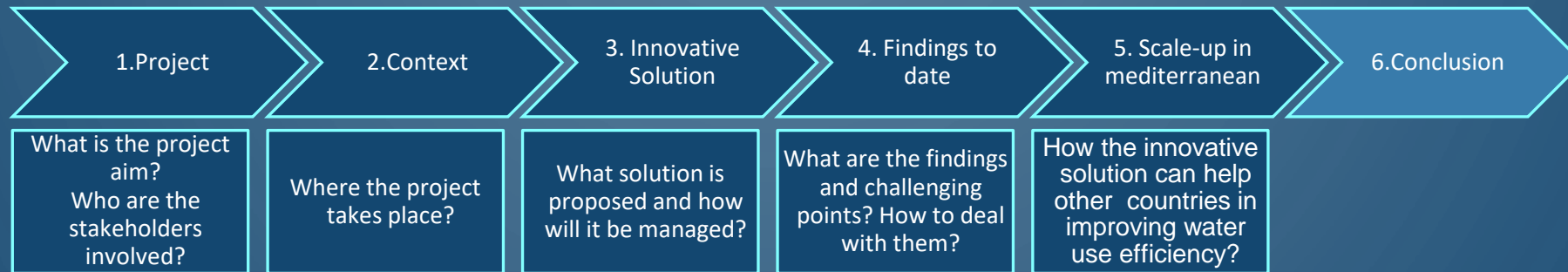


Presentation of WES Demo Project in Lebanon: Saving Water, Growing Crops: remote- controlled irrigation system to address water scarcity and promote preservation of available freshwater resources

Regional Training and Study Tour of Water Users Associations on
optimal irrigation management and practices
Bari - 12th June 2023


Env. Eng. Nicola D'Alberton – Research Fellow C3A University of Trento - nicola.dalberton@unitn.it
Env. Eng. Hanan Hassan – Agronomist and MEAL officier AlShouf Cedar Society - hanane@shoufcedar.org


Steps of the presentation



Lebanon and climate change

- Climate change in Lebanon :

 + 1.7 ° C by 2050 and - 4% to -11% precipitation with drier conditions by 2100^[1].

 Agriculture production is highly dependent on water and increasingly subject to water risks. It is the largest water using sector (70% worldwide) ^[2].

[1] Lebanon's Third National Communication to the UNFCCC

[2] OECD 2010

The Project

- **Objective:** increase the adaptation capacity to economic losses and freshwater depletion induced by climate change through an efficient use of water resources.
- **Technologies:**
 - i. Rainwater Harvesting
 - ii. Smart precision irrigation solution
 - iii. PV Pumping System



Funded by the
European Union



Partners:



