Integration of water – Agriculture sector in Egypt: concepts and applications

Aquaponics and its role in realization Water and food security
Background & challenges

• Rethinking Farming in the context of:
  Water Scarcity
  Energy
  Climate Change
  Food Security
Egypt is expected to head into Extreme water scarcity (500 cubic meters per person per year or Less) as soon as 2025.
Energy
Climate Change

Displaced population: 3,800,000
Lost cropland: 1,800 km²

Displaced population: 6,100,000
Lost cropland: 4,500 km²

Figure 4: Potential Impact of Sea Level Rise: Egypt’s Nile Delta.
Source: Sermonett et al., 2005.
Food security is defined by the Food and Agriculture Organization (FAO) as:

- when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
Agriculture and Food Security

7.5 million feddan of irrigated land - 75% old lands, 25% reclaimed

Striking growth in export of horticultural crops

Highly productive agricultural system with 2-3 planting seasons and a 172% crop intensity

Significant growth in yields per hectare of major crops over past decades: 52%, 37%, and 34% for wheat, maize, and rice respectively
Aquaculture and Food Security
Aquaculture and Food Security

Aquaculture production by culture environment the Arab Republic of Egypt (tonnes)
Source: FAO FishStat

Total aquaculture production for the Arab Republic of Egypt (tonnes)
Source: FAO FishStat
<table>
<thead>
<tr>
<th>SEAFOOD TRADE</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (Tonnes)</td>
<td>Value (US$'1000)</td>
<td>Quantity (Tonnes)</td>
</tr>
<tr>
<td>Total Imports</td>
<td>288 360</td>
<td>600 332</td>
<td>585 410</td>
</tr>
<tr>
<td>Total Exports</td>
<td>21 427F</td>
<td>25 855</td>
<td>28 775</td>
</tr>
<tr>
<td>Deficit in Trade Balance</td>
<td>266 993</td>
<td>574 477</td>
<td>556 635</td>
</tr>
</tbody>
</table>

Yet, spectacular gains in production fail to meet the levels of national food security, outpaced by population growth.

ومع ذلك، فإن المكاسب المذهلة في الإنتاج تفشل في تلبية مستويات الأمن الغذائي الوطني، التي فاقها النمو السكاني.
Aquaponics

• Aquaponics is an integrated multi-trophic system that combines elements of recirculating aquaculture and hydroponics

Figure 2. Basic aquaponic system layout.
Aquaponics
Aquaponics

Water Foodprint (litres of water per 1 kg)

<table>
<thead>
<tr>
<th>Animal</th>
<th>Water Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>15.500</td>
</tr>
<tr>
<td>Pork</td>
<td>4.800</td>
</tr>
<tr>
<td>Chicken</td>
<td>3.900</td>
</tr>
<tr>
<td>Fish (RAS)</td>
<td>400</td>
</tr>
<tr>
<td>Cricket</td>
<td>4.300</td>
</tr>
</tbody>
</table>

*One Drop* (shown in the illustration) is equivalent to 500 litres of water.

Plastic ponds, Abdelsalam Hegazy fish farm in Kafr El Shaikh Governorate

Concrete ponds; Ismail Radwan fish farm in Kafr El Shaikh Governorate
Integrated Water Management

**Global water partnership:**

a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
Drainage Reuse, Drainage Lake Abu Minqar Oasis
Aquaponics Greenhouse
Circular, Integrated farming

- Integrated farming System with Aquaponics (fish and clover) and sheep
- Circular system, making use of all resources is the most efficient way
Integrated Farming

• Making use of all resources and by-products
• Example from Fayoum: Fish, ducks, aquaponics, greenhouse, seedlings, open drip irrigation and growing area
• Save on fertilizer and grow more diverse food