



**Training course packages targeting food operators on the adoption and management of the technological innovations**

## **PRECISION IRRIGATION SYSTEMS**

### **Irrigation management**

<b>Website</b>	<a href="http://foodland-africa.eu">foodland-africa.eu</a>
<b>Twitter</b>	<a href="https://twitter.com/FoodLANDafrica">@FoodLANDafrica</a>
<b>Facebook</b>	<a href="https://www.facebook.com/FoodLANDafrica">FoodLANDafrica</a>
<b>LinkedIn</b>	<a href="https://www.linkedin.com/company/foodland-africa">foodland-africa</a>

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## **1. FoodLAND technical innovation for local food supply chains: concepts and approaches**

The FoodLAND project has the ambition to impact on a large number of supply chains and communities, hence the process of food operators' capacity development has to be tailored and as much participative as possible. Accordingly, one of the assumptions of FoodLAND is that sustainable and nutrition-responsive farming systems can be achieved basically by strengthening the capacity development, and specifically by **a)** empowering farmers and processors through the implementation of capacity building processes and concrete opportunities; **b)** creating or consolidating cooperation and shared knowledge to overcome the lack of coordination among food operators; **c)** addressing the inefficient use of resources; **d)** trying to address and build resiliency to the high vulnerability of food systems to climate change; **e)** enhancing the integration of supply chains by creating commercial and stakeholders' networks; **f)** improving the responsiveness of the production sector to the market demand.

To implement these elements of capacity development, FoodLAND proposed the adoption of specific innovations, among which the organizational ones, to create strong and responsive links between producers and encompassing all the intermediate actors along the food value chain, such as researchers, SMEs, NGOs, local and national authorities. In order to ease the creation of those links and guarantee the sustainability over time of the results, 14 Food Hubs will be created in 6 countries as part of the organizational innovations. Food Hubs are conceived as multi-actors centers of innovation where to develop or enhance the organizational and operational conditions enabling local food supply chains (D3.6).

Functional to the implementation of the Food Hubs and of the innovations, the training courses were designed – in form of capacity development activities – as a two-phase process. Firstly, a training session focused on general, preparatory topics was provided to farmers as described and reported in D3.5 (“Group Introductory Training”, GIT). According to the project GA, GIT broad set of goals

were: to enhance the knowledge of consumers' nutritional needs and market opportunities, and to boost the notions about climate change, sustainability, resilience, and food culture. Secondly, a specific training session were organized to provide food operators with practical information on the adoption and management of the innovations tested at lab / small scale level and to contribute to validating them at appropriate scale.

However, as the whole approach has been designed by FoodLAND to ensure the inclusion of the local actors from the first moment, both the training sessions were set up accordingly. Indeed, yet in the inception phase of the project, an assessment on participatory methods has been run and Participatory Learning and Action (PLA) approach has been eventually assessed as the best one to ensure the inclusion of multiple perspectives. The main purpose of PLA is to support people within communities to analyze their own situation, rather than have it analyzed by outsiders, and to ensure that any learning is then translated into action (Gosling and Edwards 2003). In addition, a gender-sensitive approach has been applied to the trainings that have been designed considering gender roles and power relations; they have provided equal opportunities to participate in the process by caring to times, venues and use of local languages.

The GITs have been conceived as the first step towards the innovation validation and aim at involving the producers, yet from the inception phase. They are just the first step in a sequence of 6, summed up in **Table 1**. After the GITs, where farmers and processors meet and share their vision and goals for the Food Hubs and exchange information about specific topics, the Food Hubs were created and the innovation tested (first in pre-test, then in pilot phase). The constant iteration between researchers and local actors is a key feature of the project: specifically, the practical trainings focused the single innovations (step 5) are aimed at validating the innovations at adequate scale and planned to trigger feedback loops of control and improvement involving developers and adopters.

Table 1. Activities with farmers and food processors (SMEs) and participatory approach

Step	1	2	3	4	5	6
Task	T3.3	T3.3	T3.4	T4.1,T4.5	T5.1,T5.5	T5.1,T5.5
Activity	Group introductory training	Food Hubs creation	Innovation undertaking	Innovation tests	Individual and group practical training	Innovation pilot and validation

## 2. FoodLAND practical training: aims and scope

According to the project bottom-up and participatory approaches, following the courses on introductory topics GIT organized in the early project phase (T3.3), and as component creating / strengthening the Food Hubs as local innovation centres, FoodLAND has organized a second set of training activities with food operators based on active learning methods and gender equality principle (Task 5.1-5.9). In this regard, specific mechanisms (being aware of the gender roles and power relations; providing equal opportunities to participate in the process by putting attention to the times, venues, use of local languages, etc.) will be lifted to ensure women's participation. These training packages are aimed at providing the local farmers and food processors with operational instructions on the adoption and management of the validated innovations.

This second set of training activities has been organised – triggering PLA approach – as individual and group practical (demonstration/capacity building) activities to be conducted in parallel to the implementation of the technological research (where relevant) and of the innovation pilots and validation. These technology-centred trainings aim at strengthening the participants' understanding of novel production and post-harvest techniques, innovative tools and systems (e.g., climate smart/precision agriculture, hydroponics, and integrated aquaculture), new technologies for primary and secondary processing, and supply chain management. Thus they aim at fostering knowledge and operational capacity to deploy, manage, and maintain the validated technological innovations – documented by the released guidelines D4.1 ÷ D4.11 (e.g., training pamphlets, user manuals, flow diagrams, and operational recommendations) and practice abstracts D6.5 – validated jointly at appropriate scale.

### **3. Second training packages on the adoption and management of the tested innovations: an overview**

The second training course aimed at consolidating the food operators' knowledge and practical skills to adopt, manage and validate the project innovations and complement the related guidelines. Specifically, the realized training materials provide local farmers and food operators with a set of notions and concrete information on a series of innovative tools and systems as per the following **Table 2**. It is clear that both the contents and formats of the learning packages widely differ across technologies as well as Food Hubs (when the same type of innovation must be validated in different contexts). The diversity that emerges from the proposed solutions reflects the different needs highlighted by farmers and stakeholders as well as the conditions and opportunities characterizing the local communities. Nevertheless, in order to take into due account the existing heterogeneity inside the local communities, the developed learning materials have been let available on the project intranet so as to be used for further training initiatives across the network of Food Hubs.