Expected results



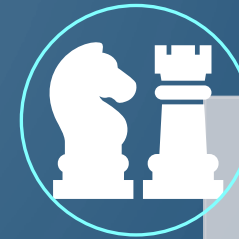
-30% freshwater
withdrawal yield



+10% production



n 93 small
households farmers
(20ha) benefitting of
the precision
solution

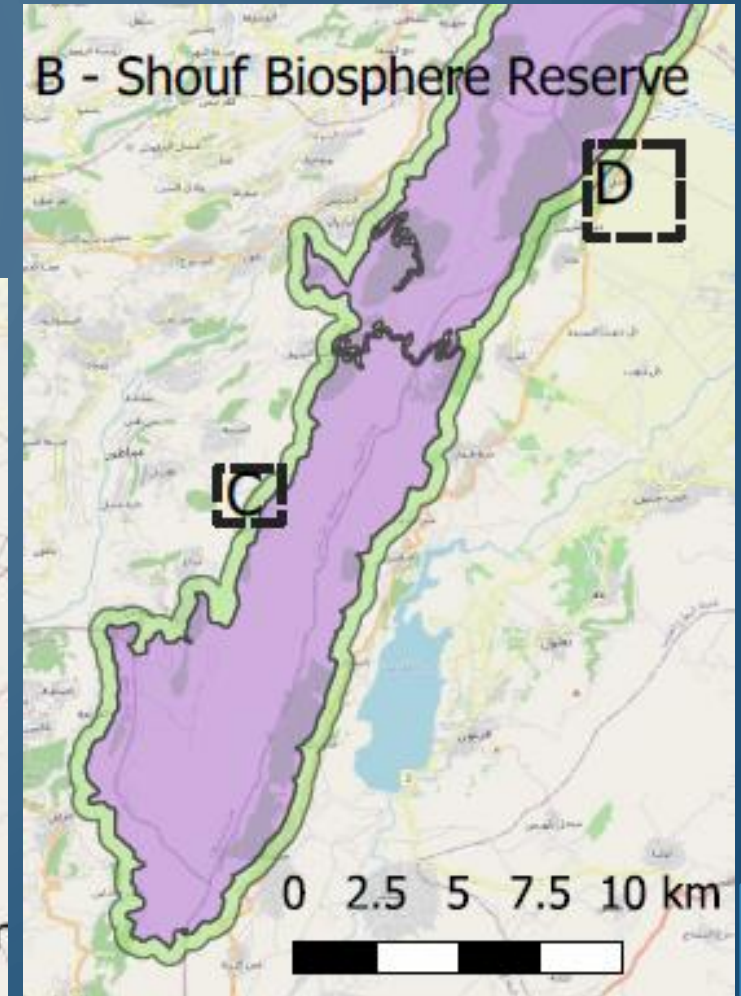
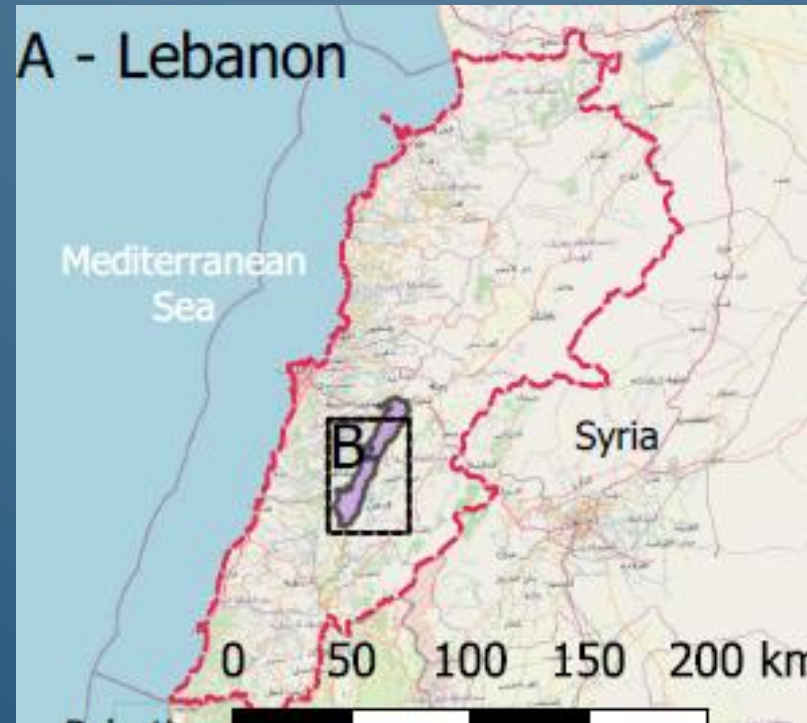


