SMARTAPV-FRUIT

(JULY 2023– JUNE 2025)

LEAP-RE

Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy

Pillar-1 project

The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.

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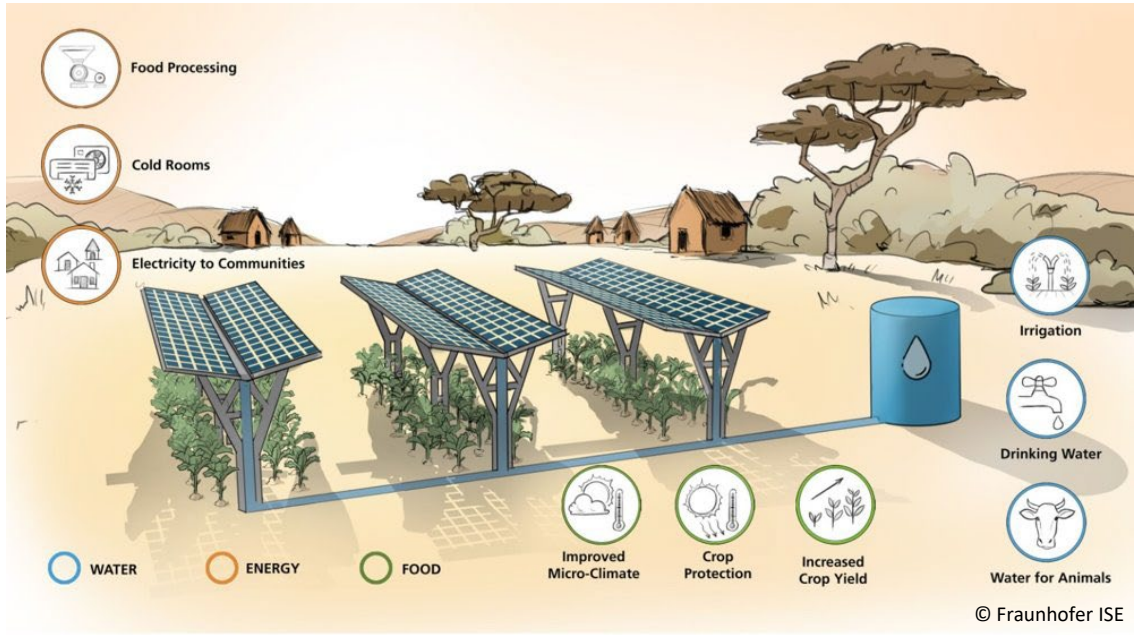
Aim of the project

- *Create a resilient agrivoltaic system to resources efficiency use, to cope with climate change and to assure food and energy security.*
- *Develop the Water-Energy-Food nexus for CO2 emission reduction.*
- *Contribute to the future strategy in Morocco and in African countries by leading the energy transition in combination with sustainable agriculture and innovative water management.*
- *The benefit of APV will be assessed in the context of agriculture in arid regions, with emphasis on the synergy between the Water-Energy-Food nexus*

Relevance vs MARs

- ***MAR4: Smart grid (different scales) for off grid application**: SmartAPV-Fruit project addresses the MAR4 directly with its innovative approach of combining energy and agriculture. It will help rural communities and small-scale farmers to access energy and increase land productivity by combining two types of land use.*
- ***MAR5: Processes and appliances for productive uses (agriculture and industry): D**eveloped APV system will protect crops and increase the agricultural yield, hence, for off grid application, it help to overcome the challenges of food security and help increase the income of farmers.*
- ***MAR6: Innovative solutions for priority domestic uses (clean cooking and cold chain):** Generated energy will further be used to prevent post harvest losses by powering the cold chain system in the industrial pilot in Kenitra.*



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Consortium

Fraunhofer ISE: *is the coordinator of the project*

FruitsRouges & Co*.: Is an owner of a large berry production site in Morrocco and will host the industrial pilot*

Insolight: *is a Swiss company expert in the development of agrivoltaic systems and will oversee the consturction of the agrivoltaic industrial pilot installation*

INRA: *will host the R&D pilot demonstrator and will conduct agricultural research in both pilots*

Raach Solar Projects GmbH: *will oversee installations, procurement and construction of the two agrivotlaic systems*

UCA: *will provide the needed experience in the various aspects of the project (monitoring, system modeling, reliability, social acceptance, capacity building, networking, promotion e.g.)*

The University of the Western Cape: *will be responsible to analyze the project replications in South Africa to deploy in a near future agrivoltaics on a larger scale.*

UIZ: *will conduct research on the energy side and modelling*

Fraunhofer ISE

RAACH SOLAR
DESIGNING PHOTOVOLTAIC POWER

insolight

FRUITS ROUGES &Co.