#### **4. Second training packages on practical information on the adoption and management of the tested innovations**

**Precision irrigation systems**

**Irrigation management**

## Training and Awareness Workshop

# *Rational and intelligent management of vegetable irrigation*



**Professor: ABOUABDILLAH Aziz**  
*National School of Agriculture of Meknes*





## Green Morocco Plan Green Generation



Reconversion



Water saving



# Survey on local irrigation:



## Studied Crops



Potato



Onion



Apple

## Survey

100 Farmers per Year



2015-2019

Fes-Meknes Region



The amount used for irrigation

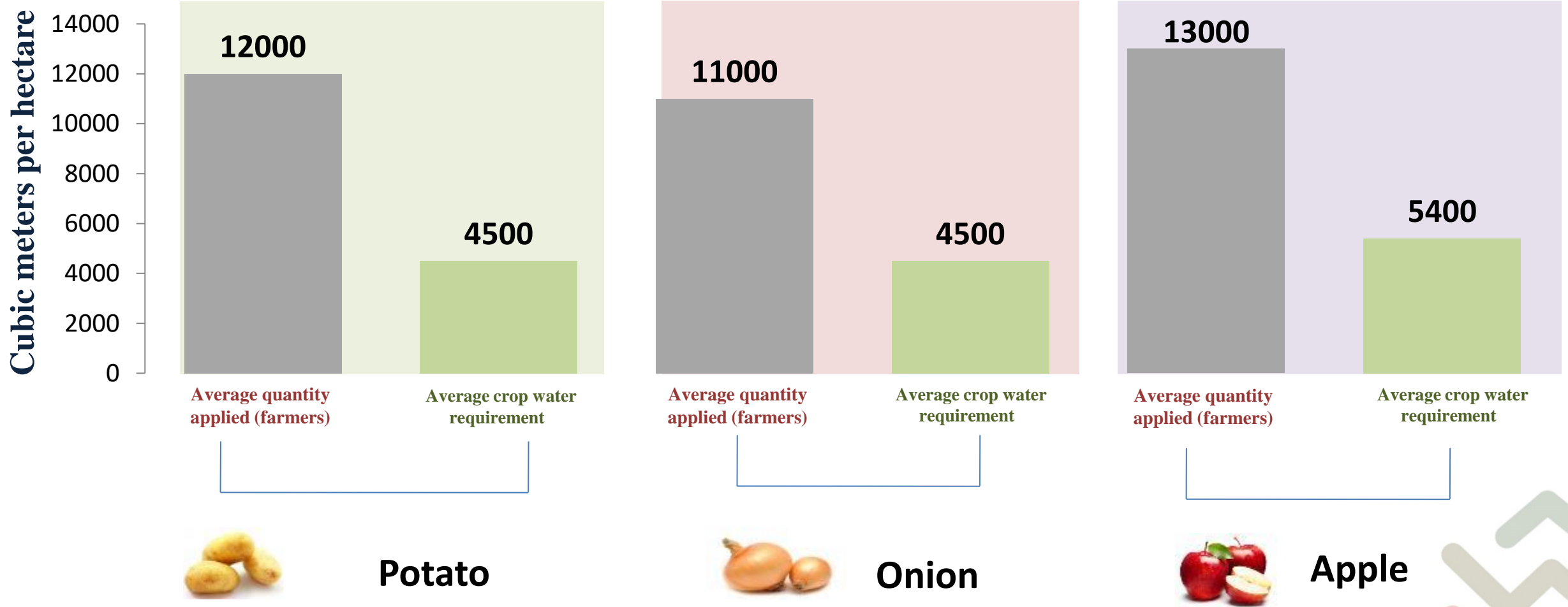
Number of irrigation

Cost of irrigation

Questions



# Results of the Survey: Water requirement



**Limited knowledge of estimating irrigation water requirements**

# Results of the Survey: Water requirement



**1**



**Potato**



**1**



**Onion**



**2**



**Apple**

**Loss of a large amount of water**



# Types of irrigation systems:



Surface Irrigation



Sprinkler Irrigation



Drip Irrigation



# Problematic:

Duration of irrigation

Quantity of Water



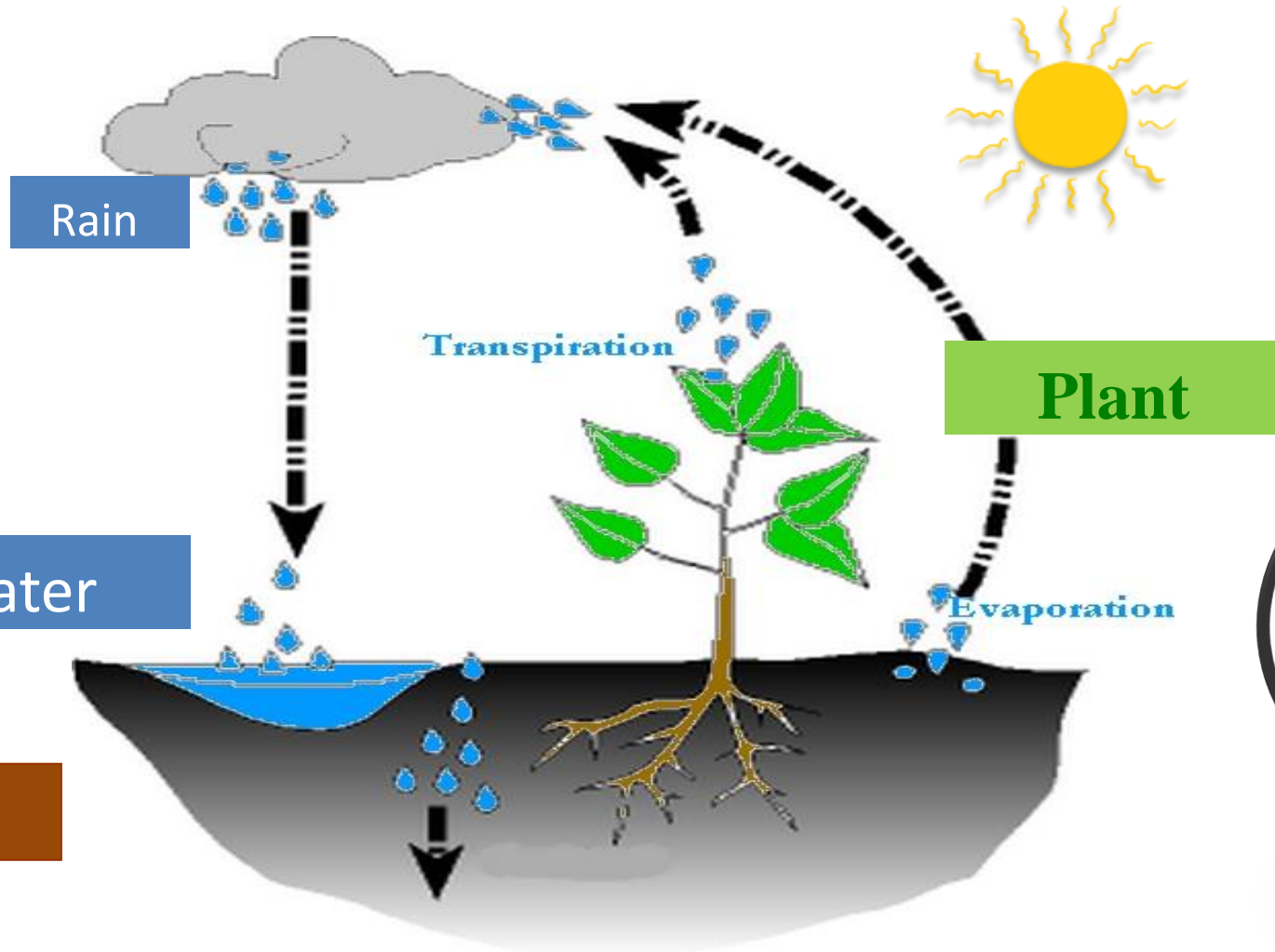
# Monitoring the water chain: Soil - Climate - Plant