Committee of
trained farmers
responsible for the
management of the
system



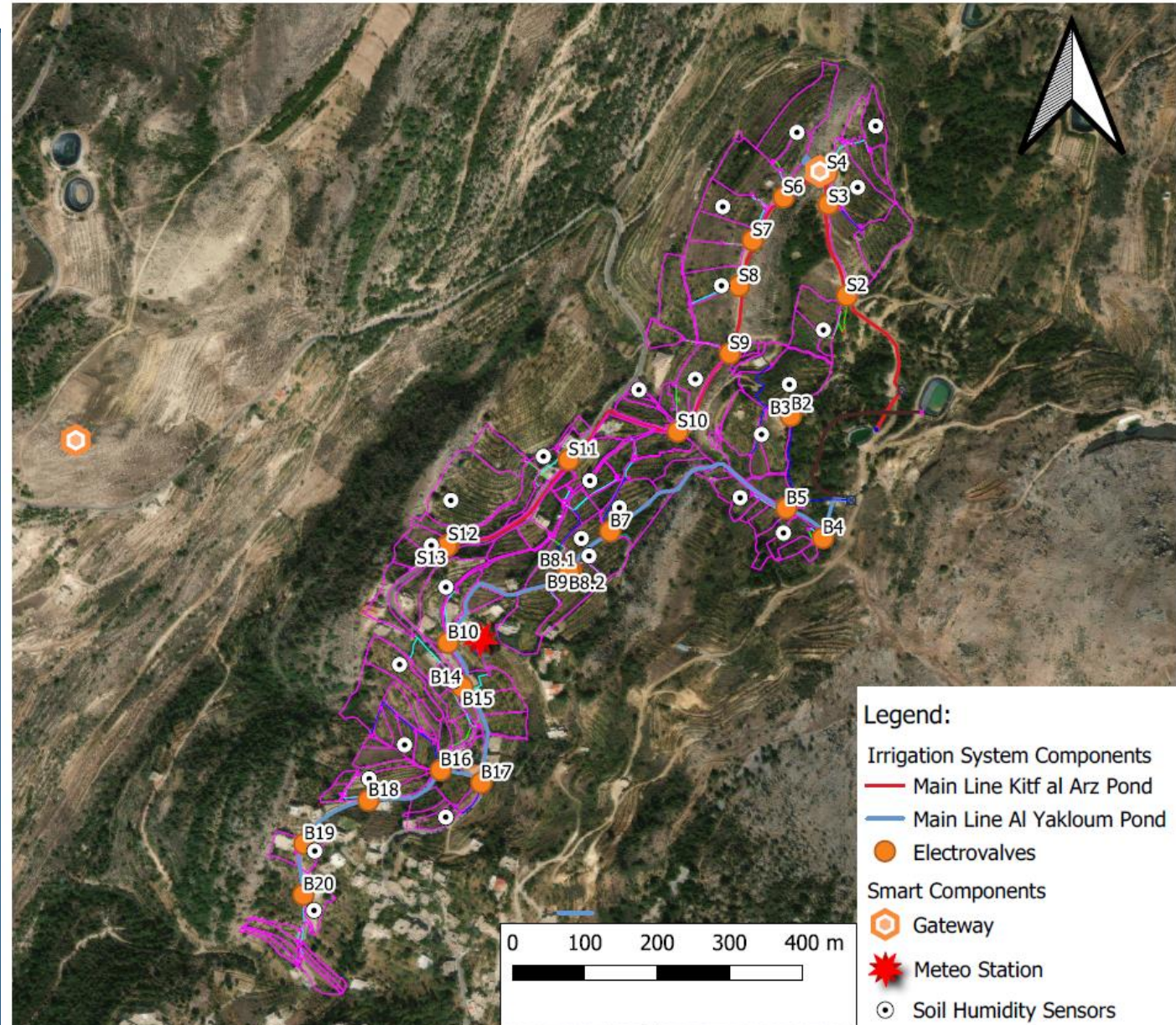
Shouf Biosphere Reserve

- Biggest natural reserve in Lebanon 550 km^2
- Core and Buffer Area