UNIVERSITY of the WESTERN CAPE

جامعة ابن زهر
UNIVERSITÉ IBN ZOHR

MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD

المعهد الوطني للبحث الزراعي
Institut National de la Recherche Agronomique

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Key challenges addressed by the project

1. **Climate change**
   - *Increasing temperatures, GHI and sun hours*
   - *Reduced rainfall(specially in spring)*
   - *Weather extremes:*
     - *More frequent and longer dry periods*
     - *Heavy rainfall or hail events*
2. **Energy transition**
   - *Energy can be used for post harvest processing*
   - *Drip irrigation*
   - *More reliable source of electricity*
   - *Decarbonization of the agricultural sector*
3. **Dwindling WEF-Nexus resources**
4. **Food and Energy Security**

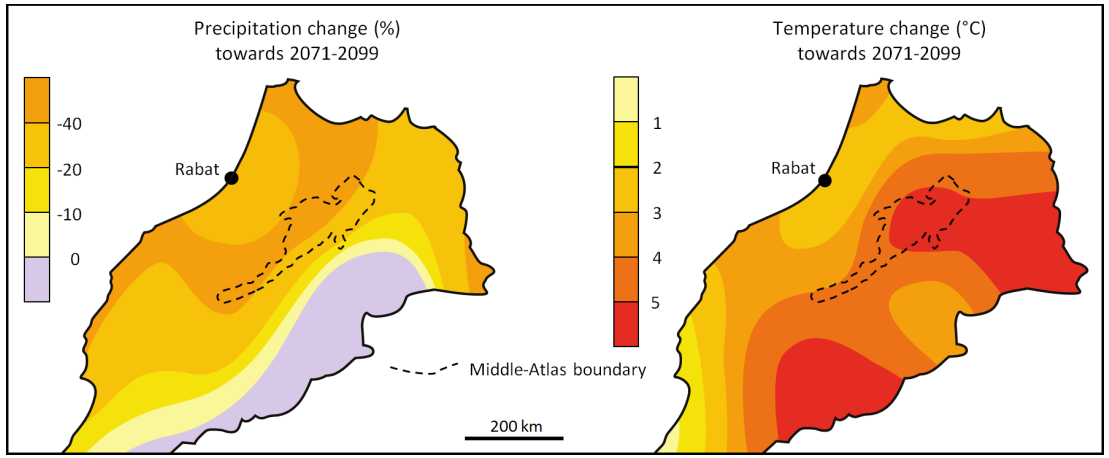

Figure 1: Precipitation (left) and temperature (right) change by the end of the century (El Jihad, 2016)

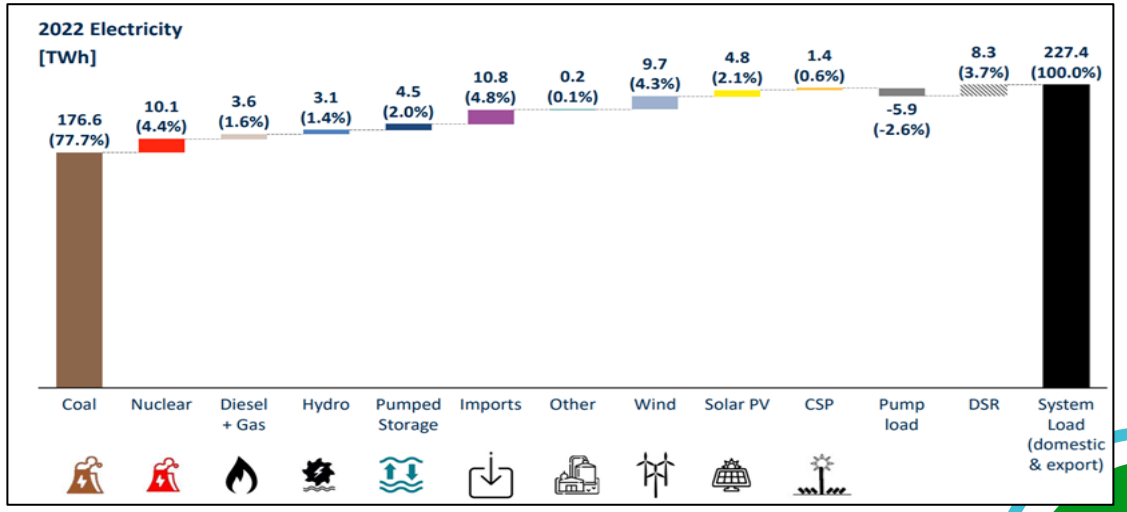

Figure 2: Electricity produced (TWh) in South Africa for 2022 per energy source(South Africa - Country Commercial Guide: Energy, 2022.)