Weather forecast

Water

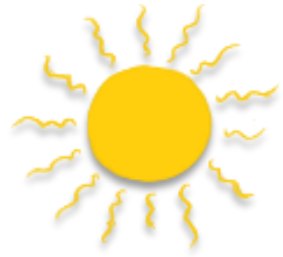
Soil



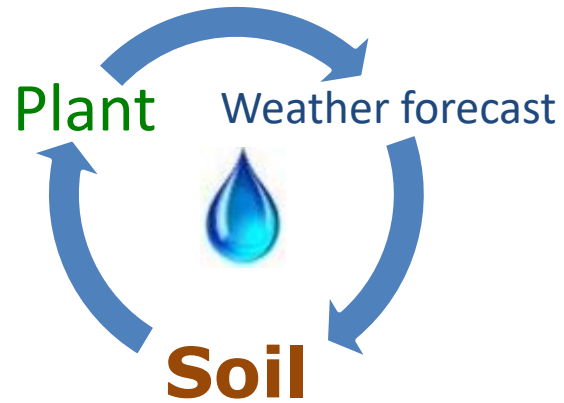
# Monitoring the water chain: Soil - Climate - Plant



Crop Water Requirement are different from crop to another



ETo



Kc

Absorption  
coefficient

Water storage capacity

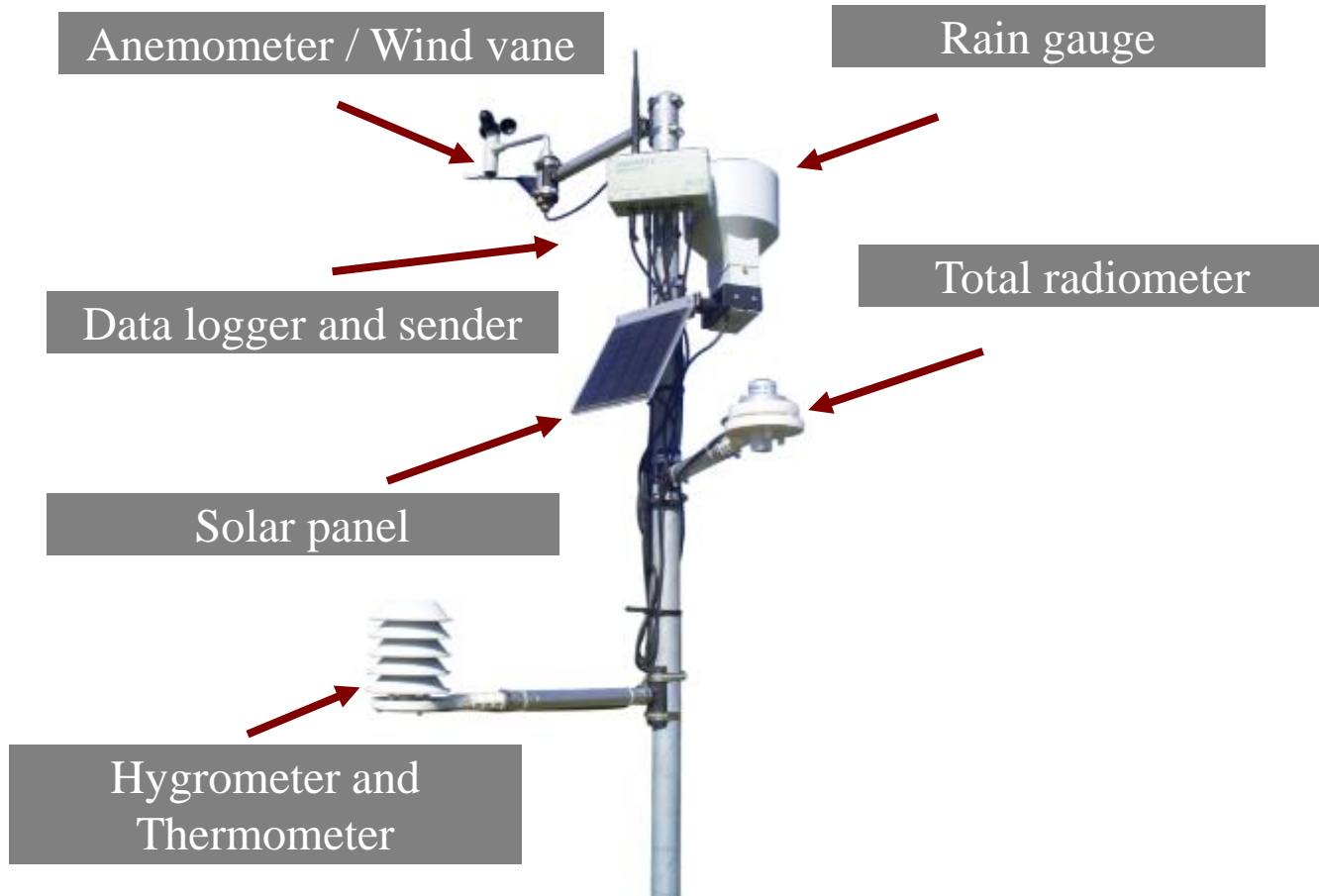