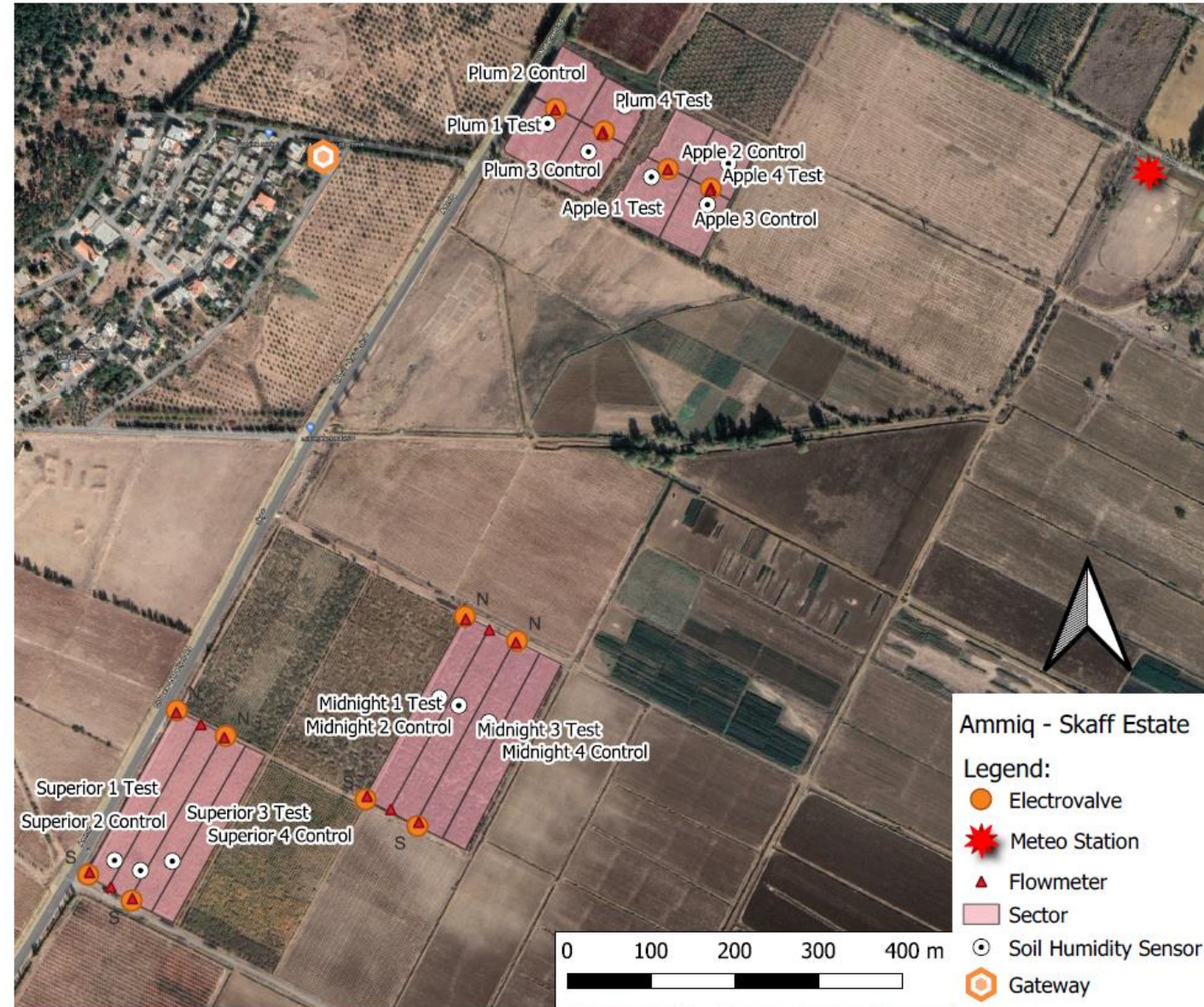
2.Context: Project Area

(a) 20 ha Mrusti Municipality
(Shouf Area, 1300 m a.s.l.)



2.Context: Project Area

(b) 10 ha in Ammiq
Municipality (Beqaa Valley
Area, 900 m a.s.l.)



