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

AQUACULTURE SYSTEMS

Implementation of integrated aquaculture: cage design

Website	foodland-africa.eu
Twitter	@FoodLANDafrica
Facebook	FoodLANDafrica
LinkedIn	foodland-africa

Table of Contents

1. FoodLAND technical innovation for local food supply chains: concepts and approaches 3

2. FoodLAND practical training: aims and scope 5

3. Second training packages on the adoption and management of the tested innovations: an overview 6

4. Second training packages on practical information on the adoption and management of the tested innovations 7

Aquaculture systems 7

Implementation of integrated aquaculture: cage design 7

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

Aquaculture systems

Implementation of integrated aquaculture: cage design

CONFIDENTIAL

FoodLAND partners only

Aquaculture Working Group

T5.2 Innovation pilots and validation in integrated Aquaculture systems

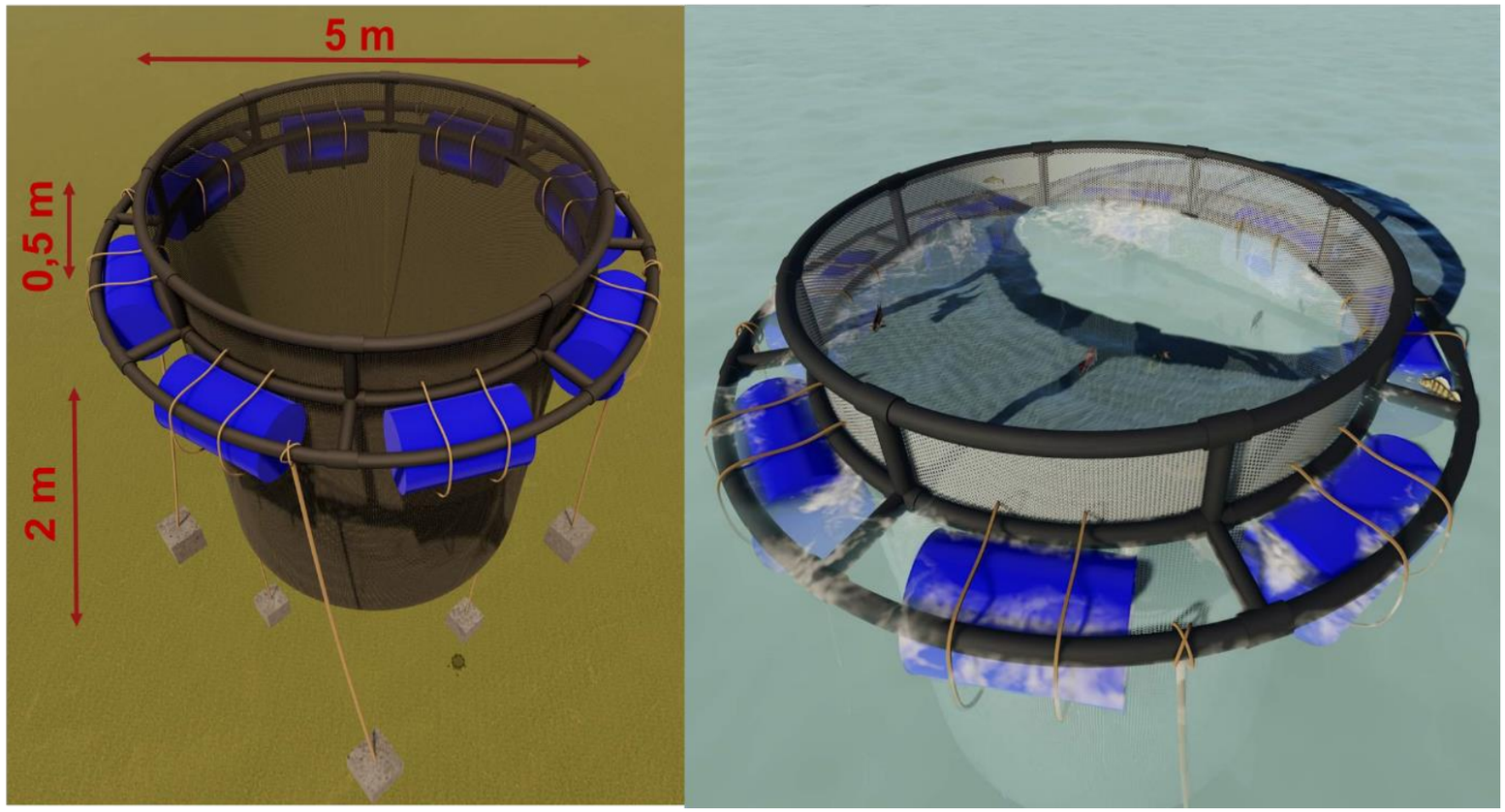
FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

INAT, Tunisia

- Cage design for fishermen

10-15 fish farmers will be trained on cage construction and maintenance.

The training will be held at the office of the Direction of Dams of Bouhertma
(Jendouba governorate).



Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
-General introduction on fishing techniques used in dams -Site selection -Design considerations and trade-offs -Operational and management considerations	Trawl net bag design			Pipes manufacturing		-Deployment of the cage into the water -Cage management

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Objectives of the training

Cage aquaculture is a low impact farming practice that uses a floating frame, net materials and mooring system to culture fish in existing water bodies, with four types of fish-rearing cages available.

