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PANEL #4

BARCELONA
2025

Theme
Sustainability

Topics: responsible computation, digital sustainability metrics, tech's role in energy transition.

Keywords: Green computing / sustainable ICT, Energy-efficient AI, Lifecycle carbon assessment, Circular economy for hardware, Environmental monitoring with AI, Climate-tech innovation, Water management.

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PANEL #4

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2025

Moderator

Dr. Mahmood Ahmad, RKH-WEFnex, Thailand

Panelists

Prof. Dr. Mamadou-Baïlo Camara, Universite Le Havre Normandie, France

Dr. Scient. Ketil Malde, Institute of Marine Research, Norway

Dr. Amir Dadrasi, Univerzita Karlova, Czech Republic

Prof. Dr. Pedro Gonçalves, Escola Superior de Tecnologia e Gestão de Águeda and Instituto de Telecomunicações, Portugal

Puja Bhetwal, RIZQ / YUNUS WEFnex Hub AIT, Thailand

Chair Introduction

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Sustainability today and tomorrow

Dr. Mahmood Ahmad, Director Climate Policy Research Center, Chanab Nagar , Pakistan

A sustainable economy -- economic system that meets the needs of the present generation without compromising the ability of future generations to meet their own needs — balancing

- economic growth,
- social well-being, and
- environmental protection.
- Question, how AI technology can help in sustainable growth with climate change happening faster than expected

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Chair Introduction

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Dr. Mahmood Ahmad,
Director Climate Policy Research Center, Chanab Nagar , Pakistan

Three pillars and examples

- Environmental Sustainability
- Uses natural resources at a rate that allows them to regenerate.
- Reduces pollution, carbon emissions, and waste.
- Promotes renewable energy, circular economy, and ecosystem protection.
- Example: In Chenab Nagar Pakistan, we showcased using COOL FARM, an AI driven tool, farmer through Regenerative Agriculture, using low cost technology we can earn carbon credits or carbon offsetting also showed cased in my work Puja and other researcher at CPRU
- 2. Economic Sustainability
- Ensures stable, inclusive economic growth that supports livelihoods.
- Encourages innovation, efficiency, and responsible investment.
- Avoids short-term profit at the expense of long-term stability.
- Example: A project at LUMS, Pakistan and work for World Bank showed for the adoption of nature-based technologies or practices to make economic sense, enhanced production with better quality must bring profits for the marketed produce, which is often not the case.
- Social Sustainability
- Promotes equity, fair wages, and community resilience.
- Ensures participation in decision-making.
- Reduces inequality and supports education and health for all.
- Example: We found in all pilot projects, we need to change the mindset of farmers, who are not prepared to take risk of loosing income due to reduced yield for few years, his main concern getting a price that can cover his cost and earn normal profits - BRIDGE FINANCUNG is NEEDED

Chair Introduction

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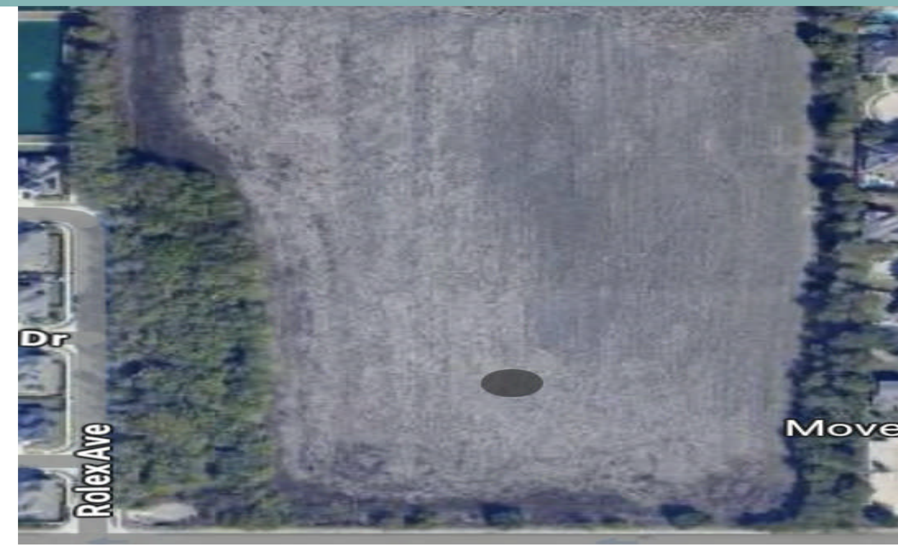
	CO_2 Seq tCO2/A/Y	Revenue $ /P/Y	Main Cost $/Y	Net Annual Benefit. $	Implem Cost $/A	Payback Period/ Year
RA	1.25	31.25	40	-8.75	150	NF
MRG	1.75	43.75	45	-1.25	250	NF
AF	6	150	50	100	300	3
NGR	2	50	30	20	200	10
S-TL	3.25	81.25	60	21.25	400	18.8
S-FS	4	100	55	45	350	7.8