2.Context: Agricultural conditions

Mrusti Municipality, Shouf

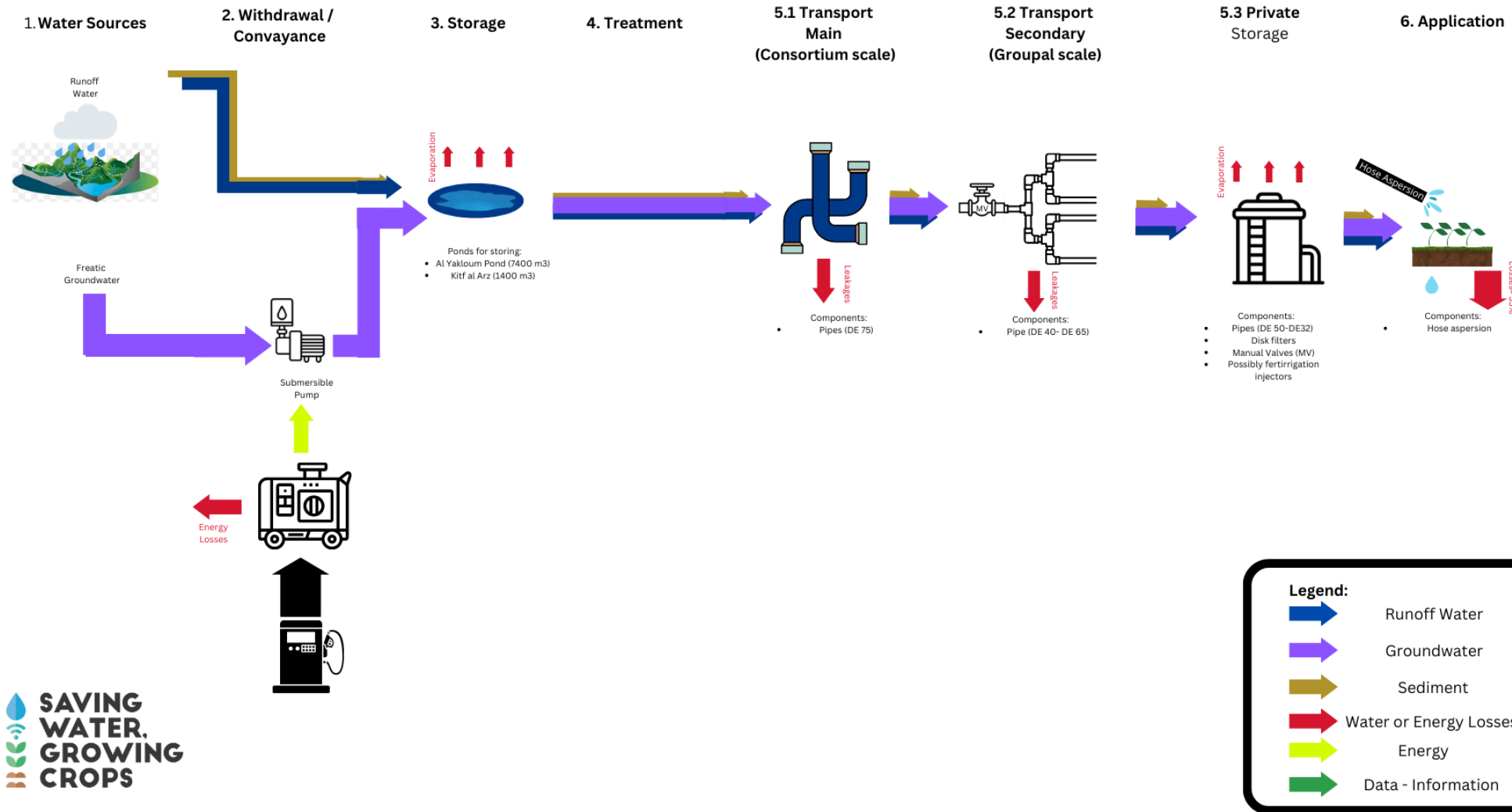
- Multicrop context (mostly apples and cherries),
- mountain environment (1300 m a.s.l.)
- Poor soil
- Complex orography
- Small scale agricultural producers

