



INITIATIVE ON  
Fragility to Resilience in Central  
and West Asia and North Africa

## The CGIAR Initiative on Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA)



### Workshop Report

### Integrated Aquaculture-Agriculture (IAA) Systems in Cairo governorate, Egypt

In partnership with



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## I. Introduction

The CGIAR Initiative on Fragility to Resilience in Central and West Asia and North Africa (**F2R-CWANA**) aims to build resilient food systems capable of withstanding the impacts of climate change. This initiative addresses the unique challenges faced by the region, including climate variability, water scarcity, and agricultural and aquaculture productivity issues, which have heightened fragility and vulnerability, particularly in rural areas. F2R-CWANA focuses on improving climate data availability, enabling different actors to better manage climate risks. The initiative also emphasizes the importance of collaboration among various partners, including academic institutions, private-sector entities, government agencies, and NGOs, to foster innovation and scale effective solutions.

Under the flagship of F2R-CWANA, on October 13<sup>th</sup>, 2024, WorldFish conducted a one-day workshop in Cairo. The workshop took place at Safir hotel, Dokki, in collaboration with two **CGIAR centers**; The International Center for Agricultural Research in the Dry Areas (ICARDA), and The International Water Management Institute (IWMI), (see concept note; Annex iii).

A total of **72 participants** attended the workshop sessions, which included a mix of input presentations and interactive discussions focused on case studies and lessons learned. The participants represented a diverse range, including medium-scale farmers, producers, NGOs, think tanks and private companies. This variety ensured that a broad spectrum of experiences and backgrounds was brought into the room, enriching the discussions and insights shared during the workshop<sup>1</sup>. The workshop



sessions were jointly delivered by experts of CGIAR Centers and IAA experts/consultants, followed by >1 hr. plenary discussion (see agenda; Annex i).

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<sup>1</sup> Link to workshop Facebook post: <https://www.facebook.com/>

## II. Workshop sessions

The workshop activities commenced with opening remarks from WorldFish, delivered by **Dr. Ahmed Nasr-Allah**, Country Representative for Egypt. In his remarks, he provided brief insights into CGIAR F2R-CWANA initiative successful implemented activities in focal countries, under work package (WP) 4, with a specific-contextual-focus on sustainable aquaculture practices in Egypt and Morocco. Similarly to the workshop held in Minya, the four subsequent workshop sessions focused on the **nexus between water, plants, and fish**.

### 1<sup>st</sup> session: Integrated farming systems

The session was kicked-off with an overview of the aquaculture development in Egypt, starting with a presentation of the global and national aquaculture growth rates. Egypt is producing **1.576 million tonnes of farmed fish** (LFRPDA, 2022). The state is expecting an increase to 3 million tonnes by 2030 through the transition from traditional to intensive farming systems.

**Expansion of IAA Systems in Egypt:** It is essential for enhancing food security and supporting rural economies which aligns with Egypt’s vision 2030<sup>2</sup> and the National Climate Change Strategy (NCCS) 2050<sup>3</sup> (see figure 1). This alignment not only contributes to Egypt’s future strategic vision, but also enhances country’s positioning as the largest aquaculture producer in Africa.



Figure (1): Advancements of IAA systems.

<sup>2</sup> Sustainable Development Strategy (SDS), Egypt Vision 2030:  
[https://arabdevelopmentportal.com/sites/default/files/publication/sds\\_egypt\\_vision\\_2030.pdf](https://arabdevelopmentportal.com/sites/default/files/publication/sds_egypt_vision_2030.pdf)

<sup>3</sup> Egypt National Climate Change Strategy (NCCS) 2050:  
<https://www.eeaa.gov.eg/Uploads/Topics/Files/20221206130720583.pdf>



## 2<sup>nd</sup> session: Integrated aquaculture systems and BMP

The session commenced with an introduction to the fundamentals of IAA Systems, emphasizing their sustainable practices and benefits.

**Water management:** Aquaculture does not consume water but rather reuses it, this innovative approach allows for more **efficient water management** that is crucial in addressing global water scarcity issues

**Enhancement of soil fertility:** The wastewater produced from fish farming plays a significant role in enhancing soil fertility, this practice not only enriches the soil but also reduces the **dependency on chemical fertilizers**

**Nutrient contributions from fish farming effluent:** The substantial benefits of using fish farming effluent for crop irrigation can **increase crop yields by at least 30%**, whereas the nutrients released into the water from fish waste include:

- **32kg of ammonia** from 1 tonne of feed
- **87kg of nitrate** from 1 tonne of feed
- **5kg of phosphate** from 1 tonne of feed

These nutrients are not only ideal for crop irrigation but also provide the equivalent of **130kg** of nitrogen for plants. This nutrient supply significantly reduces the need for expensive chemical fertilizers, which translates to approximately five sacks of urea.

**Efficiency:** Each tonne of fish feed generates nutrients for plants, particularly nitrogen, equivalent to approximately 5 sacks of urea. The one acre of intensive aquaculture can irrigate between 100 - 150 acres of crops using efficient drip or sprinkler irrigation systems.

