



# Urban agriculture in the Gaza Strip through vertical gardens and aquaponics

## Context

For most people in the Gaza Strip, obtaining sufficient quantities of good quality food remains a significant challenge. Three years of almost total blockade (partially eased in June 2010 but still exerting a stranglehold on the economy) saw private sector activity collapse and unemployment soar. The Israeli 'Operation Cast Lead' in 2008-9 saw widespread destruction of assets and infrastructure, which continuing Israeli strikes and the harsh sanctions have left still largely degraded two years on. Direct losses to the agriculture sector alone amount to at least USD 180 million. Meanwhile, Israel continues to enforce a harsh exclusion zone three nautical miles off Gaza's coast and up to 1.5km from the land border, affecting the livelihoods of around 180,000 people and putting 85% of Gaza's fishing zones and 34% of its remaining arable land out of bounds. Annual losses to fishing and agriculture resulting from these restrictions exceed USD 50 million.

Against this background of man-made crises, Gaza's hard-pressed population must also contend with the effects of natural problems. Food prices have soared globally, which compounds the local price impact of scarcity caused by the blockade. Four consecutive years of below-average rainfall has also affected domestic food production,

and put further pressure on the aquifer, abstraction from which runs at over 200% of its annual recharge rate. Salinisation has left only 5% of Gaza's water of potable quality. Meanwhile, the population continues to grow at over 3% annually, putting extra strain on the resources in one of the most densely populated areas of the world.

The overall result of these difficulties on Gaza's population has been a prolonged humanitarian crisis. In 2011, 44% of people are classified as food insecure, and in rural areas this figure reaches 52%. Meanwhile, over 80% of Gaza's inhabitants are dependent on some form of external assistance.

## Why urban agriculture?

Land available for horticulture is extremely limited in the Gaza Strip and, with the current closures and movement restrictions in place, many kinds of fresh vegetables are expensive and hard to find. Furthermore, 97% of the Gaza Strip population are urban or camp dwellers, and therefore do not have access to land. Enabling more families to produce affordable fresh produce in their own home or urban gardens therefore is a highly appropriate and effective response to the current conditions in Gaza.

"Urban agriculture has become a key component of the survival strategies of poorer sections of the population while also providing a significant contribution to the urban fresh food supply chain. Urban agriculture is also a source of employment and income, and has the potential to improve the nutrition of disadvantaged urban residents."





## Emergency food production support to poor families in the Gaza Strip

Since July 2010, the Food and Agriculture Organization of the United Nations (FAO) has implemented an emergency food production support project funded by the Government of the Kingdom of Belgium.

Through the first phase of the project, among other activities, beneficiaries were provided with vertical rooftop gardens connected to fish tanks.



Vertical rooftop garden at a beneficiary home

✓ **Rooftop units:** 119 food insecure female-headed households living in urban areas were given innovative rooftop units connected to a fish tank. In addition, 24 units were installed in educational and community establishments.

✓ **Objectives:** (i) improve the availability of high-quality fresh vegetables for the rural and urban poor, as well as protein in the form of fish; and (ii) encourage the sustainable use of scarce resources through the recycling of nutrient-rich water from fish tanks to irrigate plants.

This first phase of the project allowed to address the ongoing challenges faced by female-headed households in the Gaza Strip, drawing on the emergency and developmental experience of FAO's operations in collaboration with the four women associations and a local NGO. All beneficiaries increased their household food consumption as a result of the gardens. Rooftop garden activities have the advantage of being carried out at the homes of the beneficiaries and require little daily physical effort. This means that the women can simultaneously improve their household food security and income while still taking care of their children and homes.

Building on the successes and experience of the first phase of the project, a second phase was launched in August 2011, enabling FAO to implement a package of quick-impact measures designed to improve the food security of thousands of impoverished Gazans in a sustainable manner. During this phase, in addition to vertical rooftop gardens, FAO is piloting innovative approaches to conserving scarce resources through recycling water through the use of aquaponic systems.

✓ **Rooftop units:** 100 food insecure female-headed households will be given rooftop packages (83 fish tanks connected to vertical gardens in pipes and 17 aquaponics, i.e. fish tanks connected to plastic containers with gravel to grow plants (see p. 3 for more information).

✓ **Objectives:** (i) increase availability of nutritious fresh food for household consumption and sale; (ii) generate income to support households' basic needs; and (iii) strengthen the technical knowledge of rooftop gardening and aquaculture for further dissemination and learning.