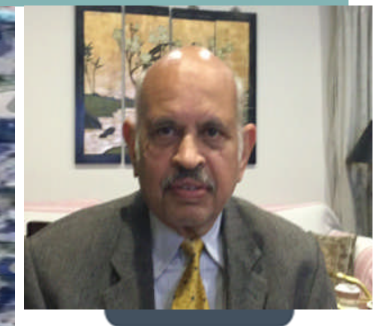
AI based Research Allen Farm in Dallas Texas

RA: Regenerative Agriculture
MRG: Managed Rotational Grazing

AF: Agroforestry
NGR: Native Grassland / Parkland Restoration
S-TL: Silvopasture (Trees + Livestock)

S-FS: Silviculture (Managed Forests + Soil)





Dr. Mahmood Ahmad, Director Climate Policy Research Center, Chanab Nagar , Pakistan

Panelist Position

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Energy transition = Current energy systems transforming process to obtain more sustainable and environmentally friendly (without compromising the future of next generations).

This process includes increasing the use of Renewable Energy (RE), improving energy efficiency, and reducing greenhouse gas emissions : Reducing our dependence on fossil fuels and promoting the use of RE sources (Solar, Wind, Hydropower, ..)

Mamadou-Baïlo CAMARA
GREAH-laboratory , University of Le Havre Normandie, FRANCE

Key Actions :

- Assessment of current energy needs
- Mitigating energy waste;
- Identifying available renewable energy sources;
- Implementing incentive policies;
- Doing consumer education and awareness

Panelist Position

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One of the potential solution = Multi-source and Multi-Energy system aggregation based on Smart grid concept

<u>Technical challenges:</u>

- How to increase the contribution of renewable energies without power grid disturbance
- How to increase the Energy Storage capability with cost reduction: High capacity batteries, Power-to-gas solution
- What Power Electronics topologies & Real-time Control strategy for the system
- How to design real-time Energy Management without Load Model & Data base
- How to integrate in real-time Energy Management the operating constraints: Dynamic characteristics of the sources, Lifetime of the components, Operating temperature, Intermittences of renewable energies , ...

Panelist Position

One of the potential solution = Multi-source and Multi-Energy system aggregation based on Smart grid concept

Economic & Political challenges:

- How to reduce initial infrastructure cost for users (industrial companies, farmers and local communities): the mechanisms of government aids
- How to develop clear regulations to promote the development of renewable energies.

Conclusion:

Energy transition is a complex issue which require a combination of the actions of the researchers, engineers, and policymakers.

