11-12 FEBRUARY 2025

RABAT, MOROCCO

Institut Agronomique et Vétérinaire Hassan II

BONEX

SURE NEXUS

WEFE NEXUS INTERNATIONAL CONFERENCE

EXPLORING AND BRIDGING NEXUS FOR A SUSTAINABLE FUTURE

PRIMA IN THE MEDITERRANEAN AREA

These projects are part of the PRIMA programme supported by the European Union.

WEFE NEXUS INTERNATIONAL CONFERENCE

Day 2 – 12th February 2024

INNOVATIVE SOLUTIONS FEATURING INNOVATIVE, DISRUPTIVE TECHNOLOGIES, NATURE-BASED SOLUTIONS (NBS), ANCESTRAL PRACTICES, AND MORE…..

An innovative methodology for technology selection utilizing Artificial Intelligence within the WEFE Nexus framework.

O.L. Sánchez Santander, *J. García Subirana, J.L. Pérez, P. Fonseca i Casas, J. Morató Farreras*

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An innovative methodology for technology selection utilizing Artificial Intelligence within the WEFE Nexus framework

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UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
UNESCO Chair on Sustainability

unesco Chair

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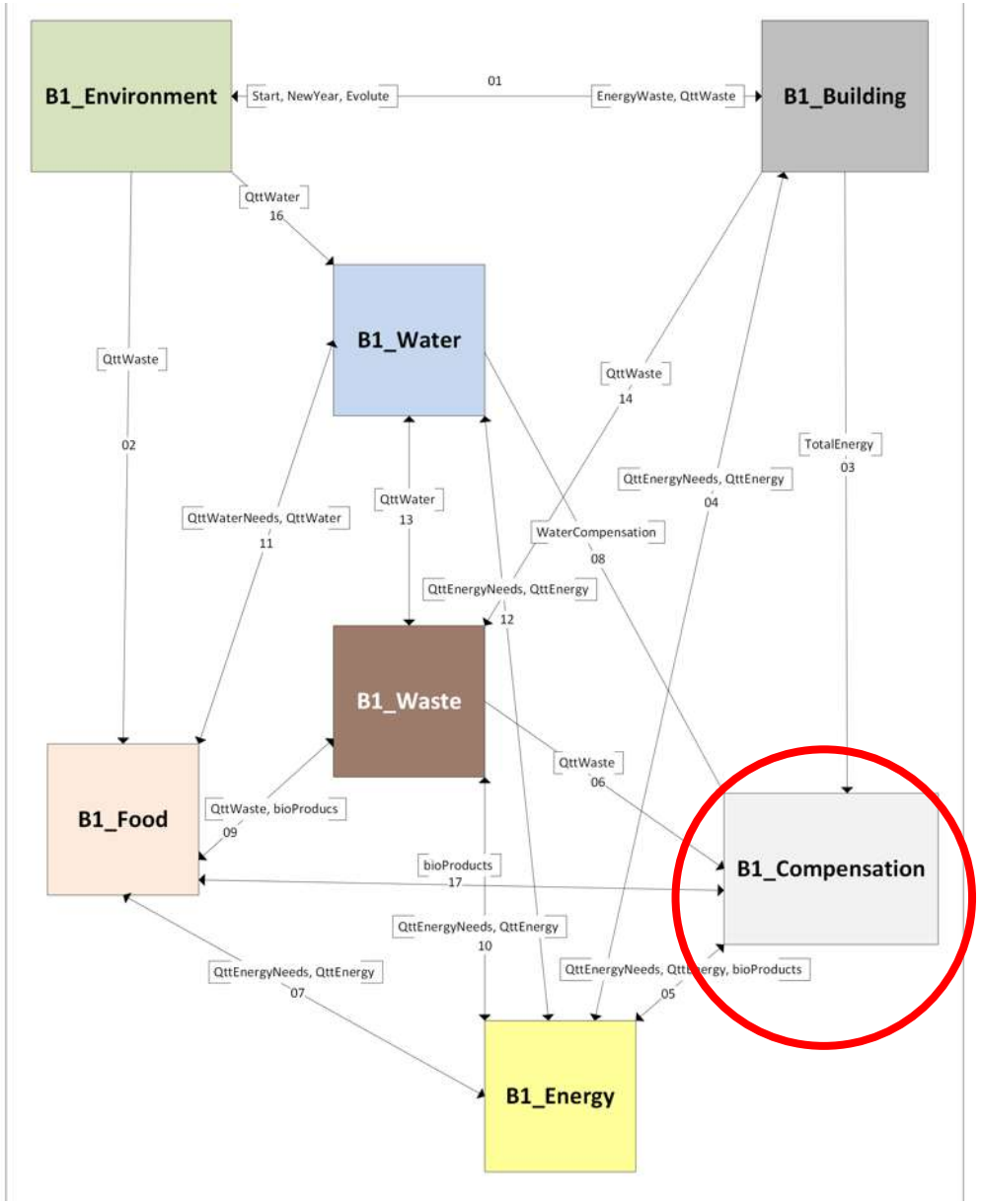

