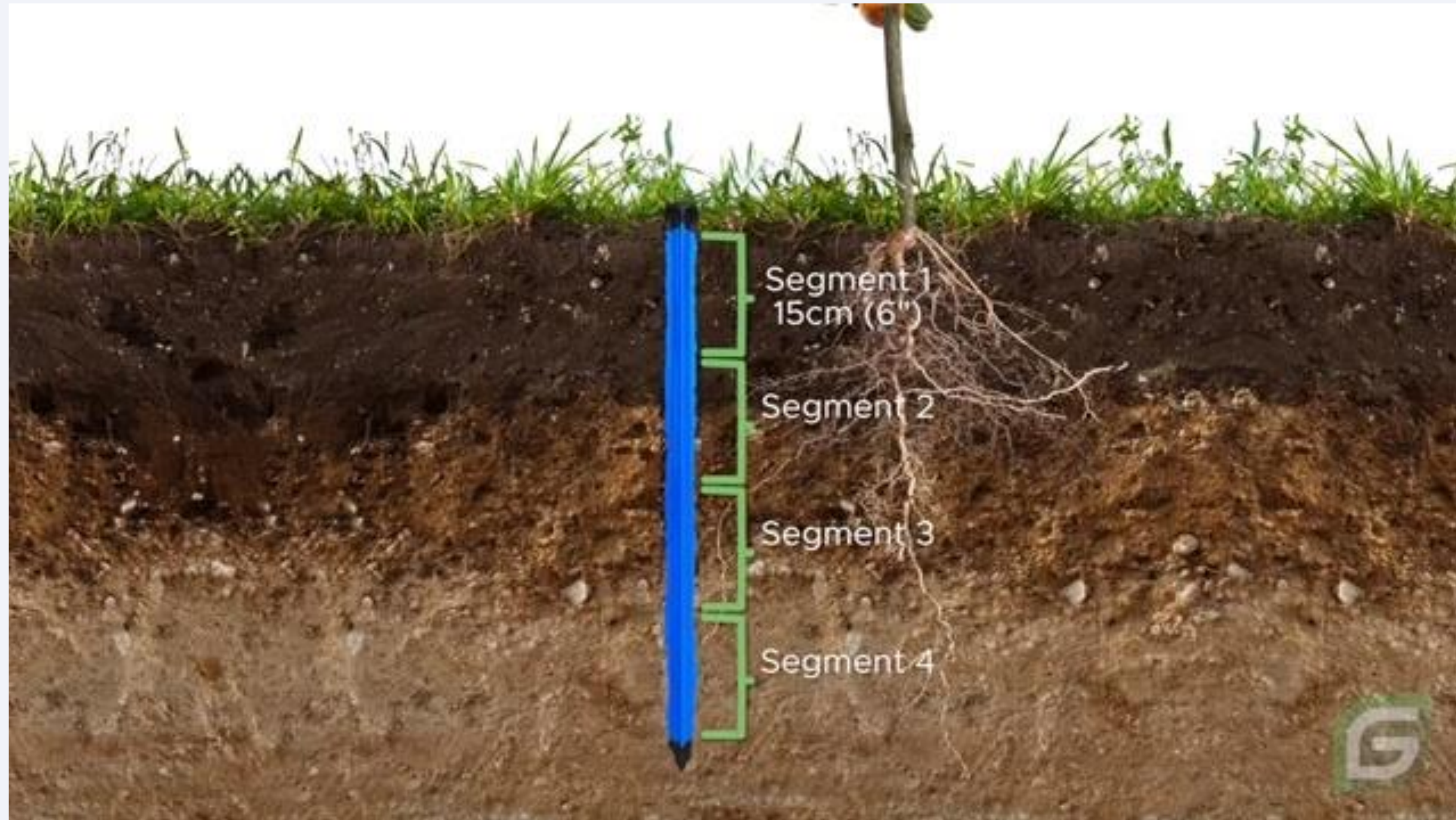
Penggunaan sumber daya air dengan lebih tepat sasaran

# Pertanian Cerdas Iklim (CSA).



Pemberian nutrisi yang seragam dan terukur bisa didapat dengan **desain** sistem yang tepat

# Pertanian Cerdas Iklim (CSA).



Monitoring kondisi tanah secara realtime dan menghubungkan dengan controller untuk mengelola sistem irigasi



*Work with the environment, not against it*



Scan for Contact

# MASSGRO

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+62 21 2972 5488

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