TechWorld 2024 & DigitalSustainability 2024

PANEL #2

Advances in Accessible Digital Agriculture Technologies

CONTRIBUTORS

Moderator

Dr. Izar Azpiroz, Fundacion Vicomtech, Spain

Panelists

Prof. Dr. Sandra Sendra, Universitat Politècnica de València, Spain

Dr. Laura García, Universidad Politécnica de Cartagena, Spain

Dr. Mahmood Ahmad, RIZQ/YUNUS WEFnex Hub AIT, Thailand

Prof. Dr. Petre Dini. IARIA. USA/EU

Izar AZPIROZ

vicomtech
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

USE CASE
Reconstruction of Valencian agriculture areas

- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**

- **Pre-Disaster: Early Detection and Preparedness**
  - Example:
    - An early warning system to detect and transfer information about potential natural disasters, such as floods, droughts, or storms. This system can use real-time data from satellite imagery, weather forecasting models, and sensor networks to predict risks and provide timely alerts to farmers and communities.

Moderator Position

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- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **Pre-Disaster: Early Detection and Preparedness**
  - Possible **requirements** for these technologies:
    - **Data Compression**: Efficient data management to reduce bandwidth usage, especially in remote areas with limited connectivity.
    - **Cloud Storage**: Access to cloud-based storage for managing large data volumes securely and remotely.
    - **Real-Time Alerts:** Notifications for authorities, farmers, and responders based on detected anomalies or hazards.
    - **Predictive Analytics:** Use of AI/ML models to forecast potential threats (e.g., landslides, floods).
    - **Edge Computing:** Processing data at the source to reduce latency and dependency on central data centers, especially valuable in rural or remote regions where connectivity is limited.
    - **Data Encryption:** Security measures to protect sensitive data during transmission and storage, ensuring data integrity and privacy, especially crucial in high-stakes scenarios.
    - **Geospatial Mapping and Analysis:** GIS integration for real-time mapping and spatial data analysis, aiding in visualizing risk areas, crop conditions, and natural hazard paths.
    - **Internet of Things (IoT) Sensor Networks:** Deployment of robust, weather-resistant sensors (e.g., for soil moisture, temperature, rainfall) to gather continuous, on-the-ground data.

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- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **Pre-Disaster: Early Detection and Preparedness**
  - Possible **requirements** for these technologies:
    - **Drones and Satellite Imagery:** Remote sensing through UAVs and satellite imagery to monitor large areas and detect early warning signs such as changing river levels or crop stress.
    - **Interoperability Standards:** Ensuring that various digital systems (IoT, data analytics platforms, weather systems) can communicate seamlessly, promoting data sharing across agencies and stakeholders.
    - **AI-Driven Image Recognition:** Identifying changes in vegetation, water bodies, and land use that indicate potential hazards, leveraging machine learning on visual data from satellites and drones.
    - **Automated Report Generation:** Rapidly creating and distributing reports based on sensor data, analytics, and predictive models, tailored to the needs of local authorities and farmers.
    - **Scalability and Load Balancing:** Cloud or hybrid architecture that can handle high volumes of data and users during disaster events, scaling as needed without compromising performance.
    - **Localized Language Support:** Interfaces and notifications in local languages to improve accessibility and comprehension for local farmers and first responders.

- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **During Disaster: Monitoring and Immediate Response**
  - Example:
    - Satellite imagery-based interferometry maps, which are frequently updated, to track changes in land elevation and water levels during floods. These maps can help assess damage, guide emergency responses, and provide critical information for local authorities and farmers to make informed decisions in real-time.

Open Discussion

- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **During Disaster: Monitoring and Immediate Response**
  - Possible **requirements** for these technologies:
    - **Streaming**: Continuous data feed to provide real-time monitoring.
    - **Responsive**: Rapid adaptability to distinct devices.
    - **Data Integration**: Ability to integrate multiple data sources (e.g., satellite, UAV, IoT sensors).
    - **High-Resolution Imaging:** Use of high-quality satellite or drone imagery for accurate mapping.
    - **Low Latency**: Minimal delay in data processing and transmission to ensure timely responses.
    - **Reliability**: Consistent system performance under unstable or high-traffic conditions.
    - **Scalability**: Capacity to scale up or down to handle varying data loads and cover large areas.

Open Discussion

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- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **Post-Disaster: Recovery and Reconstruction**
  - Example:
    - Use of drone technology and remote sensing tools to assess damage to agricultural land, infrastructure, and crops after a disaster. This data can help in planning efficient recovery efforts, such as identifying areas that need immediate attention or where resources like water or seeds should be distributed.