How artificial Intelligence (AI) can help to select best technologies for WEFE NEXUS?

TECHNOLOGY SELECTION BY COMPENSATION BLOCK

AI analyzes **WEFE Nexus interactions and trade-offs** using a “compensation module” with semi-automated technology selection to optimize water, food, and energy security while reducing ecological impact.

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Identifying most effective strategies for

Water Security
Energy Security
Food Security
Ecological Resilience

The SureNexus WEFE Nexus AI Tool is designed to support technology selection for:

- Best **NBS** Treatment
- Find **Energy** Recovery
- Find **Bioproduct** Recovery

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Compensation Block DB

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AI DATABASES FOR TECHNOLOGY SELECTION

#WATER

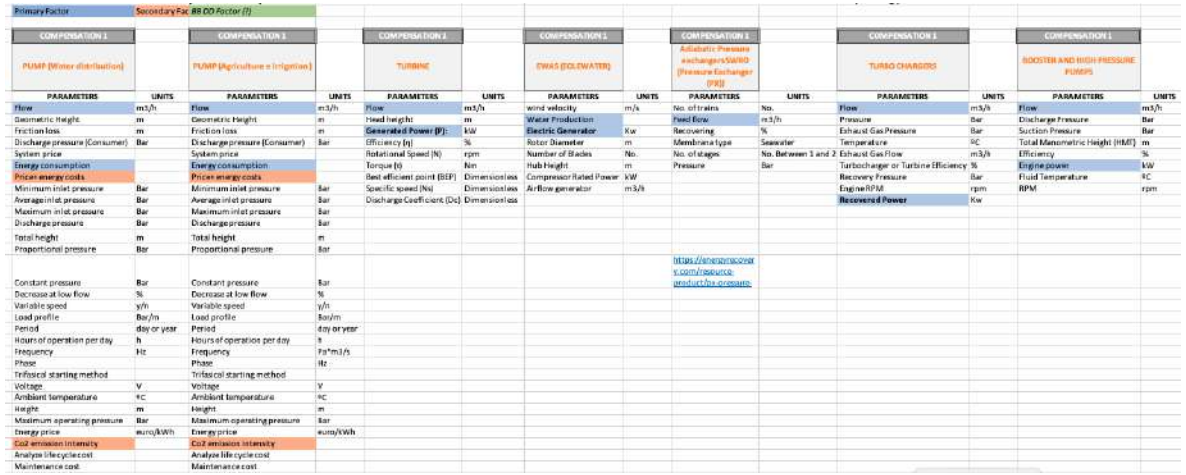
NBS FOR WATER TREATMENT

#ENERGY

ENERGY RECOVERY

#BES

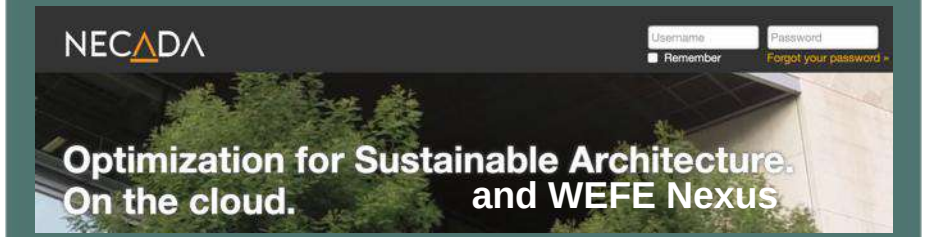
BIOECONOMY PRACTICES & SOLUTIONS



COMPENSATION 1		COMPENSATION 1		COMPENSATION 2		COMPENSATION 1		COMPENSATION 1		COMPENSATION 1		COMPENSATION 1	
PUMP (Water distribution)		PUMP (Agriculture e Irrigation)		TURBINE		EWAS (DESEWATER)		Adiabatic Pressure exchangers/SWRO (Pressure Exchanger (PX))		TURBO CHARGERS		BOOSTER AND HIGH PRESSURE PUMPS	
PARAMETERS	UNITS	PARAMETERS	UNITS	PARAMETERS	UNITS	PARAMETERS	UNITS	PARAMETERS	UNITS	PARAMETERS	UNITS	PARAMETERS	UNITS
Flow	m3/h	Flow	m3/h	Flow	m3/h	wind velocity	m/s	No. of trains	No.	Flow	m3/h	Flow	m3/h
Geometric Height	m	Geometric Height	m	Head height	m	Water Production		Feed flow	m3/h	Pressure	Bar	Discharge Pressure	Bar
Friction loss	m	Friction loss	m	Generated Power (P):	kW	Electric Generator	Kw	Recovering	%	Exhaust Gas Pressure	Bar	Suction Pressure	Bar
Discharge pressure (Consumer)	Bar	Discharge pressure (Consumer)	Bar	Efficiency (η)	%	Rotor Diameter	m	Membrane type	Seawater	Temperature	ºC	Total Manometric Height (HMT)	m
System price		System price		Rotational Speed (N)	rpm	Number of Blades	No.	No. of stages	No. Between 1 and 2	Exhaust Gas Flow	m3/h	Efficiency	%