It is economically viable with high returns and minimal carbon emissions. Natural currents provide the fish with oxygen and other appropriate natural conditions, and the method requires low investment and land use, making it ideal for small scale fisherfolks as an alternative income source.

The design of the cage and its accessories can be customized according to individual requirements.

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Site selection

Site selection process is crucial for successful cage farming as favorable physical, environmental, and water quality conditions are essential

Some of the more important site selection considerations:

<u>Meteorological factors</u>

- Winds: prevailing directions, velocities, seasonal variations, storm intensity and frequency
- Light: total annual solar energy impingement, intensity, quality, photoperiod - diurnal cycle
- Air temperature and variations
- Relative humidity or dew point and variations
- Precipitation: amount, annual distribution, storm maximums and frequency

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Site selection

<u>Locational factors</u>

- Watershed characteristics: area gradients (elevations and distances), ground cover, runoff, up-gradient activities
- Groundwater supply: aquifers, water table depth, quality
- Tides: ranges, rates, seasonal and storm variations, oscillations
- Waves: amplitude, length, direction, seasonal and storm variations, storm frequency, fetch lengths
- Hydrography: depths and bottom types
- Water quality: normal variations, short and long-term threats
- Coastal currents: magnitude, direction and variations, exchange rates
- Existing facilities and characteristics
- Accessibility of site
- History of site: prior uses and experiences

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Site selection

Soil factors

- Soil type: profile, sub-soil characteristics
- Percolation rate: coefficient of hydraulic permeability
- Topography and distribution of soil types
- Particle size and shape
- Angle of repose: wet, dry
- Fertility
- Microbiological population
- Leachable toxins: pesticides, heavy metals, other chemicals

Biological environment

- Primary productivity: photosynthetic activity
- Local ecology: number of trophic levels, dominant species
- Wild populations of desired species: adults, sources of seed stocks
- Presence and concentrations of predators: land, water, airborne
- Endemic diseases, parasites and toxic algal blooms

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Design considerations and trade-offs

Before proceeding with the design process, it is necessary to have some tentative answers and values for the decisions:

Floated, fixed, submersible or submerged cages?
Size and shape of individual cages?
Catwalked or not? Partial platforms?
If floating, type of floatation, freeboard (if any) and water plane area?
Are cages nested or moored separately? What is the configuration?
Mesh type and size?
Expected system lifetime?
Materials of construction for various components?
Solid or articulated cage collars, if any?
Connections - nets to collars/frames, between cages, collars to servicing platforms and collars/frames/platforms to mooring lines?
Means to control cage shape and volume in presence of water currents, if any? Underwater predator netting, if any?
Bird netting, if any?
Spray ice shielding, if any?
Anticipated biofouling composition and rates on system components?
Planned operating and servicing procedures?

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Operational and management considerations

The successful grow-out of an aquatic organism, assumed but not necessarily restricted to being a fish, requires a number of activities to be carried out. These operating and servicing functions must be considered early in the project before design decisions are fixed:

Stocking of organisms
Counting organisms
Measuring/weighing organisms
Grading organisms
Feed preparation and/or storage
Feeding of organisms
Prophylactic treatment of organisms
Monitoring water quality and flowrate
Monitoring and control of status and health of organisms
Harvesting and processing of organisms
Cleaning of system (biofouling control and good hygiene)
Logistical support for organisms and personnel (trucks, boats, etc.)
Mechanical maintenance (connections, moorings, equipment)
Support facilities and services for personnel (including shelter)
Storage for equipment and supplies

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design

Steps

1- Trawl net bag design

2- Pipes manufacturing

3- Preparation of the concrete blocks

4- Deployment of the cage into the water

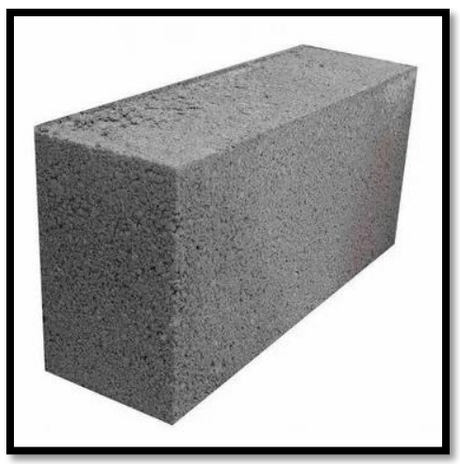
FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design
Materials

Net: A 16mm mesh braided trawl net

Ropes: pressed ropes of 10mm diameter

The floats: the cage floats on 2 circular Polyethylene pipes



The weights: they are cement blocks of 70kg weight

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design

Step 1: Trawl net bag design

Materials

-Polyamide braided thread spool with a diameter of 210/36 PET 250 gr used for sewing and splicing.

-Shuttle: working tool generally used to build splices.

-Rope: polyamide reinforcement rope used for the assembly of parts and the bottoms of the cages

-Scissors: Working tool used to cut nets, wires, rope....

-Net: A 16mm mesh braided trawl net

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design

Step 1: Trawl net bag design

1- Net cutting

2- Nets gathering

3- Attachment of the nets to the headline (selvedges)

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design

Step 2: Pipes manufacturing

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Cage Design

Step 3: Preparation of the concrete blocks

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Thank you

Aquaculture Working Group !

FOODLAND has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement (G.A NO 862802).
The views and opinions expressed in this presentation are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.