Panelist Position

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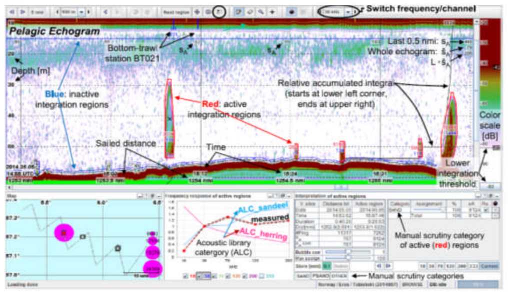
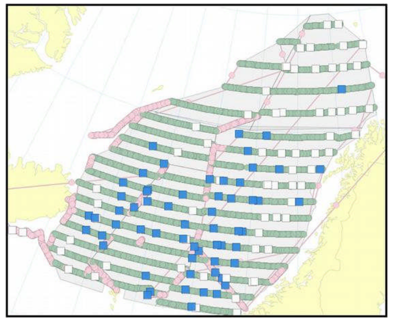
▪Sustainable fisheries management

Sensors



Scrutiny and integration
<use AI to replace manual process>



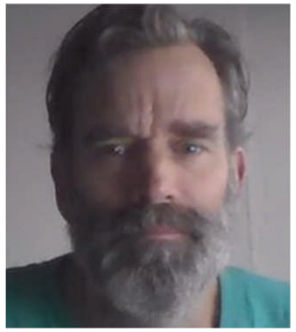
Survey estimation

Assessments and harvest control rules

Catch statistics

Estimating Catch at Age

Nils Olav Handegard
Institute of Marine Research, Norway
Ketil Malde



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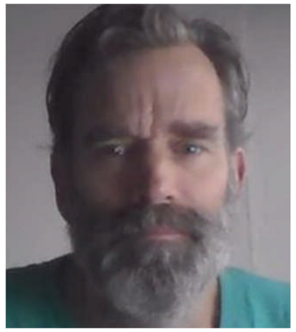
- Sustainable fisheries management
- Data quality
  - Which version of the data set was used for the asesessement?
  - Are there errors in the input data?
  - Are the data consistent between years?
- Trust
  - Are the AI models drifting?
  - How can we build trust in the method?
  - Semi manual operations for validation?
- Resources spending on AI-driven Digital Hassle
  - Requires different expertise than the usual domain expert
  - Difficult expertise to obtain
  - Loose oversight of the process, running blind

Nils Olav
Handegard
Institute of
Marine
Research,
Norway
Ketil Malde



Panelist Position

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Amir Dadrasi
Environment Centre, Charles University,Czech Republic

AI for Environmental Monitoring in Sustainable Agriculture

- **Challenge** Climate change threatens crop yields and water availability, impacting food security.
- **AI Solutions**
  - Monitor soil, crops, and weather in real-time using Internet of Things (IoT) sensors, drones, and satellites.
  - Predict pests and nutrient needs to reduce chemical use.
  - Optimize water use for efficient irrigation in water-scarce regions.
- **Impact:** Reduced resource waste, lower emissions, and resilient farming.
- **Discussion:**
- We need to explore the potential of AI for sustainability in two main areas: (1) using AI in research to promote sustainable practices, and (2) applying AI in real-world farming conditions.
- How can AI improve water management for smallholder farmers?
- What are the challenges of adopting these technologies in diverse agricultural contexts?

Implementation / Examples in research

- **Practical AI application:** In one of my recent projects, we used a **Genetic Algorithm** to optimize nitrogen and phosphorus fertilizer application in global agricultural systems. The goal was to **increase crop yield while minimizing greenhouse gas emissions and other environmental impacts.** This is a clear example of responsible computation and AI in sustainable agriculture.

Panelist Position

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Amir Dadrasi
Environment Centre, Charles University,Czech Republic

Concept: Energy-efficient AI tools enable sustainable farm management with minimal environmental impact

Key Strategies

• Lightweight AI on edge devices for real-time farm decisions (e.g., irrigation timing).
• Solar-powered sensors to reduce reliance on fossil fuels.
• Circular economy for AI hardware to minimize waste (e.g., recycling sensors).
• **Impact**: Lower energy use, cost savings for farmers, and sustainable farming practices.