Energy consumption		Energy consumption		Torque (τ)	Nm	Hub Height	m	Pressure	Bar	Turbocharger or Turbine Efficiency	%	Engine power	kW
Price energy costs		Price energy costs		Best efficient point (BEP)	Dimensionless	Compressor Rated Power	kW			Recovery Pressure	Bar	Fluid Temperature	ºC
Minimum inlet pressure	Bar	Minimum inlet pressure	Bar	Specific speed (Ns)	Dimensionless	Airflow generator	m3/h			Engine RPM	rpm	RPM	rpm
Average inlet pressure	Bar	Average inlet pressure	Bar	Discharge Coefficient (Cs)	Dimensionless					Recovered Power	Kw		
Maximum inlet pressure	Bar	Maximum inlet pressure	Bar										
Discharge pressure	Bar	Discharge pressure	Bar										
Total height	m	Total height	m										
Proportional pressure	Bar	Proportional pressure	Bar										
								https://energyrecovery.com/resource-product/hx-pressure-					
Constant pressure	Bar	Constant pressure	Bar										
Decrease at low flow	%	Decrease at low flow	%										
Variable speed	y/n	Variable speed	y/n										
Load profile	Bar/m	Load profile	Bar/m										
Period	day or year	Period	day or year										
Hours of operation per day	h	Hours of operation per day	h										
Frequency	Hz	Frequency	Pa*m3/s										
Phase		Phase	Hz										
Trifasical starting method		Trifasical starting method											
Voltage	V	Voltage	V										
Ambient temperature	ºC	Ambient temperature	ºC										
Height	m	Height	m										
Maximum operating pressure	Bar	Maximum operating pressure	Bar										
Energy price	euro/kWh	Energy price	euro/kWh										
Co2 emission intensity		Co2 emission intensity											
Analyze life cycle cost		Analyze life cycle cost											
Maintenance cost		Maintenance cost											

COMPENSATION NECADA DB

Enter technologies in AI Necada



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View of Compensation DB to enter water/energy/bioproduct information

Compensations

Create a new one

Name — Name of the Compensation.

Description — Description of the Compensation.

Cost (€) — Cost of building it.

0

Maintenance Cost (€/day) — Maintenance Cost per Year.

0

Make this compensation public — Choose whether your compensation will be public or private.