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How the project is addressing these challenges

R&D pilot

- *Location: INRA agronomic research center*
- *Total surface area: 900m2*
- *GCR: 30%*
- *Crops: Raspberries, blueberries, strawberries*
- *Use of energy: irrigation, cold storage desalination system, residential load*

Figure 3: Location of the R&D pilot in Agadir

Figure 4: Example of agrivoltaics system in an apple orchard

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How the project is addressing these challenges

Industrial Pilot:

- *Location: FruitsRouges & Co., Kenitra*
- *Total area: 2000m2*
- *Crops: raspberries, blueberries, strawberries*
- *Technology: insolagrin technology that allows both partial shading with homogenous light and dynamic shading/light adjustment*
- *Use of energy: self consumption by the company*

Figure 5: Location of the R&D pilot in Kenitra.
Source: FruitsRouges & Co.

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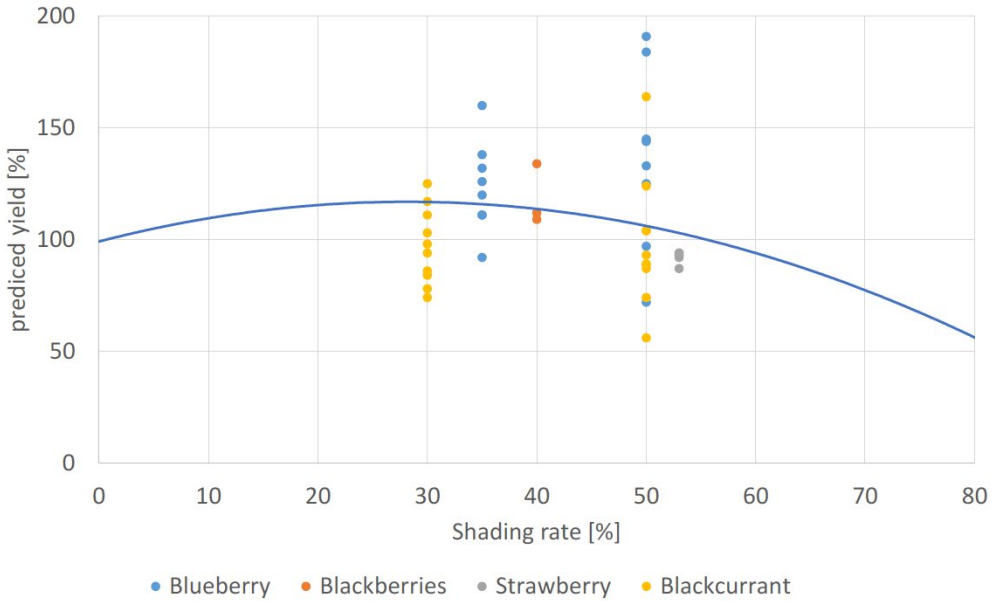
Expected results :

- ***Mid-term expected results (mid 2024)***
  - *Installation of R&D pilot in Agadir*
  - *Installation of Industrial pilot in Kenitra*
  - *Reach 10 actively participating stakeholders*
  - *Initial social acceptance evaluation*

- ***End of project expected results (2025)***
  - *Improved yield and quality of crops under the agrivoltaic system*
  - *Increased Land use efficiency*
  - *Reduction of water consumption by 20%*
  - *Self production and consumption of clean and affordable electricity*
  - *Business model generation and multiplicaton for Morrocco and South Africa*



Source: Fraunhofer ISE

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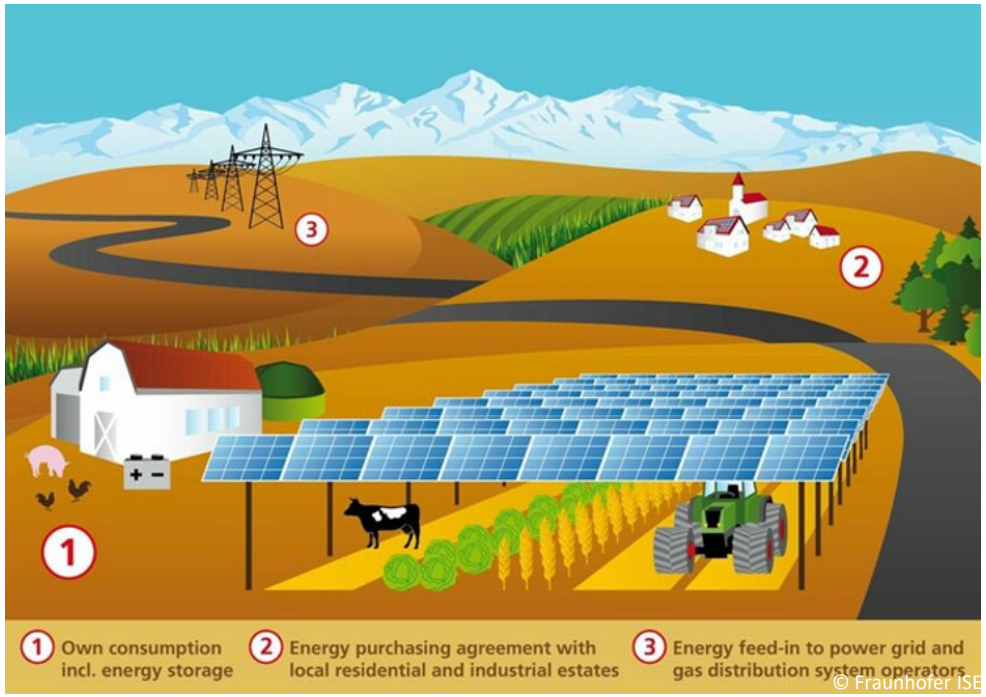
Expected outcomes