## What are the smart solutions and mechanisms for a rational management of drinkable water?



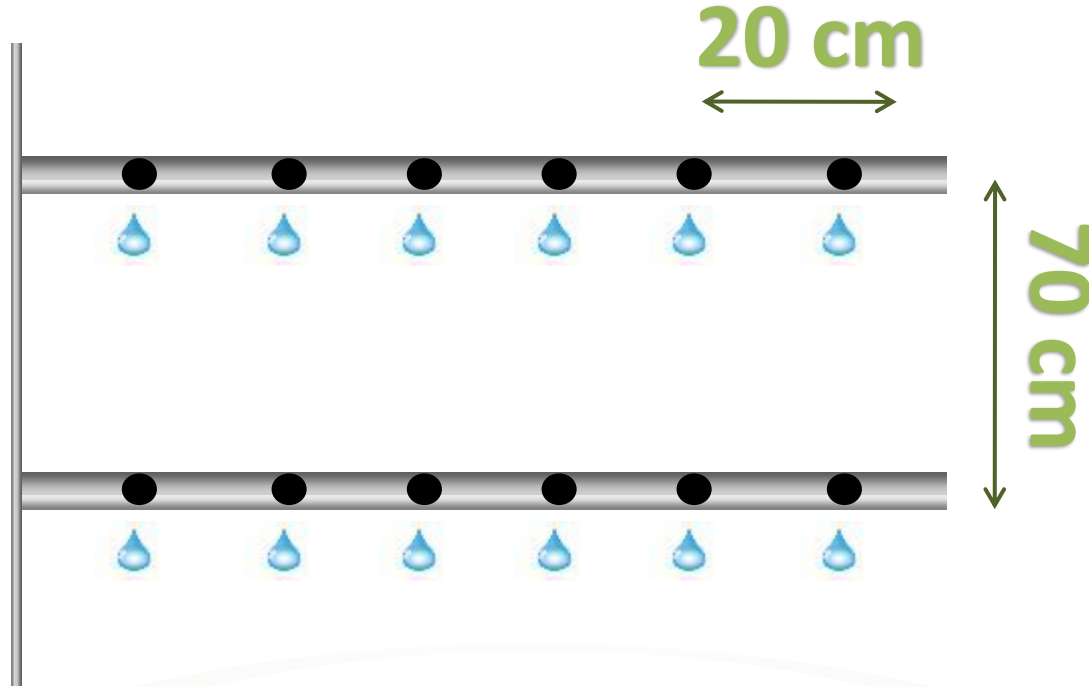
# Water Requirement



# Example :



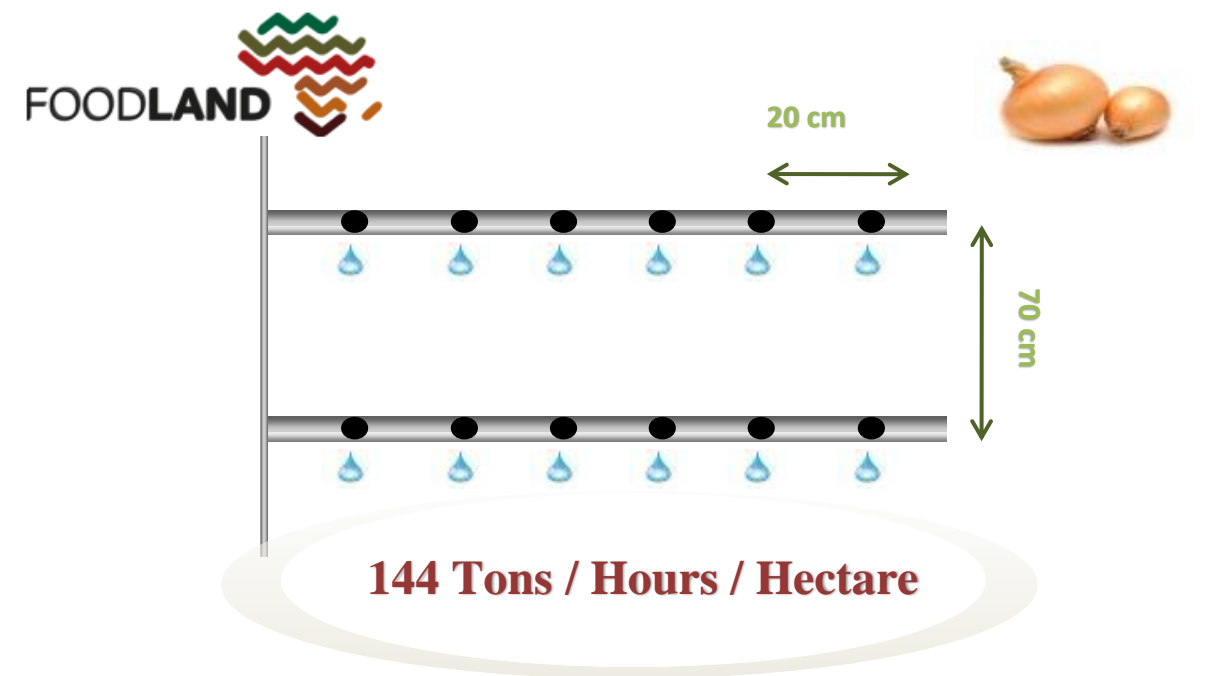
1.6l/h



**144 Tons / Hour / Hectare**



# Example : EL HAJEB



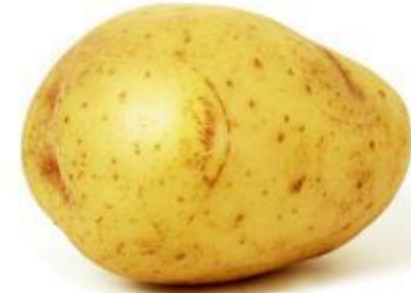