Discussion

How can energy-efficient AI drive sustainability in resource-constrained rural farms?
How can circular economy principles be applied to farm tech for long-term sustainability?

Real Example: Big Terra's AI models in Czech regenerative agriculture projects predict crop resilience and support carbon farming with low-energy satellite data.

Big Terra uses AI models in Czech regenerative agriculture projects to forecast crop resilience and support carbon farming, primarily by analyzing low-energy satellite data to predict crop yields and monitor sustainable practices. These AI systems combine satellite imagery with other data like weather, soil, and topography to create models that help farmers transition to proactive management and make data-driven decisions for improved soil health and carbon sequestration.

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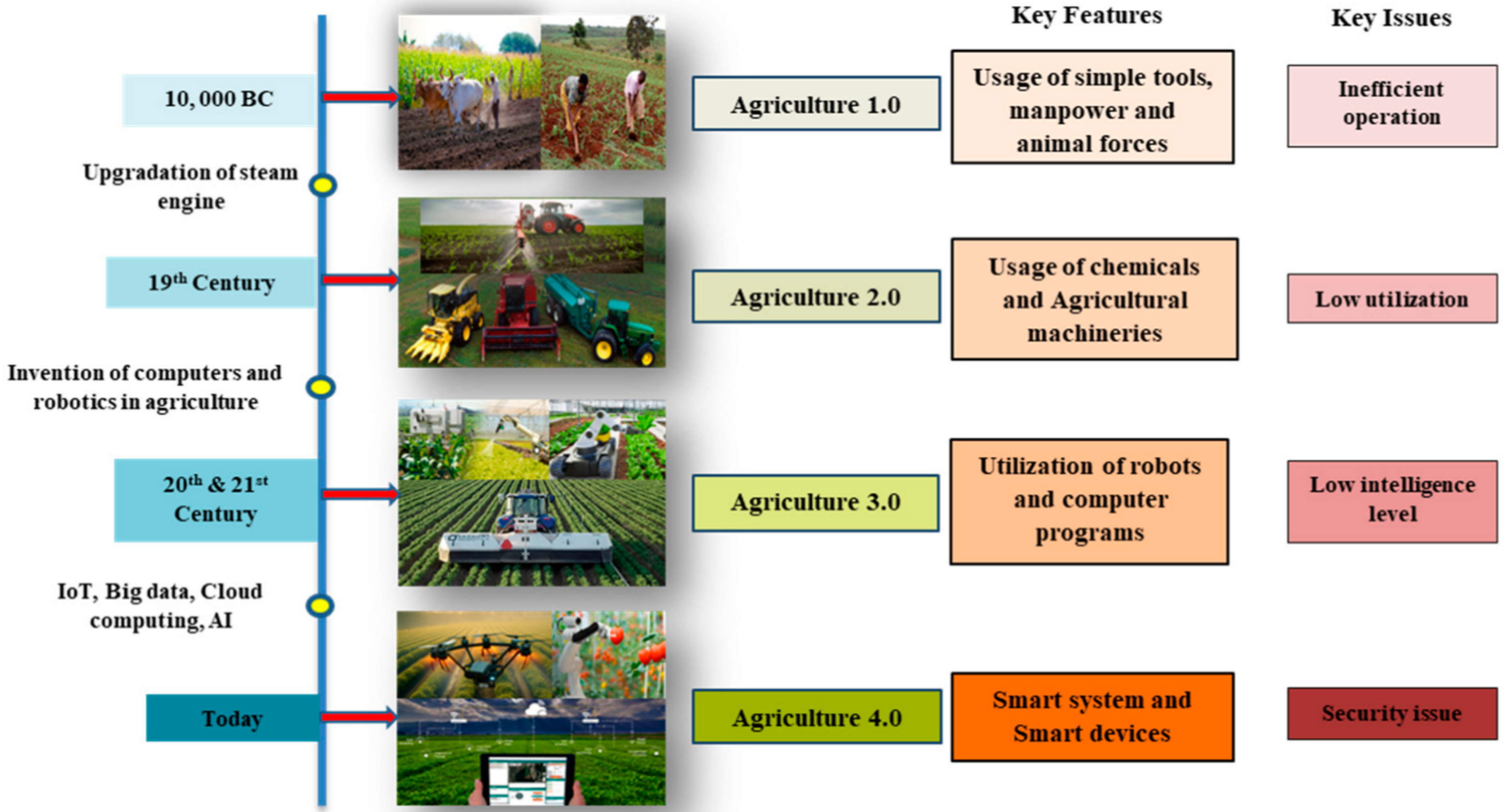
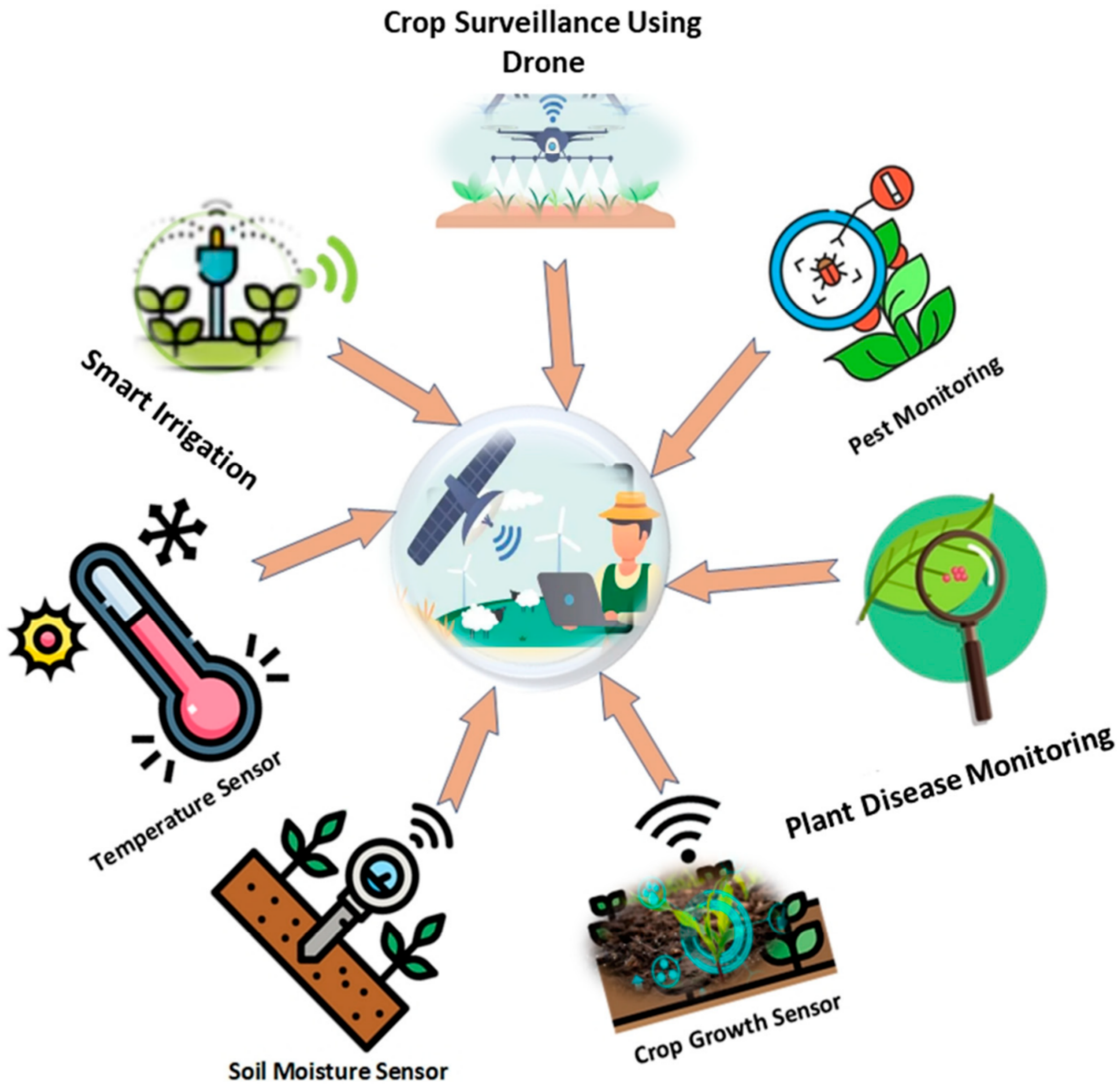