- *Improved protection of crops against heat waves and droughts*
- *Improved yields*
- *Access to affordable clean energy*
- *Create new revenue streams for rural areas*
- *Meet energy transiton targets*
- *Training and knowledge centers for capacity building*
- *Increased competencies of local companies for design and implementation of agrivolaics*
- *Enhanced food security*



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Main risks during the project implementation

1. ***Severe price increase of demonstrators/pilots***
    - *Check for alternative lower cost solutions, reduce system size, shift budget*
2. ***Deployment delay due to global supply chain issues***
    - *Where possible, it will be relied on sourcing local materials for construction components. The consortium has two very strong industry partners with reasonable stockpiling. Alternatively, pressure will be put on suppliers or alternatives will be found*
3. ***Technology not performing as expected***
    - *Preliminary experiments, simulations and optimal system design will be conducted before pilot implementation. The consortium has strong technical competencies to ensure optimal performance of the pilots.*

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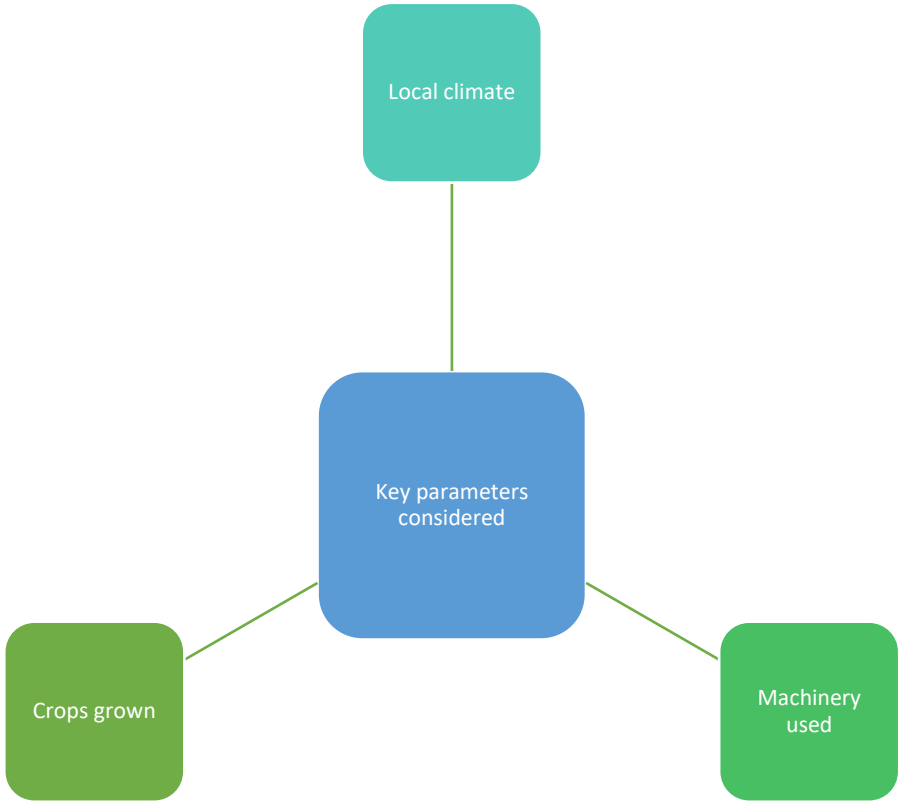
Interest of Consortium members in participating in LEAP-RE clustering activities (methodology):

- ***System design**: standardization of agrivotlaic system design procedure*
- ***Experimentation**: Standardized experimentation protocol for agriculutral analysis*
- ***Monitoring**: Standardized monitoring protocol for agrivoltaics: PV, agriculture, microclimate, water*



THANK YOU

CONTACT US FOR MORE INFORMATION

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