FOODLAND

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

SMART STORAGE SYSTEMS

Smart onion storage system

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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

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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.

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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

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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.

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

Smart storage systems

Smart onion storage system

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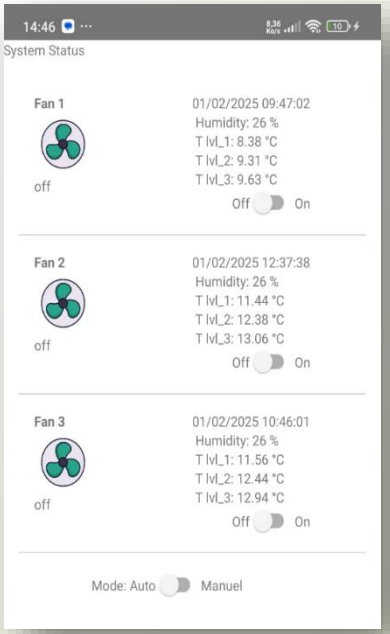
Smart Onion Storage System in the region of El Hajeb



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Presentation plan

- Introduction
- Importance of onion in El Hajeb region
- Sector constraints
- Technical management of onion cultivation
- Storage and preservation
- Mobile Application
- Average cost per hectare of onion
- Conclusions and recommendations

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Introduction

Nationally, the onion sector occupies second place in market gardening with an area of 27,000 ha.

At the regional level ofFez-MeknesIt has a production area of11,600ha and holds the 1st rank in national production with 454,600 tonnes.

The area of action of the province of El Hajeb is the champion of this sector given its importance in the plant production system with an area of 6000 ha.

It represents 22% of the national area and 52% of the regional area.

The sector is taken into consideration by PARCA.

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Importance of Onion in El Hajeb

Onion cultivation plays a vital role in the socio-economic development of the province of El Hajeb.

It generates an average turnover of 264 million Dirhams per harvest.(0.8Dh/kg of bulbs).

The sector contributes to the creation of employment of around 900,000 working days per year in rural areas (150 days/hectare).

The method of onion cultivation is drip irrigation using varieties with high storage capacity.

The region participates in supplying the national market during the winter period with export prospects in Africa (Mauritania, Senegal and Burkina Faso).

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Sector constraints

- Predominance of field sales.
- Low quality of thesystem oftraditional conservation.
- Difficulty related to themastery of the technical itinerary of culture and conservation.
- Unorganized marketing circuit.
- Low efficiency ofprofessional organization working in the sector (Cooperative, association, GIE, etc.).
- Absenceof technologiesmodern conservation.
- Massive presence of speculators and intermediaries.

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Technical Driving Tips

- Respect for rotations and soil work to reduce infestations by weeds and cryptogamic diseases;
- Respect for intervention periods for herbicides: Do not exceed the cotyledonary stage;
- Early sowing in November in mountain areas andmorelate in mid-altitude areas;
- Appropriate transplanting density is 300,000 plants/Ha;
- Splitting of nitrogen inputs, particularly at the start of the growing cycle;
- Balanced phospho-potassium fertilization (according to soil analyses and crop samples);
- Provision of appropriate irrigationinlow doses and high frequency;
- Tpreventive treatment against mildew during high humidity during the month of June;
- Contribution of foliar calcium to improve the firmness of the bulbs;
- Respect for harvest stage: 80% of leaves withered;
- Storage and valorization of production.

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Operations planning

Planning of the different techniques of onion cultivation in the El Hajeb region

Jan	Feb.	March	April	May	June	July	August	Seven.	October	Nov.	Dec.
									Sowing seeds		
Nursery maintenance			Replanting								
				Maintenance and irrigation							
						Harvest					
						Drying					
									Storage and marketing		
Storage and marketing											

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Seed production

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Production of seedlings

Raising plants in the nursery

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Replanting

Uprooting and transplanting operations

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Irrigation

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Fertilization

Level of fertilizing elements for storage onion

Elements nutritious	N(kg/Ha)	P2O5(kg/Ha)	K2O(kg/Ha)	CaO(kg/Ha)
Fertilizer background	80	60	150	-
Fertilizer ofblanket	120-150	30	150-200	50

The contribution of calcium in the cover fertilization allows to have a dressing necessary for the conservation and for a prolonged storage.

Onion cultivation is also demanding in sulfur which is provided alone or with other fertilizers such as nitrogen (ammonium sulfate) and potassium in base dressing (potassium sulfate).

To better manage fertilization, it is recommended to carry out soil analyses.

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Weeding

Weeding, whether manual or chemical, is a necessary operation to avoid competition for mineral elements and water:

Manual weeding: should be carried out as soon as weeds appear.

Chemical weed control: is carried out using a herbicide

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Phytosanitary Protection

Main onion pests

Mildew

Botrytis on bulb

Thrips

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Harvest

Harvest date	• Juilly à August
optimal harvest stage	• 80% fading
Harvest conditions	• Reduced irrigation at early maturity
Drying mode and period	• On a board for 4 to 8 weeks

Pulling out the bulbs

Rwiping onion in the field

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Storage and preservation

Silo storage

To successfully store in Silos, you must:

Harvest

- stage 80% fall

Location and orientation of silos

- Windswept terrain
- Silos parallel to wind direction

Dimensions of silos

- Length: 5 to 6 m per radius
- Width: 90 to 100 cm
- Height: 90 to 100 cm
- Between silos: 5m

Silo Covering

- Use of straw
- Polyethylene cover

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Storage and preservation

Comparison of storage losses:

Loss max. de:

- 10% in 4 months.
- 20% in 6 months.