Ammiq Skaff Estate, Bekaa Valley

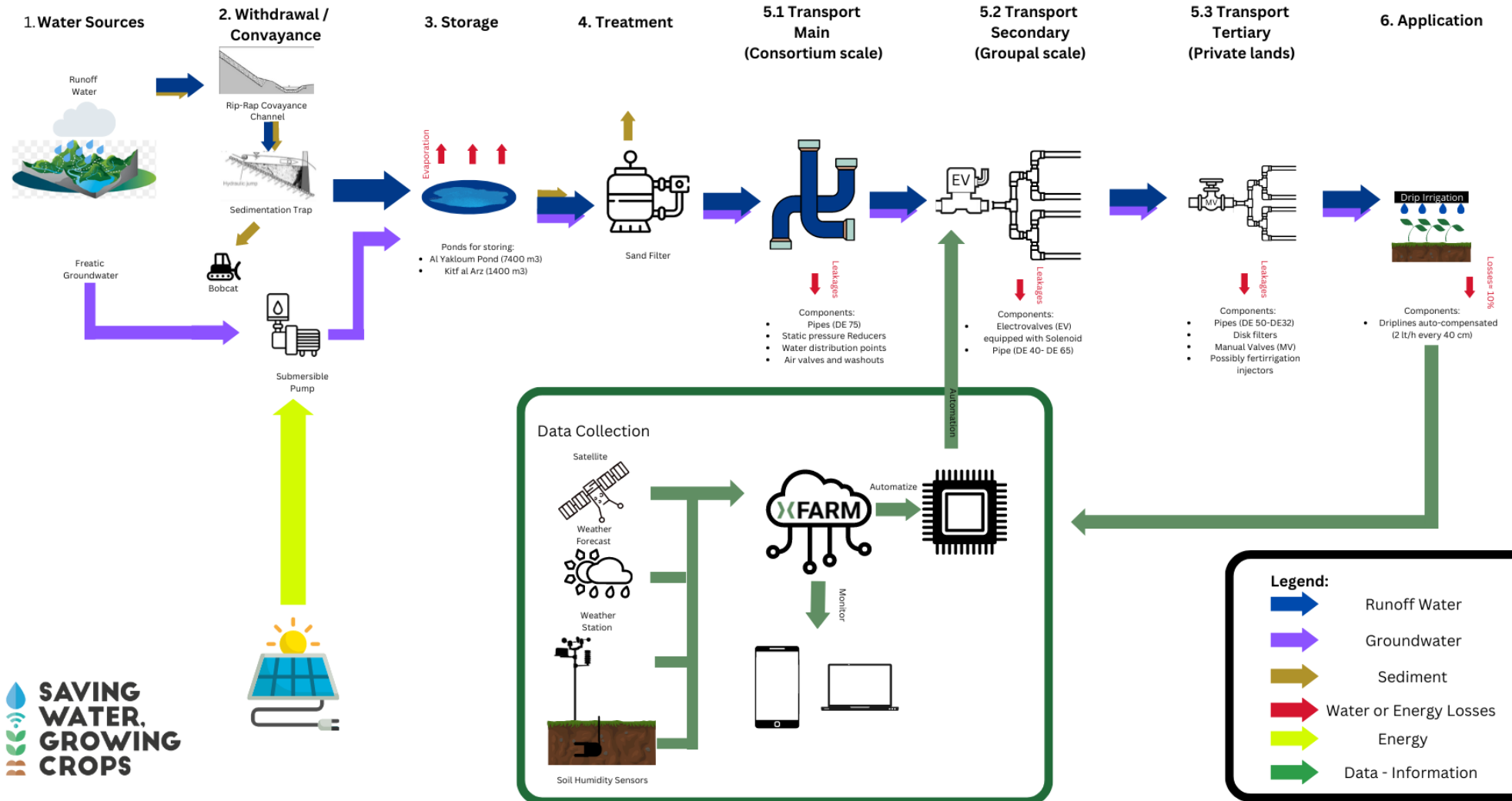
- Monocultural,
- Plateau (900 m a.s.l.)
- Rich soil
- Plain orography
- Big scale agricultural producers



Old System



New System



Old vs New System



Deficit and inefficient irrigation (approx 50% of the theoretical irrigation requirement)



Irrigation strategies based on water demand and real time data



Inequalities: Water availability in the area depends mostly on the plots position due to the different outlet pressures



Providing homogeneous irrigation (autocompensed driplines, pressure regulator...)



Absence of monitoring tools implies that the water **tariffs** are **not proportional** to the volumes withdrawn



Introduction of a monitoring system and proportional tariff



Illegal connection : many connections to the irrigation system are not regulated



Including rules to involve the farmers and raising awareness, technical solutions