**50 Tons / Day / Hectare**



**Duration of Irrigation**  
**26 minutes / Hectare**



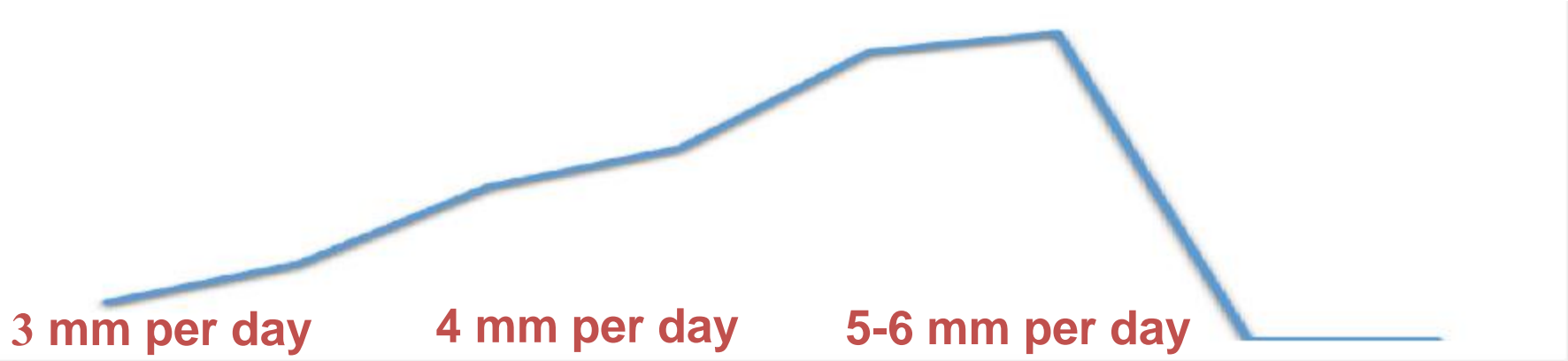
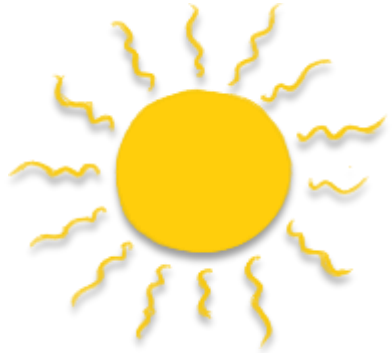
# Water Requirement



**Irrigation water requirements are 4000 to 6000 m<sup>3</sup> per hectare**



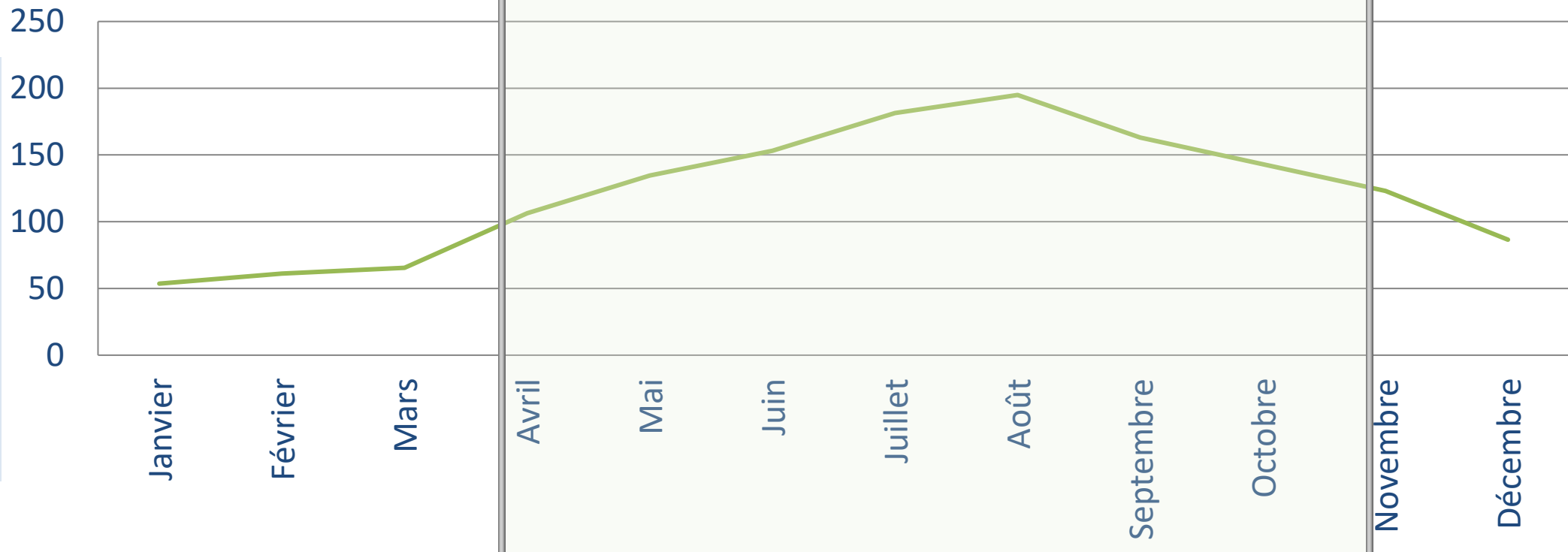
# Water Requirement : Absorption coefficient