Storage in traditional silos loss are around 40-60%.

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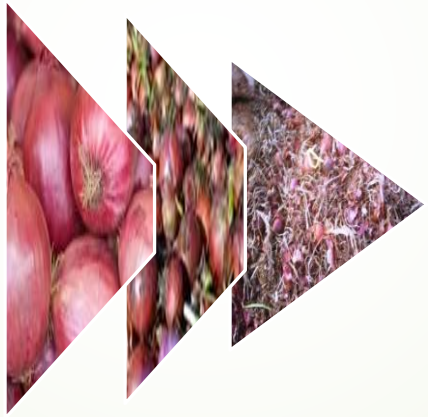
Storage and preservation

Storage loss in traditional silos:



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Storage and preservation

Improved storage and packaging:

Stone pile silos for conservation and storage

Modern storage silo

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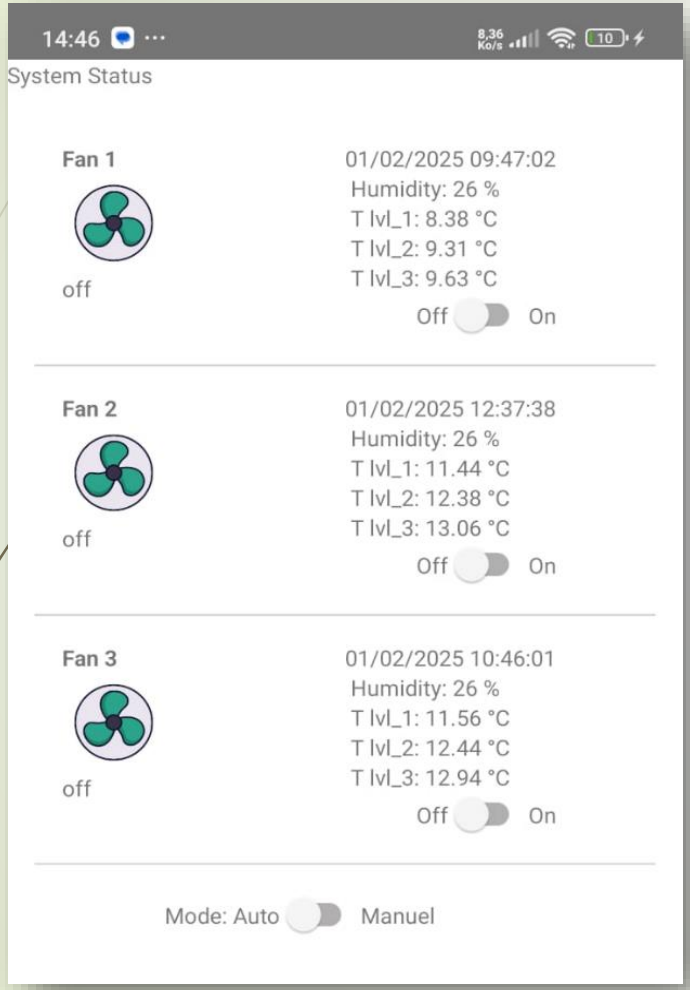
Mobile application



OniSave
A CONSERVATION SYSTEM

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Analysis of the average cost of a hectare of onion

- **Structure of production costs per hectare**

Designations	Cost in DH	Share in %
Soil work	1,500.00	3.75
Seeds	1,500.00	3.75
Workforce	25,000.00	62.5
Fertilization	3,500.00	8.75
T. phytosanitary	4,000.00	10.00
Irrigation	4,500.00	11.25
Total	**40,000.00**	**100**

The analysis of this table places the focus on the creation of a significant number of working days during the entire crop cycle of approximately **62% of the production cost.**

- **Production value:**

Culture	Yield (T/ha)	Pricesale (Dh/kg)	Value
Onion	**52**	**1.5**	**78,000.00**

➢ **Income from one hectare (result)**

Gross margin = 78,000.00 – 40,000.00 =**38,000.00Dhs**

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Conclusion

- The onion industry plays a very important socio-economic role in the El Hajeb area.
- It still faces difficulties in the management of the culture and downstream by the traditional storage and conservation method causingimportantlosses.
- MalThe organization of this sector and the massive appearance of intermediaries have a negative influence on added value for producers and the marketing circuit.
- Ineffect,the following recommendations can be made to succeed in this sector:

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Recommendations

- Support fortransfer of technologies in the field of onion production and valorization.
- Encouragementfarmers by organizing competitions for the best producers.
- Organizationawareness, information, training and travel days for the benefit of onion producers.
- Organizationof the sector through the creation of cooperatives and economic interest groups to control the marketing circuit and eliminate the intervention of intermediaries.

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Recommendations

- Facilityof silosmodern ofstorage foravoid the huge losses caused by storage in traditional silos.
- Encouraging producers to open up to the international market.
- Upgrading the annual onion festival in El Hajeb province by organizing a national fair to improve this sector.
- Support for the sector by research institutions (INRA, ENAM, ONSSA)

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Thank you for your attention

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