Open Discussion

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- **How to Apply Digital Agriculture Technologies in Natural Disaster Scenarios**
- **Post-Disaster: Recovery and Reconstruction**
  - Possible **requirements** for these technologies:
    - **Data Validation**: Mechanisms to ensure accuracy and reliability of post-disaster assessments.
    - **Historical Comparison**: Tools to compare current and past disaster data to estimate impacts.
    - **Digital Documentation**: Collection of digital records for insurance, compensation, and rebuilding assistance.
    - **Geo-referenced Analysis**: Use of GIS to map damage levels and prioritize recovery efforts.
    - **User-Friendly Interface**: Simplified dashboards for accessibility by local stakeholders, not just experts.
    - **Offline Access**: Solutions for intermittent connectivity, allowing access in low-internet areas.
    - **Crowdsourcing**: Enabling community participation in data collection for localized impact information.
    - **Longitudinal Tracking**: Tools to monitor recovery progress over time, useful for rehabilitation planning.
    - **Reporting Automation**: Auto-generated reports for relevant agencies and organizations.
    - **Data Security**: Ensuring sensitive data is protected, especially in vulnerable post-disaster settings.

IARIA

Panelist Position

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Sandra Sendra

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

- **OPEN DATA FOR ALL AND EMPOWERING OF FARMERS THROUG TRAINING CAMPAINGS**
  - **Transparency and Empowerment:** Access to data can empower citizens and farmers, enabling them to make informed decisions about agricultural practices and sustainability.
  - **Improvement of Efficiency:** Accessible data optimizes resources, improves yields, and reduces operational costs.
  - **Innovation and Collaboration:** Data platforms foster innovation and collaboration among farmers, researchers, and technology companies.
  - **Mindset Change:** It is crucial to educate farmers and citizens about the benefits of digital technologies in agriculture.
  - **Inclusion and Equity:** Awareness campaigns can change perceptions and ensure that all farmers have access to the necessary information and tools, promoting inclusion and equity.

Panelist Position

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Laura García

Universidad Politécnica de Cartagena

People-oriented technologies for digital agriculture

- **Using technologies to improve peoples lives – PostLab** EUT+ European University of Technology

- **Agrivoltaics: Bringing power to rural communities.**
  - Double use of land.
    - Allows farmers to have another source of revenue independent of crops.
    - Allows the deployment of autonomous greenhouses.
    - Energy surplus can power houses and factories.

- **AI and computer vision: Software tools for all types of data and all types of devices.**
  - Top sensing at the hands of any farmer using smartphones.
  - Improving the low-cost sensor readings with AI.
  - Predictions for early decision-making to obtain better-quality crops.

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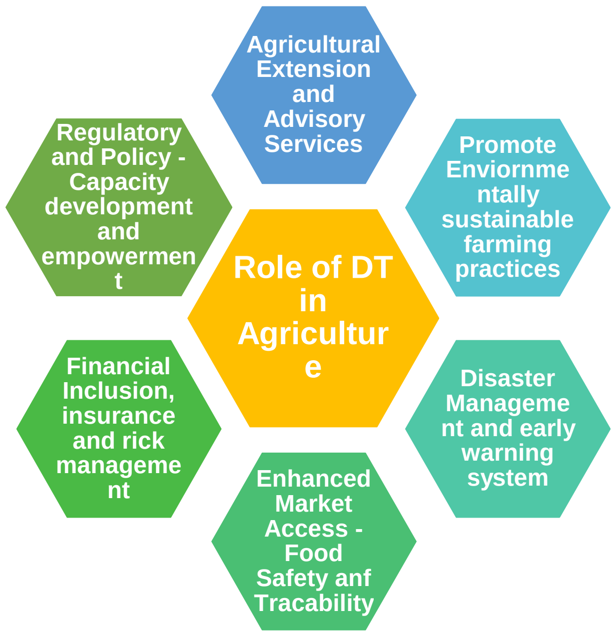

Digital Driven Service Providers for Farm Practices	Market linkages - Farm level	Digital Driven Financial Services- GTZ and Easy Piasa
bridge the gap between agricultural researchers, extension agents and farmers)	Digital Driven Market linkages - Consumer Levels	Retail Shops (chains) Online Delivery

RIZQ/YUNUS WEFnex Hub AIT, Thailand

Two success stories

- Use of Digital technology in rural Bangladesh: During Pandemic, through the virtual call centers, farmers have sold products worth more than Taka 34.4 million to buyers including private companies.
- Easy Piasa in Pakistan: tap the unbanked population of the country, especially help those who are working in cities and need to send money to their families in rural area

Challenges

- Digital Divide
- Infrastructure and Connectivity
- Digital Literacy and Skills:
- Data Management and Analytics
- Cybersecurity and Data Protection

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Major technologies for transforming farming

Petre Dini
IARIA
USA/EU

Precision Agriculture: GPS, IoT devices, and sensors to monitor field conditions; precise amounts of water, fertilizers, and pesticides.

Remote Sensing: Satellites, drones, and aircraft collect data; monitor crop health, soil conditions, and weather patterns; planting, irrigating, and harvesting.

Farm Management Software:Integrated platforms; unified view of their operations; resource management, planning to financial accounting, and market access.