Compensations

Compensation's List

ID	Name	Description
1	Aerated constructed wetlands	Aerated treatment wetlands (AETs) are an advanced type of treatment wetlands (TWs), which allow more efficient removal of contaminants from wastewater owing to the higher availability of oxygen. This subsurface flow system is aerated mechanically from below, with an appropriate distribution system of air. This system is ideal for treating wastewater with high organic matter loads and for minimizing the land footprint of the TW.
2	Agitated bay composting with biofilter	In an enclosed building, the material to be composted is placed in uncovered bays. Forced aeration is carried out in combination with mechanical turning. The biofilter is used to treat the removed air from the building.
3	Agroforestry	Agroforestry is the integration of agriculture and trees, including the agricultural use of trees. This comprises trees on farms and in agricultural landscapes, farming in forests and along forest margins and tree-crop production. (Source: worldagroforestry.org)

Add a Compensation

Name:

Aerated constructed wetlands

Description:

Aerated treatment wetlands (AETs) are an advanced type of treatment wetlands (TWs), which allow more efficient removal of contaminants from wastewater owing to the higher availability of oxygen. This subsurface flow system is aerated mechanically from below, with an appropriate distribution system of air. This system is ideal for treating wastewater with high organic matter loads and for minimizing the land footprint of the TW.

Cost (€):

2067.23

Maintenance Cost (€/day):

12.46

Choose time units:

- Years
- Months
- Days

Input parameters

Ecosystem:

Solid Waste (Kg/day): 200

Liquid Waste (m3/day): 200

Impact (CO2, Toxicity,...): 200

Food:

Consumption (kg/day): 200

Water:

Flow (m3/day): 200

Water Storage (m3H20/day) 200

Welland area (m2) 200

Volume of welland (m3) 200

Energy:

Energy Consumption (Kw/day): 200

Output parameters

Ecosystem:

Solid Waste (Kg/day): 200

Liquid Waste (m3/day): 200

Impact (CO2, Toxicity,...): 200

Food:

Production (kg/day): 200

Water:

Removal TSS (%) 200

Removal TDS (%) 200

Removal BOD (%) 200

Removal COD (%) 200

Removal Nitrogen (N) (%) 200

Removal Phosphorus (P) (%) 200

Removal Heavy Metals (mg/L) 200

Removal Organic compounds (Chlorpyrifos) (%) 200

Energy:

Energy Generated (Kw/day): 200

Save changes

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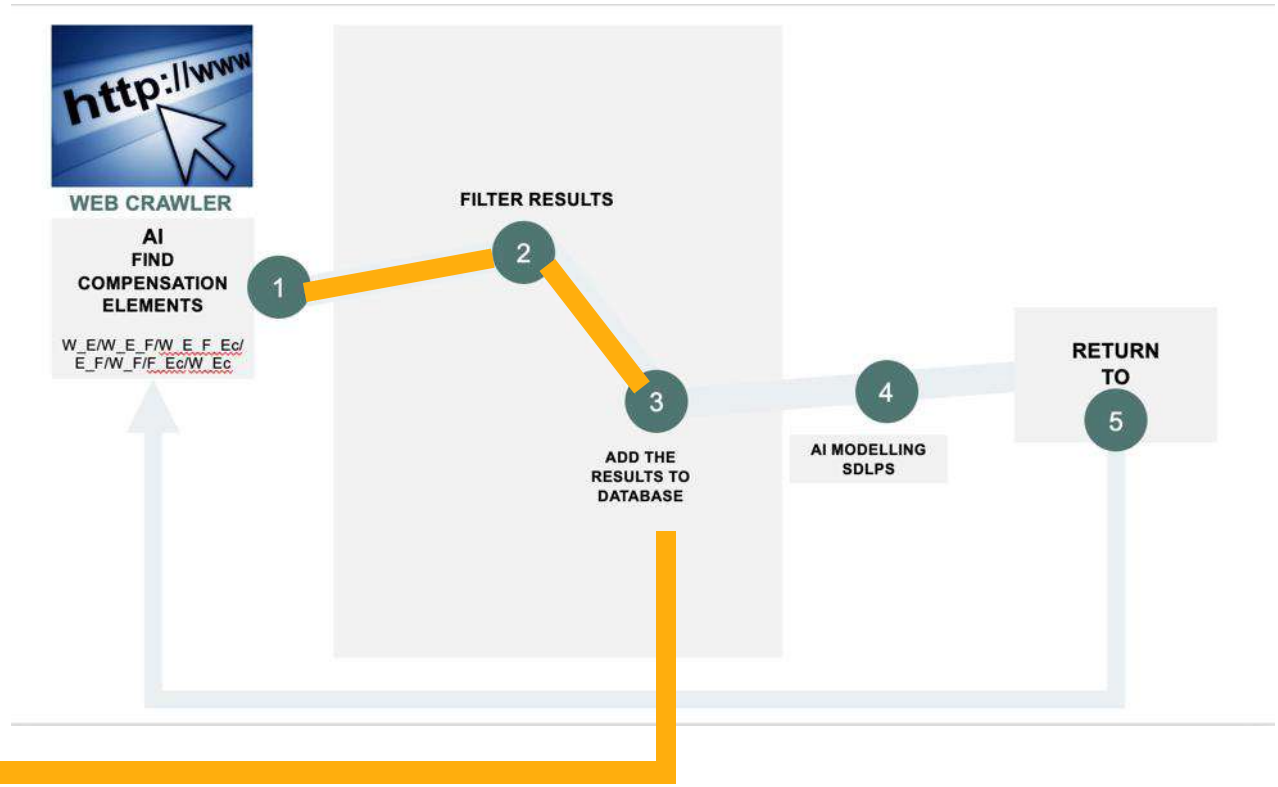
Semi/Automated Compensation Data entry with LLM