Aquaponic system, just after it was set up



Plants after three weeks

“Food production, processing and distribution also contribute to the livelihoods of urban people and are important sources of income and employment. Support to small-scale food and agriculture activities should therefore be seen as a key component of urban poverty alleviation.”



“Environmental sustainability is a key issue in the frame of urban development. Therefore, appropriate techniques and practices should be promoted to ensure food safety and healthy environments, prevent soil erosion and floods, and protect and improve water and air quality.”

## What is aquaponics?

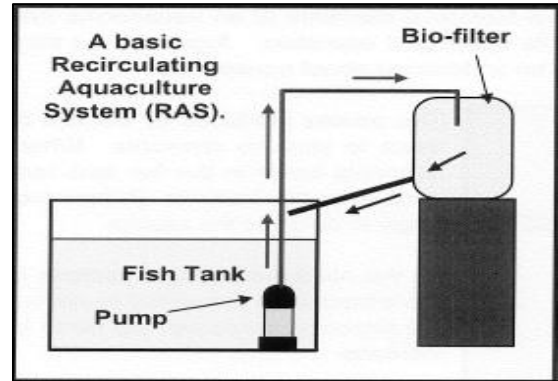
Aquaponics is the combination of soil-less vegetable growing (**hydroponics**) and fish farming (**aquaculture**) within a closed recirculating system.

With this system, nutrient-rich wastewater from the fish tanks, which would normally need to be changed, treated or dumped (leading to environmental problems), is used as an organic fertilizer for plant production. In turn, this removes the constant need for chemical fertilizers for plant growth using hydroponics.

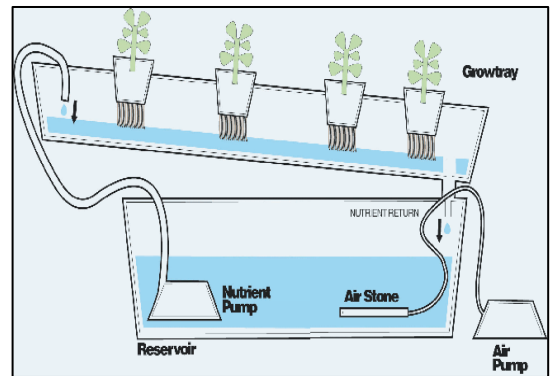
## What are the benefits of aquaponics?

- Two agricultural products can be produced from only one input (fish food);
- Harvesting methods are very simple;
- It allows for high density crop production;
- It is very water-efficient (they use less than 50% of the water needed for normal soil farming);
- Aquaponic food production creates ZERO waste, so it is very environmentally friendly;
- It allows to remove most environmental factors impairing soil root growth (soil compaction, shortage of water, insufficient soil aeration and soil temps);
- It requires very simple technology (plastic containers, gravel and plumbing); and
- It can be used in all urban areas (rooftops, patios, community centres, etc.).

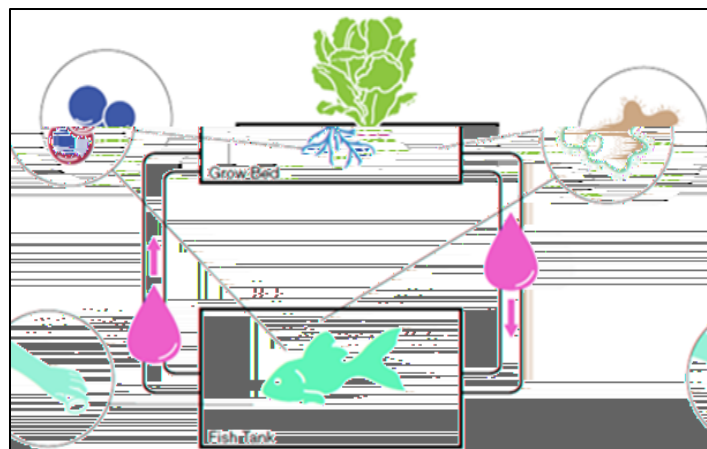
## Aquaculture



## Hydroponics



## Aquaponics



- Fish producing ammonia
- Bacteria converting ammonia to nitrate
- Plants taking up nitrate
- Re-circulating water
- Oxygen for plant roots and fish