Mobile Applications: Mobile apps for real-time information and services directly to farmers' smartphones; easy access to weather forecasts, market prices, and agricultural advice.

Automated and Robotic Systems: Robotic harvesters, autonomous tractors, and drones for spraying, automation; reduce the labor intensity, increases precision, and can improve safety and efficiency.

IoT and Smart Farming: IoT devices for monitoring conditions like soil moisture, crop health, and livestock conditions, transmitting data to farmers/automated systems to optimize care and resources.

Blockchain for Traceability: Blockchain technology is used to create transparent, tamper-proof records for food traceability; food safety, supply chain efficiency, and consumer trust.

Artificial Intelligence and Machine Learning: AI and ML analyze data from various sources for crop prediction, pest and disease prediction, and yield optimization.

Vertical and Urban Farming: Optimization of growing conditions in vertical and urban farming environments; hydroponic, aeroponic, or aquaponic systems; reduce the carbon footprint associated with transporting food into cities.

Solar-powered Solutions: To power farming operations; irrigation pumps to sensor networks, reducing the dependency on non-renewable energy sources and lowering operating costs.

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Mobile apps to deliver real-time information and services directly to farmers' smartphones

Petre Dini
IARIA
USA/EU

AgriWebb: To monitor livestock management, helping farmers track animal movements, manage breeding data, and record medical treatments.; compliance reporting and operational efficiency.

FarmLogs: To monitor field conditions, plan and manage crop rotations, track weather updates, and analyze satellite imagery to assess crop health and growth trends.

Granular: Provides a suite of tools including operational planning, inventory management, and field-level profitability analysis; optimize resources and manage businesses

Climate FieldView: Allows farmers to collect, store, and visualize critical field data to optimize inputs and improve crop performance; tools for field health imagery and weather tracking.

myAgro: (primarily at farmers in Africa), helps users plan their planting season, make payments for seeds and fertilizer, and receive tailored agronomic advice via SMS.

aWhere: It offers hyper-local weather data and agricultural insights that help farmers manage daily operations, understand weather patterns, and make better agronomic decisions.

Tambero: It focuses on dairy and meat cattle as well as crop management. It offers features for monitoring herd health, feeding, milking, and breeding.

Farm At Hand: A management app that helps farmers keep detailed farm records and manage their inventories; from planning and planting to harvesting and selling

Agroptima: It allows farmers to easily record farming activities as they happen, plan future tasks, and analyze historical data for better decision-making.

CropX: It offers soil sensor technology and integrates data analytics to provide farmers with insights about irrigation and crop management to optimize water usage and improve yields.

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Flooding issues

Petre Dini
IARIA
USA/EU

➢ Most Advanced Achievements for Agriculture/Crop Protection Systems in Case of Flooding

Flood-Resistant Crop Varieties: Crop varieties that can withstand short periods of flooding. These varieties, such as Sub1 rice, have genes that allow them to survive submerged conditions by slowing their growth until waters recede.

Water-Sensitive Irrigation Systems: Irrigation systems equipped with sensors can adjust watering schedules based on the moisture content of the soil; thie technology prevents over-saturation and manage water use more efficiently during flood threats.

Elevated Farm Structures: Techniques such as raised beds, ridges, and elevated platforms for planting are being used to keep crops above flood levels.

Flood Forecasting and Early Warning Systems: Satellite data and predictive analytics provide timely warnings to farmers about impending floods; preventive measures - early harvests, water barriers.

Integrated Watershed Management: It manages both water and land resources to mitigate flooding. It includes constructing reservoirs, improving drainage systems, and restoring wetlands, which act as natural buffers against floods.

Bioengineering Techniques: The use of plants and other natural materials to reinforce riverbanks and slopes in agricultural areas can help prevent soil erosion during floods and reduce the impact on crops.

➢ Most Potential Failures in Agriculture/Crop Protection Systems in Case of Flooding

Infrastructure Failure: Levees, dams, and other water control structures can fail if they are not properly maintained or designed to handle extreme weather events, leading to catastrophic flooding.

Overreliance on Technology: Excessive dependence on advanced technology and automated systems; lack of preparedness for unexpected failures or malfunctions, ... sensor errors or system breakdowns during critical times.

Inadequate Drainage Systems: Poorly designed or insufficient drainage systems can exacerbate flooding conditions; especially in low-lying agricultural lands, by failing to effectively divert floodwaters.

Lack of Localized Solutions: Protection strategies that do not consider local geographical and climatic conditions may fail because they are not tailored to the specific needs and risks of the area.

Economic Constraints: Small-scale farmers often lack the financial resources to invest in advanced flood protection systems, making them more vulnerable to flood impacts.

Environmental Degradation: Continued degradation of natural landscapes and ecosystems can diminish their capacity to absorb floodwaters, leading to increased flood risks and potential system failures.

Delayed or Inaccurate Warning Systems: Failures in early warning systems due to technical glitches, slow data processing, or miscommunication can lead to inadequate response times, preventing timely protective measures.

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