Amir Dadrasi
Environment Centre, Charles University,Czech Republic

Panelist Position



Amir Dadrasi
Environment Centre,
Charles University,Czech
Republic

Panelist Position

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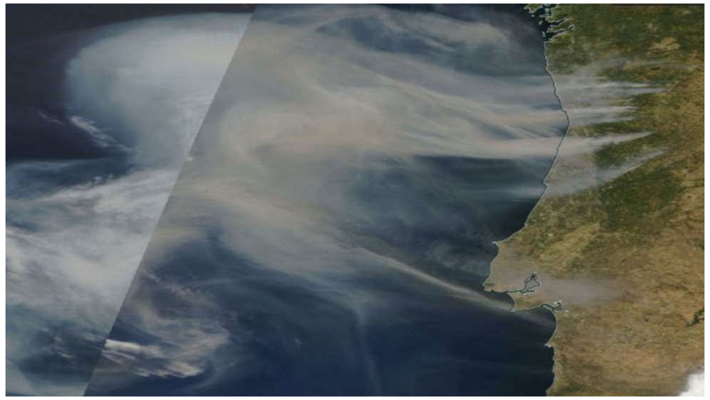
Pedro Gonçalves
Universidade de Aveiro

- **Grazing provides a relevant societal service**
  - Territories with temperate climates have regular problems with wildfires
    - 139,819 hectares Portugal; 504,000 hectares EU were burned in 2024
    - wildfire carbon emissions during the 2023-2024 fire season were approximately 2.4 gigatons of carbon, at global scale
      - 24 billion km of a EURO6 car
  - Abandonment of agricultural land leaves combustible material near villages
    - herbs and bushes grow during spring season, and get dry during the summer
    - any ignition takes the fire near the villages, the houses and people goods
  - Cost of fighting fires
    - 287 Million € , 221M€ for aerial means
    - The cost of a flying hour (either a plane or a Helycopter) 35.000€
  - Animals are very efficient removing the herbs and the bushes
    - they do not produce CO_2,
    - they don't need fuel.



Panelist Position

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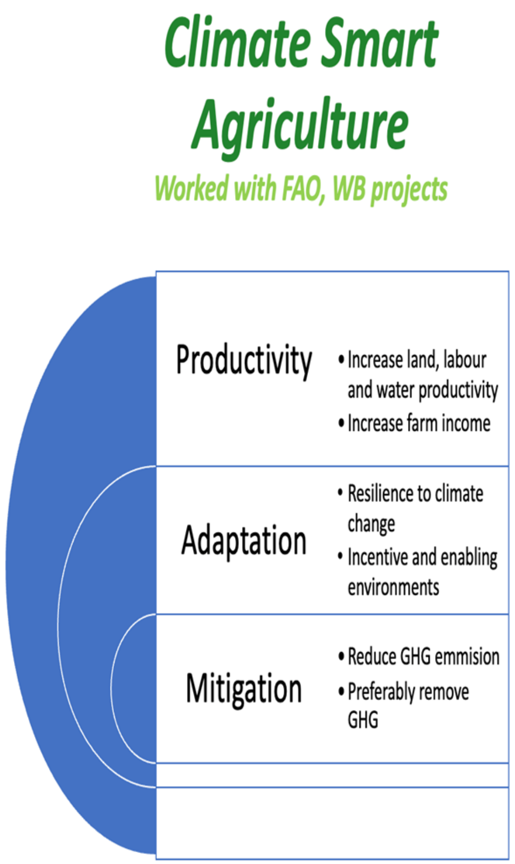
Pedro Gonçalves
Universidade de
Aveiro