**Case study — IAA farms in Wadi Natroun:** The farms there are specialize in production of **citrus fruits**, specifically oranges and mandarins. The farms utilize water from a 1-acre fish farming pond to effectively irrigate 100 acres of citrus trees, demonstrating the practical application of (IAA) systems. Notably, this approach has resulted in significant savings on nitrogen fertilizer costs, amounting to approximately 100,000 Egyptian pounds over a six-month period, due to the benefits of **nutrient-rich-fish** effluent.

## 3<sup>rd</sup> session: Aquaponics in arid land —International experience

The session started with a comprehensive explanation of **aquaponics systems**, which are symbiotic systems where fish and plants thrive together in a closed-environment. In this system, **fish waste** serves as a nutrient source for the plants, while the plants play a crucial role in **purifying water** for the fish, enabling efficient water recycling.

The discussion then shifted to the multi-advantages of aquaponics in arid zones, highlighting that it utilizes up to **95% less water than traditional farming**, making it particularly suitable for regions with limited water resources. Furthermore, aquaponics systems are recognized as one of





the most **efficient food production systems**, facilitating faster crop growth without reliance on pesticides, herbicides, or chemical fertilizers.

**Freshwater aquaponics systems:** They combine freshwater fish, such as Nile tilapia, with crops including lettuce, cherry tomatoes, and cucumbers

**Saltwater aquaponics systems:** They utilize saltwater tilapia and quinoa, demonstrating the adaptability of the system under varying salinity conditions

**Each system comprises:** Fish tanks; Water treatment units (mechanical and biological filters); Planting areas. Water is circulated at a rate of **10 cubic meters per hour**

#### **4<sup>th</sup> session: Shrimp culture in (IAA) farms in Egypt**

The session started with an input presentation that included videos illustrating fundamental principles of shrimp culture. Following this, a comprehensive overview of Egypt's shrimp production was provided, highlighting current practices and challenges. Emphasizing on the synergy between shrimp farming and agricultural practices, where aquaculture waste is utilized to enhance crop fertilization. This innovative approach is recognized as a sustainable solution for improving resource efficiency in the desert and arid regions of Egypt, addressing both environmental and economic concerns.

- **Water efficiency:** Integrated shrimp farms utilize groundwater effectively, reusing water from shrimp ponds for crop irrigation, which minimizes the reliance on chemical fertilizers
- **Environmental sustainability:** Utilizing brackish or slightly saline water for shrimp farming is ideal for Egypt's arid regions, where freshwater is limited. This approach helps reduce water waste and manage soil salinity effectively

The Pacific Whiteleg Shrimp *Litopenaeus vannamei*, is an ideal species for shrimp farming in desert regions using brackish water, renowned for its adaptability to varying salinity levels and resilience to diseases.

**Case studies — Shrimp culturing in IAA farms in Egypt:** In Marsa Matrouh, IAA farms illustrate the effective connection between shrimp farming and crop production through shared water resources. Additionally, farms like Al-Zeini agricultural development in Wadi El-Natron exemplify efficient water use by employing desalination plants and utilizing shrimp pond effluent to irrigate crops, including fruit trees and forage plants.

#### **5<sup>th</sup> session: Plenary discussion and feedback**

The workshop speakers were engaged with participants in over a 1hr. discussion facilitated by WorldFish. The participants identified several **significant challenges** impacting their fish farming practices. Encountering by IAA farmers, challenges related to weak infrastructure such as; water leakage from concrete tanks and difficulties in managing water inlets and outlets. The farmers face obstacles like poor quality of fry, logistical difficulties and lack of knowledge of culturing high-value species such as shrimp. Other challenges included the fragility of individual operations,

inadequate understanding of licensing and water sharing, and the high costs associated with operation.



### III. Key recommendations

After thorough discussions among experts and a comprehensive review of various perspectives, the participants have outlined several key recommendations and next steps for enhancing aquaculture practices.

- **System construction and design:** It is crucial to conduct a detailed study by experts before constructing aquaculture systems. The excavation for concrete tanks should account for approximately half of the total tank height. Utilizing appropriate materials in the concrete mixture or HDPE sheets is essential to prevent water leakage. The design process should prioritize the inlet and outlet systems to ensure optimal water flow and management
- **Water management:** Effective water management and irrigation methods are vital for preserving water resources and enhancing efficiency. A well-planned schedule for water use can significantly improve sustainability in aquaculture practices
- **Shrimp culture considerations:** When cultivating shrimp, it is important to consider specific requirements such as water salinity and winter temperatures. Additionally, *processing shrimp* can add significant value to production, enhancing profitability
- **Export opportunities:** There is a significant opportunity for IAA farmers to engage in exporting their products. Given the high quality of fish produced, it is essential to consider production volumes to meet export demands effectively
- **Aquaponics systems marketing strategies:** Targeting consumers who prefer organic products can enhance aquaponic production. Knowledge sharing and dissemination are crucial for success