Crop Water Requirement are different from crop to another

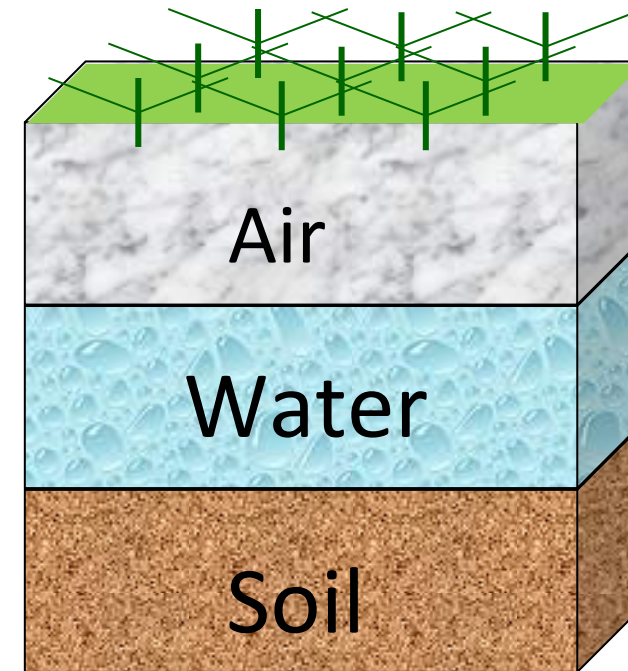
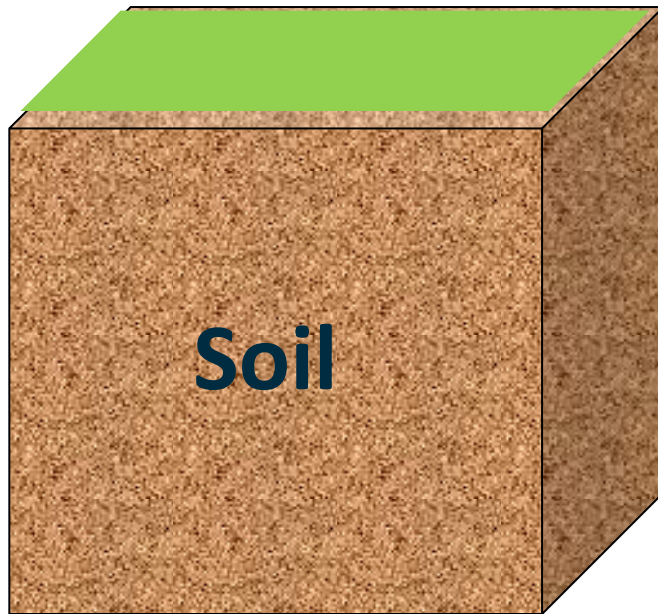


Climatic requirements: ET0



Climatic requirements: ET0 (mm)	106	134	153	181	194	163	143	Total 1076 mm
Plants Absorption coefficient KC	0,45	0,65	0,9	0,9	0,7	0,6	0,5	
Water requirement	47	87	137	163	136	97	71	742 mm

# Soil





# Nature of the soil?



# Analysis of the soil



# Soil Fertility



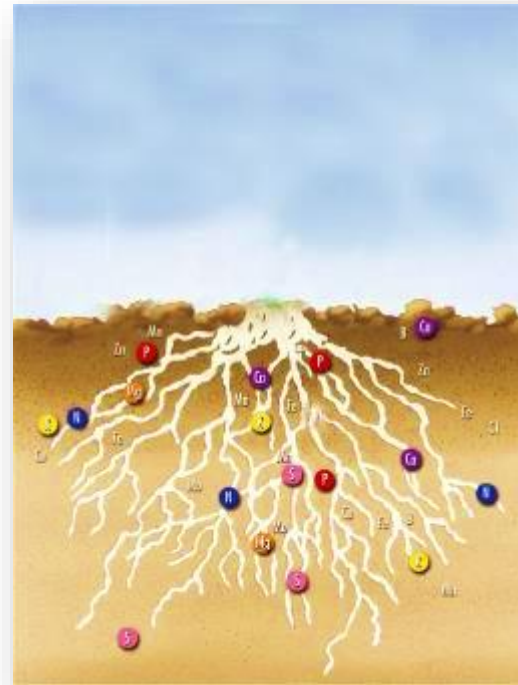
## Nature of the soil

- Depth
- Composition (Sand - Terce...)



## Stock of materials

- Mineral elements
- Organic material

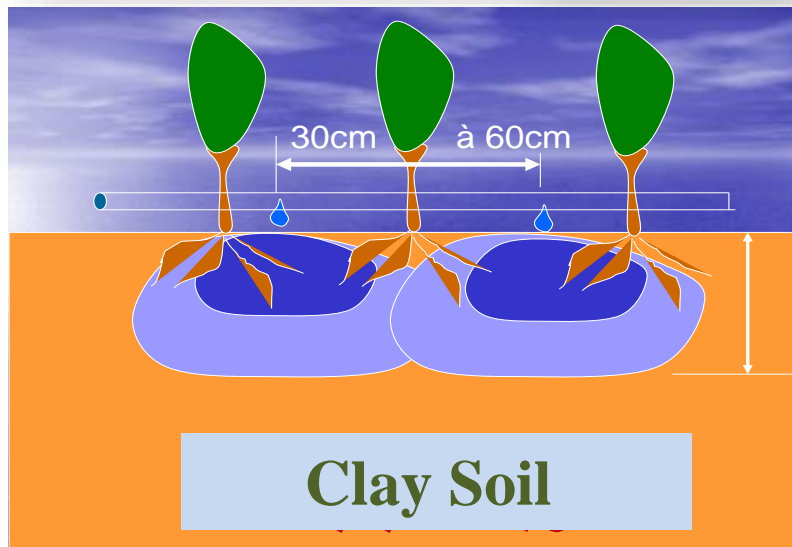
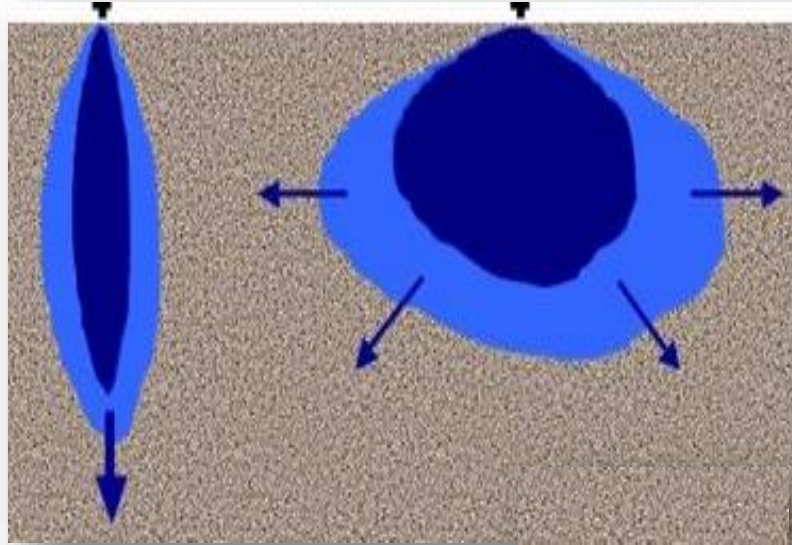