#WATER
#ENERGY
#BES

DATABASES

Completing DB from Webpage

Semi-Automated Completion of DB



The AI system will not automatically add new elements. Instead, it will propose them, and **a technical user will review and decide whether to incorporate them into the database**

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TECHNOLOGIES FOR WATER TREATMENT AND EFFICIENCY IMPROVEMENT

TREATMENT WETLAND

UNDERGROUND IRRIGATION

MANGROVE SOLAR DESALINATION

ANCESTRAL HYDROTECHNOLOGIES

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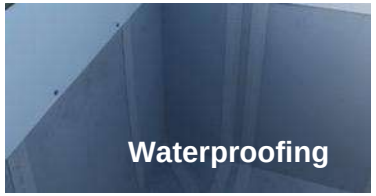
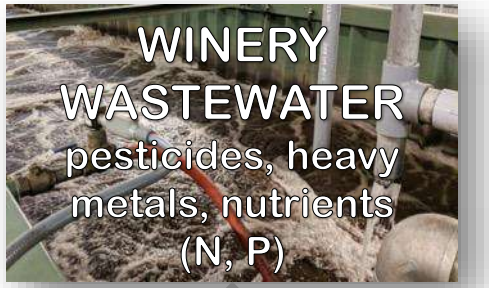
DS 1A (Spain): Vineyard & Winery Demo Site – Catalonia, Spain) Lead: UPC/IRTA



Innovative aerated vertical flow subsurface treatment wetland (TW)
Recycled cork by-product as filter medium
Removal of Nitrate pollution

Aeration enhanced removal of nitrogen compounds



influent

waste

treated water

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NEW knowledge

Materials?

Nutrients?

Waste?

Emissions?

Green-water?

Other ecosystem services?

LIFE14 ENV/ES/460

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Comp DS (Tunisia): Underground Irrigation vs conventional drip irrigation for Olive trees

Tatouine, Tunisia - Olive trees underground irrigation

Conventional drip irrigation

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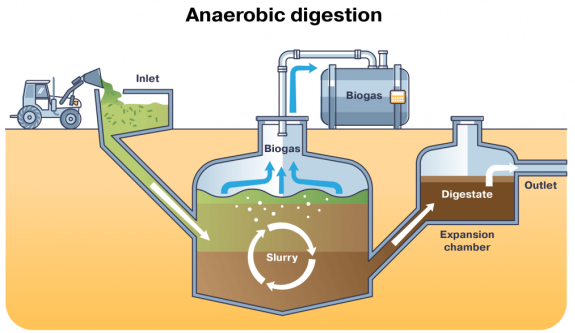
TECHNOLOGIES FOR ENERGY RECOVERY

PUMP AS TURBINE

ENERGY RECOVERY DEVICES (ERD)

BIODIGESTERS



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BIODIGESTERS IN ANTIOQUIA (COLOMBIA) FOR PIG FARMING SECTOR

Barcelona Solidarity Project
July 2024

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WASTE MANAGEMENT

BIOECONOMY SOLUTIONS AND BEST PRACTICES

Some agricultural residues, which have traditionally contributed to pollution, can now be valorized and transformed into valuable, high-impact products

Coffee Peel Infusion

CIRCULAR COFFEE PRODUCTION IN COLOMBIA

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- A compensation block aids semi-automated technology selection for better WEFE strategies.
- The Artificial Intelligence (AI) WEFE Nexus tool is designed to assist in selecting the most effective technologies for water and wastewater treatment, energy recovery, and bioeconomy waste valorization.
- The AI WEFE Nexus tool facilitates the comparison between conventional technologies and NBS and other more appropriate technologies.