#### IV. Annex i: Workshop agenda

Time	Activity	Speaker
09:00 – 09:30	Registration and Group Photo	
09:30 – 10:00	Opening Remarks	Dr. Ahmed Nasr-Allah
10:00 – 10:30	Integrated Farming Systems (Achieving Sustainability)	Dr. Ahmed Saney
10:30 – 11:00	Integrated Aquaculture System and BMP	Dr. Salah Haggag
11:00 – 11:30	Tea/coffee Break	
11:30 – 12:00	Aquaponics in Arid Land (International experience)	Dr. Ibrahim E H Belal
12:00 – 12:30	Shrimp Culture in IAA Farms in Egypt	Dr. Sherif Sadek
12:30 – 02:00	Partner Discussion and Feedback	Dr. Ahmed Nasr Allah
02:00 – 03:00	Lunch	





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V. Annex ii: List of participants

**From Fragility to Resilience in Central and West Asia and North Africa (CWANA) Initiative**  
 One Day Training Workshop  
 Integrated Aquaculture Agriculture (IAA)  
 13 October 2024, (09:00-15:00) Cairo Local Time  
 Safir Hotel, Dokki-Cairo

**Registration Form**

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## VI. Annex iii: Concept note

The CGIAR Initiative on Fragility to Resilience in Central and West Asia and North Africa ([F2R-CWANA](#)) aims to **build resilient food systems** capable of withstanding the impacts of climate change. This initiative addresses the unique challenges faced by the region, including climate variability, water scarcity, and agricultural and aquaculture productivity issues, which have heightened fragility and vulnerability, particularly in rural areas.

Integrated agriculture-aquaculture (IAA) is one of the most promising, and fastest-growing, food production systems in Egypt. IAA systems offer an excellent opportunity to optimize the use of water resources, increase fish production, decrease the use of chemical fertilizers in crop farming and reduce the impact of aquaculture on the environment (Sadek S. et al., 2023)<sup>4</sup>.

Under the flagship of F2R-CWANA, in partnership with The International Center for Agricultural Research in the Dry Areas (ICARDA), and International Water Management Institute (IWMI), WorldFish is **hosting two separate workshops**, each for one-day, on Integrated Agriculture-Aquaculture Systems (IAA). The workshops are tailored to objectives of F2R-CWANA for empowering various stakeholders to effectively manage climate-related risks, and in alignment with [Egypt's National Climate Change Strategy \(NCCS\) 2050](#).

The two workshops are intended to engage approximately 80 -100 participants from various governorates throughout Egypt who are either implementing, adopting, or planning to initiate IAA systems. This will comprise establishment of a database for small and medium-sized farmers, hatchery and fish farm owners, researchers, enterprises, NGOs, and other key stakeholders. Special emphasis will be placed on participants from Mineya governorates Wadi El Mughra in Marsa Matrouh, who have experience with IAA systems that vary in size and types of fish and crops, ranging from semi to fully integrated systems.

The first workshop is planned for two days, on September 22<sup>nd</sup> and 23<sup>rd</sup>, in Mineya. The first day will include two to three field visits to IAA farms located in the Mineya and Mallawi districts. On the second day, similar to the one-day workshop scheduled in Cairo on October 13<sup>th</sup>, participants will include farmers and IAA experts, along with representatives from WorldFish, ICARDA, and IWMI. They will come together to discuss challenges, present case studies which will include input presentations, and participate in a more than one-hour discussion aimed at identifying future interventions. Ultimately, the two workshops will serve as a platform for sharing scientific knowledge, success stories, and lessons learned. Most importantly, it aims to foster collaboration among diverse stakeholders from both the private and non-private sectors.

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<sup>4</sup> Sadek S, Elewa A, Ahmed N, Munir S, Mahfouz AR and Nasr-Allah A. 2023. An assessment and analytical report for integrated agriculture-aquaculture (IAA) systems in Egypt. Penang, Malaysia: WorldFish. Program report: 2023-38. <https://hdl.handle.net/10568/134559>

## Objectives and expected results

- 1. Increased knowledge, awareness and capacity building:** Participants will gain a comprehensive understanding of IAA systems, including best practices, innovative techniques, and the latest research findings on optimal crops and water management.
- 2. Networking and collaboration opportunities:** The workshops will facilitate networking among participants, creating a collaborative environment where stakeholders can share experiences, challenges, and solutions related to IAA.
- 3. Actionable synergies for climate resilience:** Participants will collaboratively identify and develop actionable strategies and recommendations for enhancing climate resilience in IAA systems specific to the regional context of F2R-CWANA initiative. This will be compiled into recommendations of the workshop report to guide future practices and initiatives.
- 4. Compilation of IAA data base, success stories and lessons learned:** a comprehensive database will be established, collecting farmers contact information and IAA farms' data (e.g. size, number of fish tanks, types of crops, etc.). The key points of discussions, including success stories and lessons learned from participants engaged in IAA systems will be outlined in a documented report.
- 5. Feedback and roadmap for future workshops:** Comprehensive verbal feedback on the workshops will be collected from participants to assess effectiveness and areas for improvement. This output will be compiled into next steps of the workshop report, and will inform the design and planning of future workshops or training activities, ensuring they are more aligned with stakeholder needs and challenges.