## Biological Abrasion

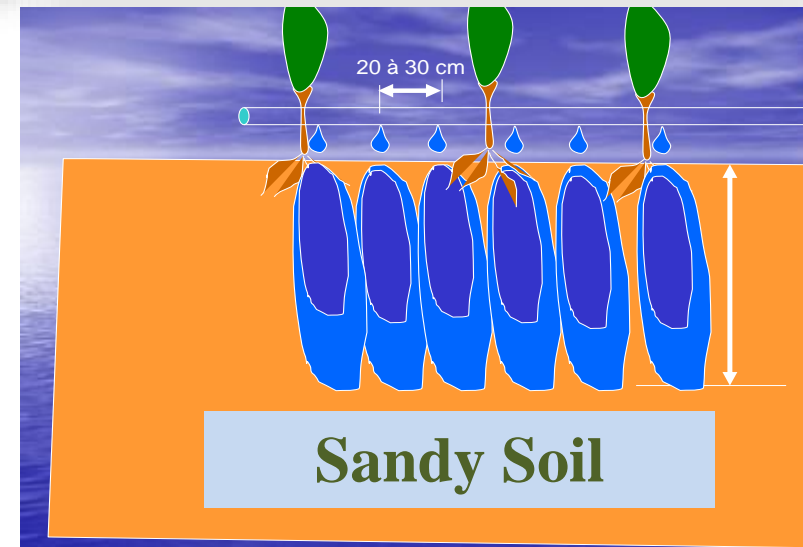
- Harmless living organisms
- Biological reactions



# Irrigation Network : Nature of the soil



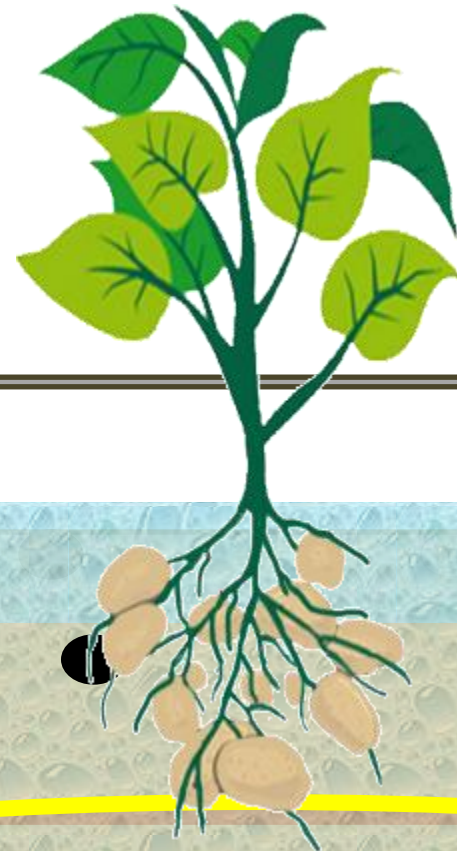
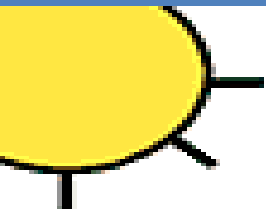
**Clay Soil**