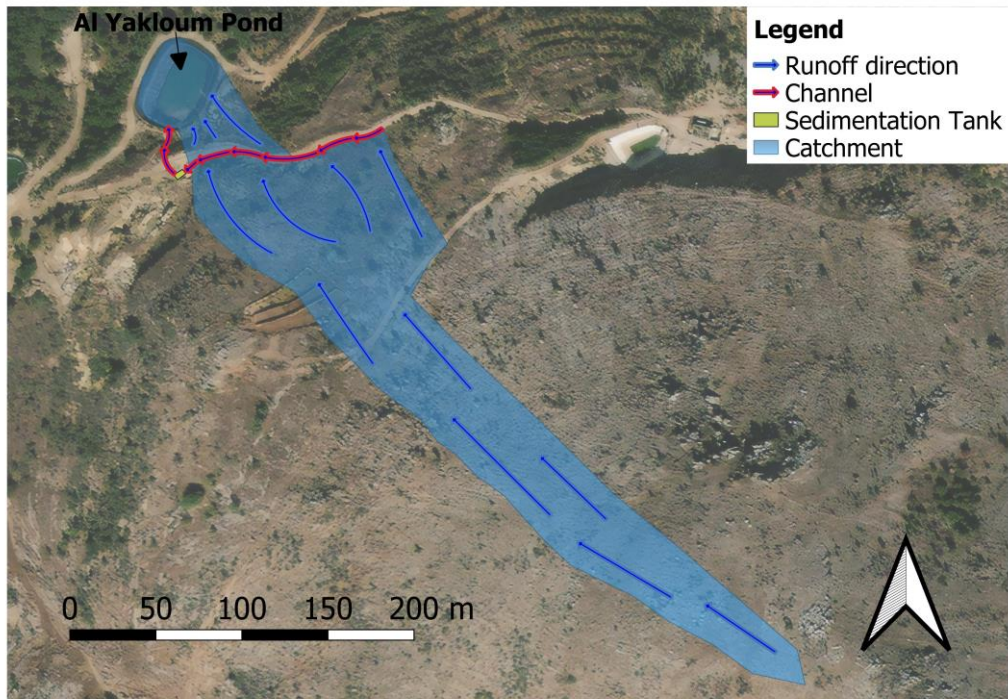
Rainwater Harvesting

- Rehabilitation of: Runoff water harvesting structures (Pond)



Rainwater Harvesting

- Rehabilitation of: Runoff water harvesting structures (Pond)