- But no one pays for their service
  - Animal handling is a costly process
    - animal handling requires knowledge
    - they eat every day
    - their maintenance requires fences
    - travelling with animals require authorization
  - Consumption of sheep and goat meat is very low:
    - Pork: ~41.4, Poultry: ~28.8%, Beef: ~15.8%., Sheep and goats: ~3.9%.
      - Therefore, production yields reduced profits.

- Despite the fact that animals offer excellent by-products
    - Milk and cheese are highly appreciated.
    - Meat is consumed especially during Carnival and Easter.

Panelist Position

Nature based solution and use of AI – our going work



- **Land Allocation:** The 2-acre plot has been divided into 36 equal parts . Each pair of plots is allocated to the three cultivation techniques mentioned above, ensuring a comprehensive comparison.

- **Cultivation Techniques:**

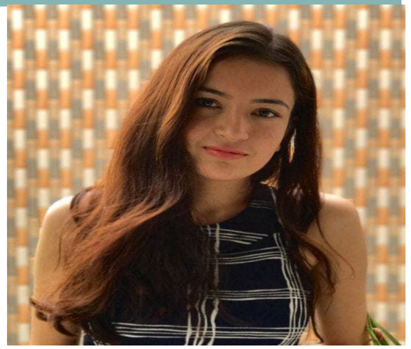
System of Rice Intensification (SRI): *This method focuses on planting younger seedlings singly and widely spaced, maintaining soil aeration, and ensuring intermittent watering.*

1. ***Direct Seeded Rice (DSR):*** *Seeds are directly sown in the field, which reduces labor and water requirements.*
2. ***Traditional Method:*** *Conventional practices involving transplanting seedlings into puddled fields.*

- **Water Conservation:**

Alternate Wetting and Drying (AWD): *A water-saving technique thatinvolves periodic drying and wetting of fields.* Perforated PVC pipes *or **field water tubes** are inserted into the soil to monitor the water level, ensuring it reaches the desired depth before re-flooding the field (Fig 2).*