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DE CATALUNYA
BARCELONATECH
UNESCO Chair on Sustainability

Olga Lucía Sánchez Santander
Olga.lucia.sanchez@upc.edu

Jordi Morató
Jordi.morato@upc.edu

www.unescosost.org

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THANK YOU FOR YOU ATTENTION

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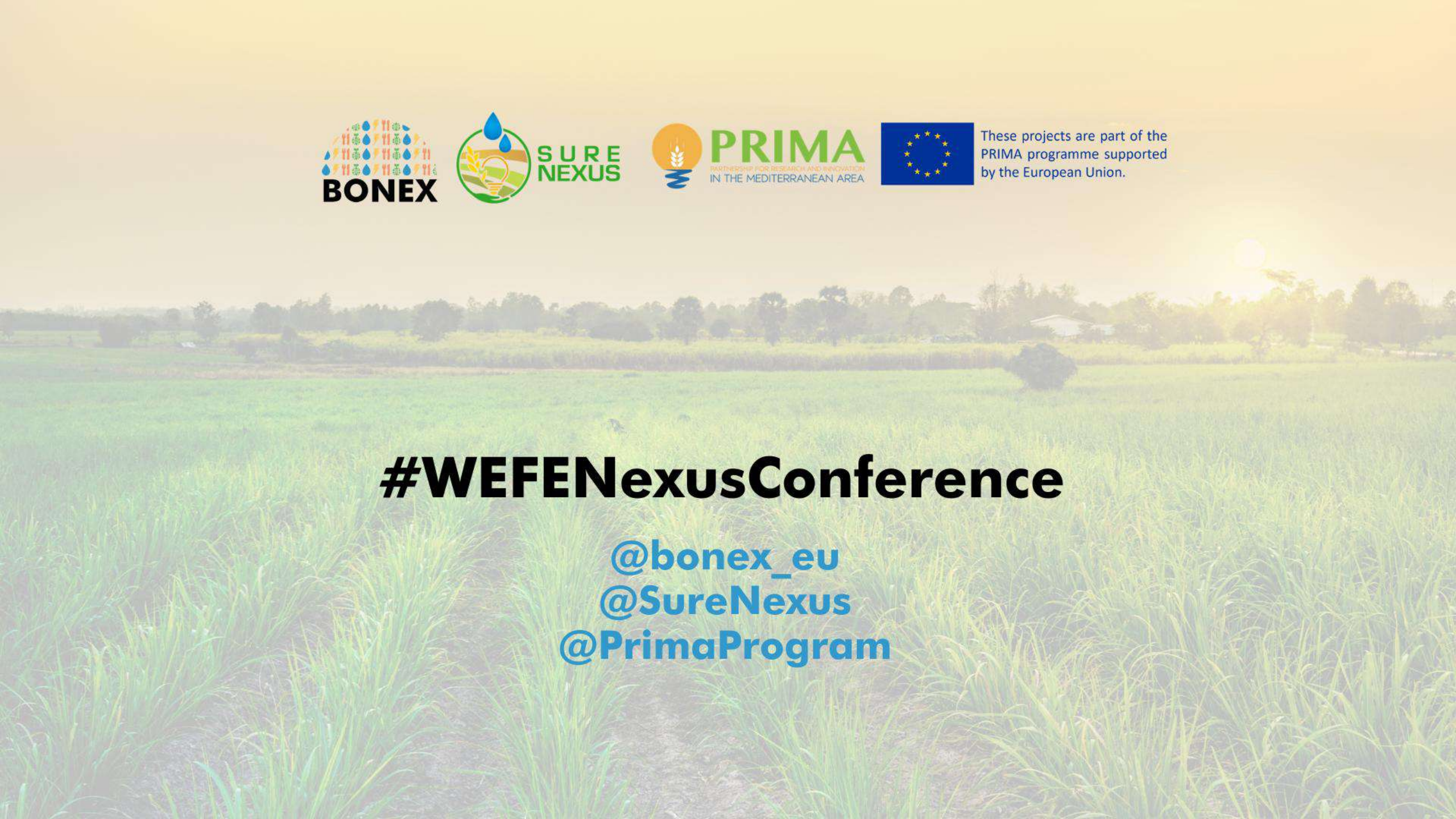
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