Smart Irrigation: IoT Components



Meteorological Station

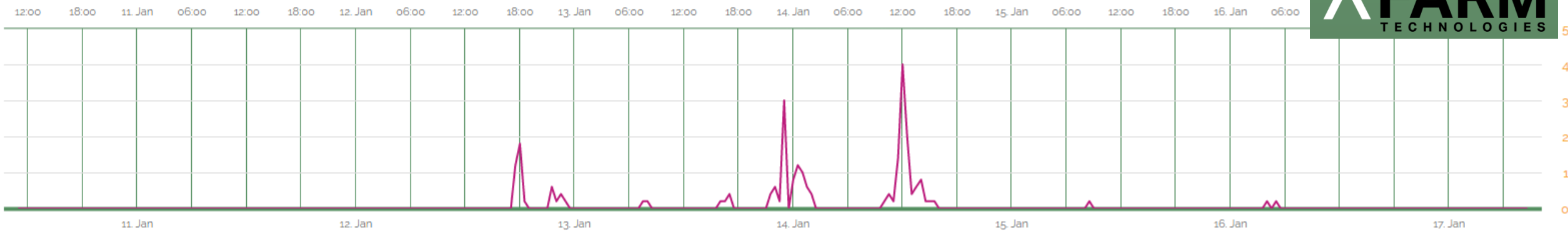


Soil Humidity Sensors

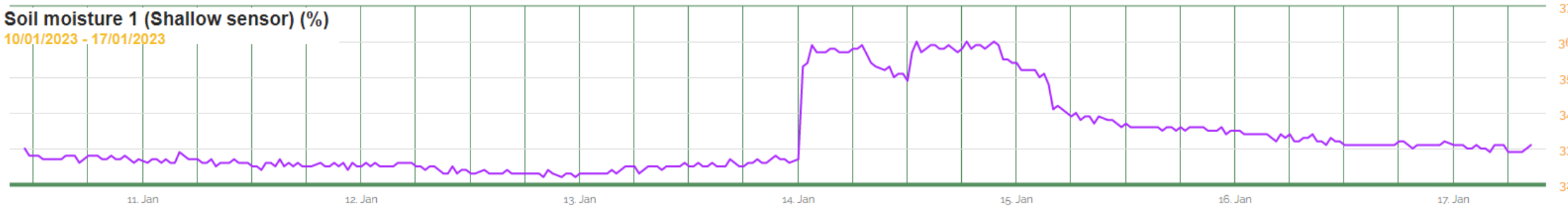




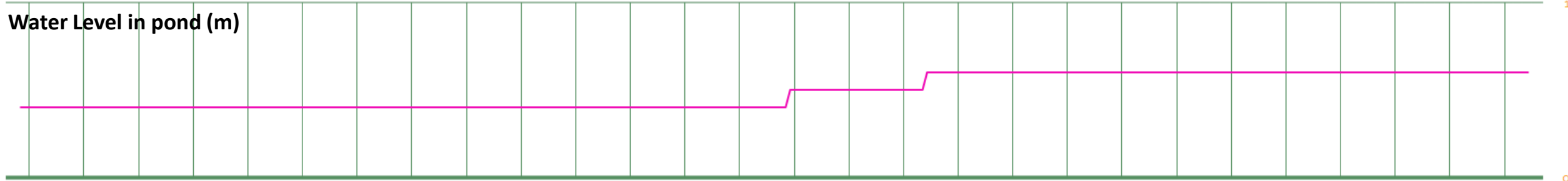
Rain Meter (mm)
10/01/2023 - 17/01/2023











Soil moisture 1 (Shallow sensor) (%)
10/01/2023 - 17/01/2023



Water Level in pond (m)



Remote controllers

Sectors	Pumps	Groups	Future Jobs	Past Jobs	Devices List
					<div>  <div> <div>PLUM 1 (Z151)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>PLUM 4 (Z152)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>APPLE 1 (Z153)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>APPLE 4 (Z154)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>MIDNIGHT 1N (Z155)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>MIDNIGHT 4N (Z156)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>MIDNIGHT 1S (Z157)</div> <div>START</div> <div>HH:MM</div> </div> </div>
					<div>  <div> <div>MIDNIGHT 3S (Z158)</div> <div>START</div> <div>HH:MM</div> </div> </div>

Remote control User Interface



Installation of remote controller (xidro)



Operation, Management and Maintenance



Development of a Operation and Maintenance manual

- define the task to
be done and the
responsibilities



Establishment of a **Consortium** and a **Water Committee**

Definition of role
and responsibilities,
creation of an
elective system



Introduce a
**proportional and
fair tariff** to allow a
proper maintenance
of the system

Challenges

- Covid-19 and the economic crisis
- Absence of a cadastral plan
- Farmer's acceptance to the irrigation system from drip line to technology
- Small farmers are landowners (production is an additional income)
- Ability of farmers' to pay a tariff that sustains the project
- High cost of imported products
- Lack of punctual Monitoring
- Heterogeneous cultivation in small farms
- Import material in the Lebanese Context is a costly and time requiring procedure, local suppliers involvement takes a relevant role

Solutions/ Lesson Learnt

- Proper planning (cadastral plan) is a must before designing and execution
- Capacity building
- Fair tariff
- Efficiency versus saving
- Local management along with technical enhancement
- Precise irrigation is best:
 - Small farms could be combined on a municipality level
 - Big farms

Outcome

- Water Harvesting Rehabilitation is an effective solution (+165% of RWH than prior to the project)
- Water Efficiency Improvement
 - Uniform Water availability in different altitude
 - Reduction in losses (distribution and application)
 - Irrigation strategy depending on real time data
- Increase in the energy efficiency of the system and reduction of dependancy on fossil fuel

Scale-up in Mediterranean area

- Smart IoT devices are spreading, market expanding and prices becoming more accessible thus enabling enhanced irrigation solution based on specific soil-crop condition
- Mediterranean area is characterized by increasing Evapotranspiration rates and climate change is affecting the rain frequency and intensity, therefore new irrigation strategies are needed
- Solution to adapt to climate change offer therefore new possible scenarios involving appropriate technologies from small to big agricultural producers



Thank you for your attention!

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Links:



Istituto OIKOS

<https://www.istituto-oikos.org/projects/saving-water-growing-crops-lebanon>



Shouf Biosphere Reserve

<http://shoufcedar.org/>



XFarm

<https://app.xfarm.ag/#/sensors/dashboard>



UNESCO CHAIR in Engineering for Human and Sustainable Development

<http://www.unescochair.dicam.unitn.it/>