Traditional Irrigation: *Continuous flooding of fields.*



Research Associate
Climate Policy Research Unit,
Based in Nepal

Panelist Position

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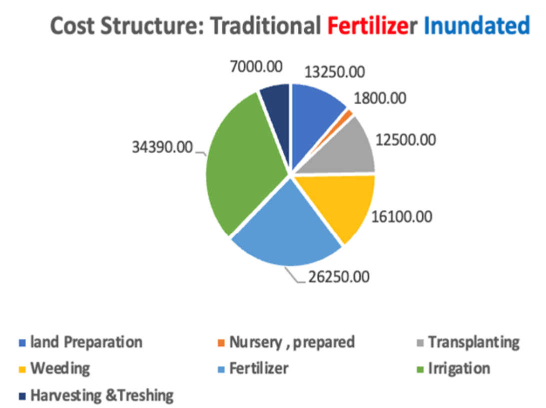
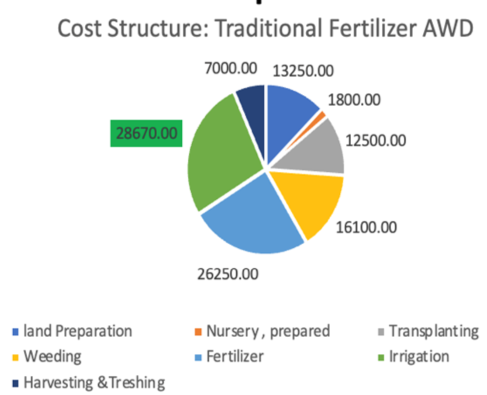
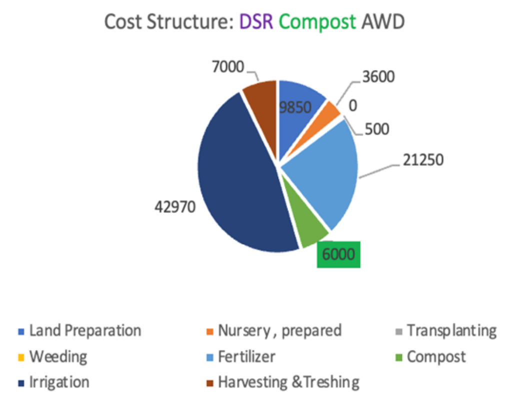
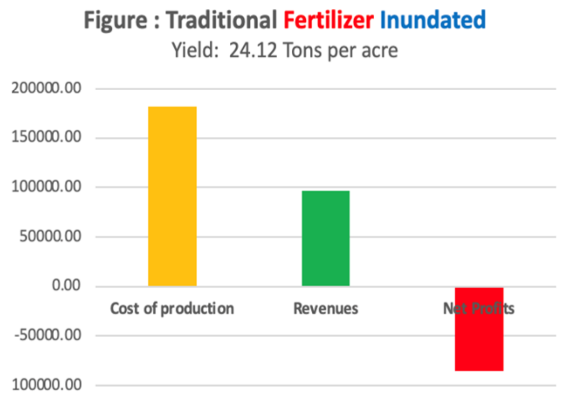
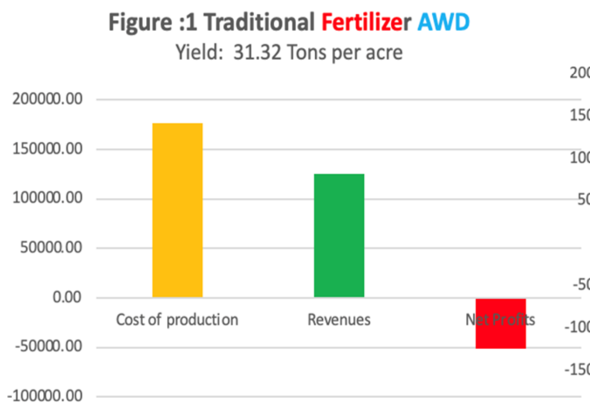
Cost of Environmental Compliance and Policy Failure

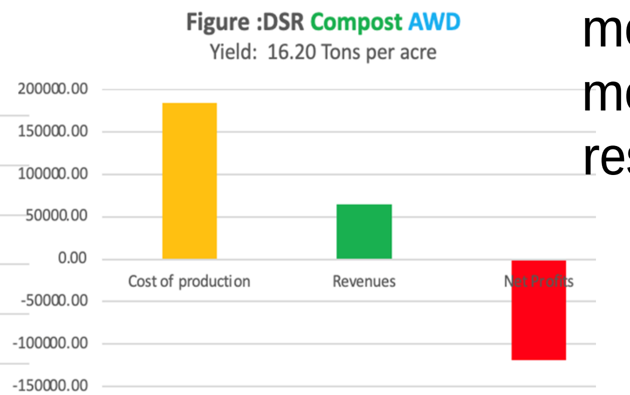




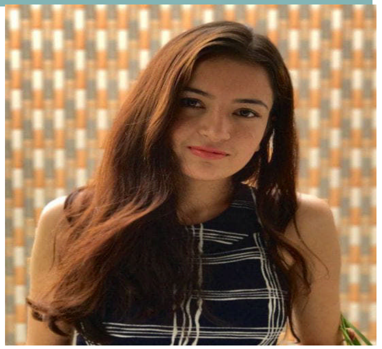








Cost of Compliance is least in AWB but water monitoring through human labour was not perfect
We plan to Install AI driven sensor monitoring to get more accurate results



Research Associate
Climate Policy Research Unit,
Based in Nepal

THE STAGE IS YOURS