**Sandy Soil**



# Water Requirement



Soil

≈15 - 30 cm



# Water Requirement ; Division of the irrigation

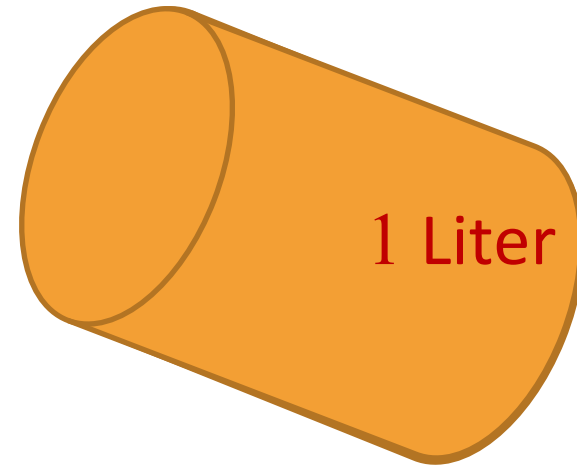


1 Liter

1 Liter of water

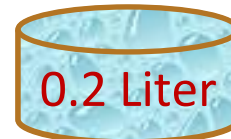


1 Liter

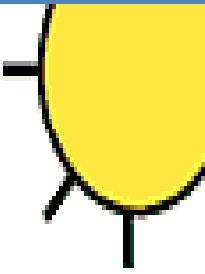


1 Liter

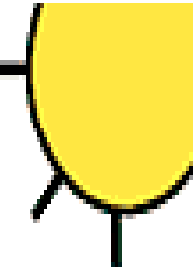
1 Liter of water



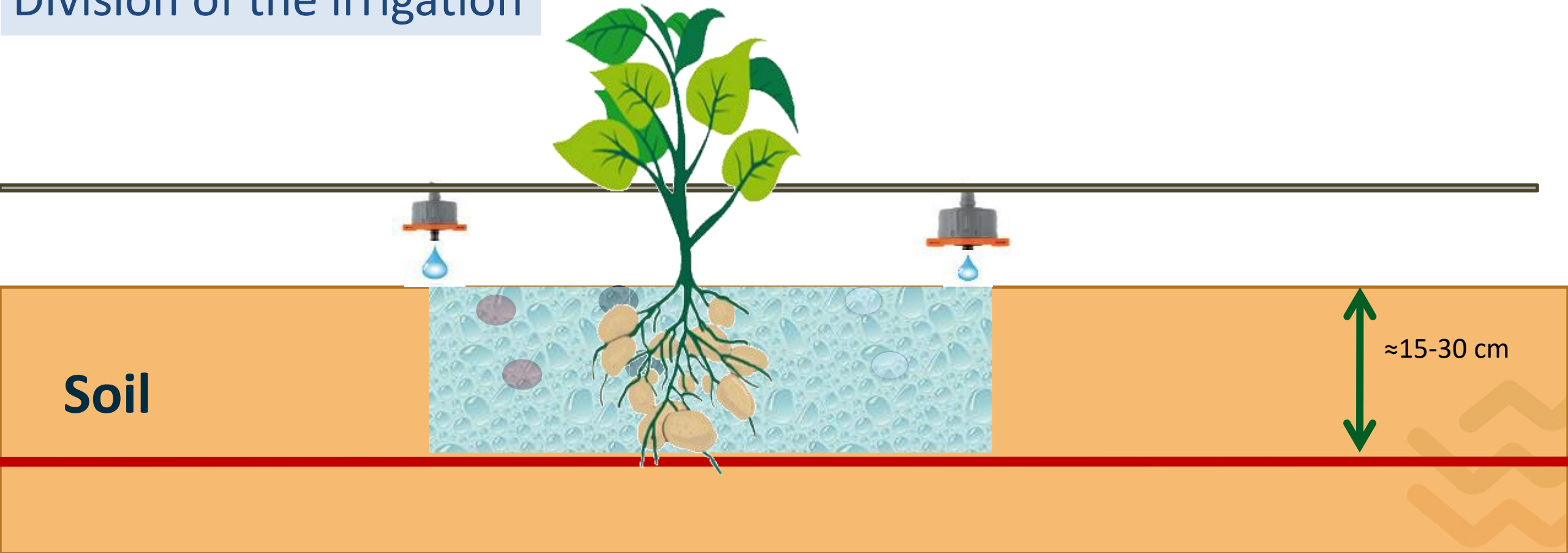
0.2 Liter



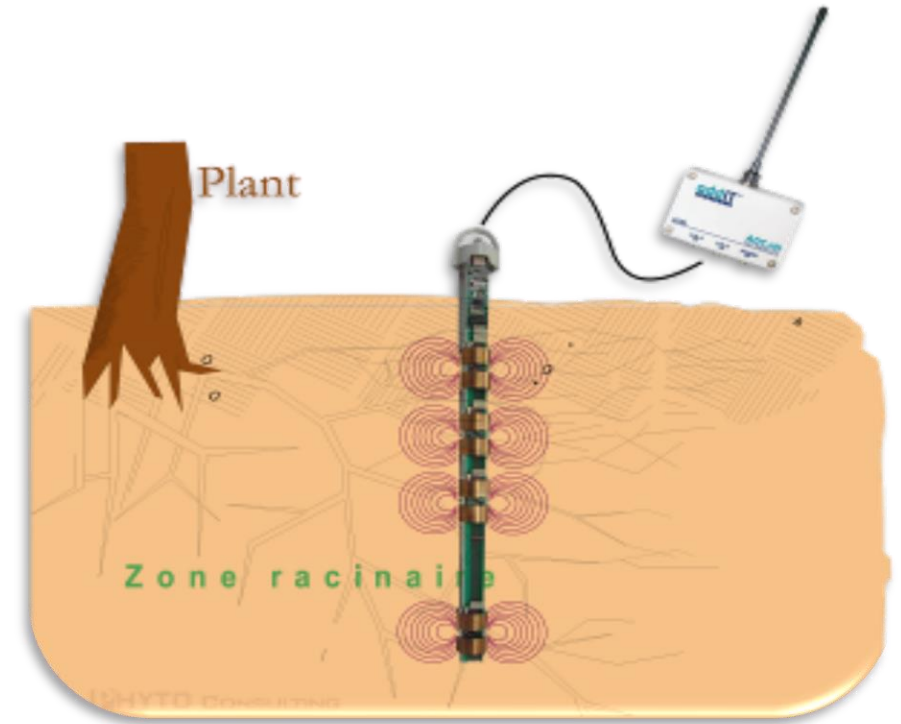
# Water in the soil



## Division of the irrigation



# Monitoring and tracking soil moisture





## Early Warning System



# Smart solutions

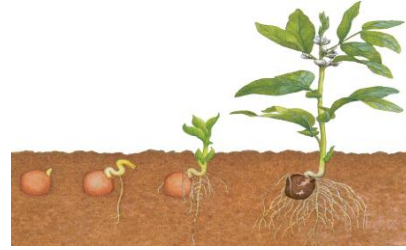


Weather forecast

•ETO



Suivi continu des conditions climatiques de votre parcelle



Soil

•Kc



Recevoir un programme quotidien des irrigations



Soil

DNM



Mieux gérer l'irrigation de votre parcelle



Irrigation System

Micro

NANO



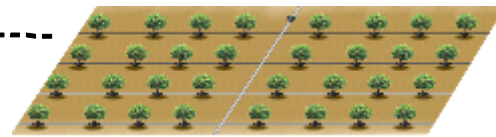
# Irrigation management: Developing an intelligent application



## Technology and information transfer

Opération Post

ENA



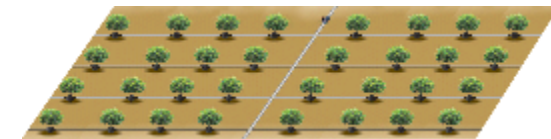
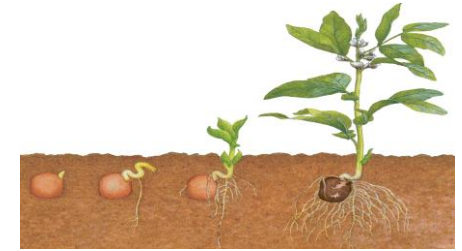
**Agriculture: type and history of plantation**

**Types of irrigation system: Specifications**

**Type of soil: Proprieties**

**Number of sectors**

**Irrigation Program**



# Smart app: Keep track on farmers



**Receive the right data at  
the right time**



**Water  
Requirement**



**Number of  
irrigation**



**Duration of  
irrigation**



# Research results on water saving in local irrigation



# Research results on water saving in local irrigation



## The amount of water provided by farmers

From 8,000 to 15,000 tons per hectare

## Evaluate the estimated amount of water needs

From 3,500 to 5,000 tons per hectare

Tubercles formation phase

Available Quantity  
Provide it

75% of needs during the growth phases (2630 tons per hectare)

50% at the potato tubercles formation stage (2580 Tons per hectare)



## Training and Awareness Workshop

# *Rational and intelligent management of vegetable irrigation*



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