This document is an excerpt from the following article:

Hydroponics in Developing Countries, Part 1

By Peggy Bradley and Cesar Hernan Marulanda Tabares

Throughout the twentieth century; hunger and malnutrition plagued large portions of the ever-increasing human population [in developing countries]. Concurrently, commercial, soil-based agriculture continued to expand its hold of the land on Earth. By the end of 1999, over half of the food produced was from lands irrigated by nearby waterways.

But somehow, this agricultural expansion didn't translate into enough food for everyone. The world's population grew from around 1.5 billion at the beginning of the century to over 6 billion by the end. About 1.2 billion of those people lived in a constant state of hunger and malnutrition. Every day 35,000 children starved to death.

Ironically, throughout this misery, there was-and is- enough sunlight reaching the land to feed the people on the earth many times over. However, people growing plants in soil – the only way much of the population knew how to produce crops – were dependent upon climate and the vast amount of water that is necessary to provide "suitable" growing conditions. Over and over again, drought conditions and lack of access to sufficient resources caused starvation and death of people on the margins of modern society.

Simplified Hydroponics [The Proposed Solution]

While hydroponic technology has usually been centered on complex mechanical systems, simplified hydroponics doesn't use any mechanical devices or energy other than human labor and sunlight (unless you use the beds indoors under simulated sunlight-however, this system has been specifically designed for use outdoors in developing countries). Simplified hydroponics reduces the amount of resources required to grow food. All of the growing systems are watered once a day by hand. And, if using floating bed systems, the nutrient water is aerated twice a day by hand. Growers can be built by hand in just a few hours and cost very little. The methods outlined by simplified hydroponics can be used by a person in poverty to help provide food for their family or for use when bartering for other food items.

Plants are always in various stages of growth. The goal is to have a continuous supply of fresh food once the system is up and running.

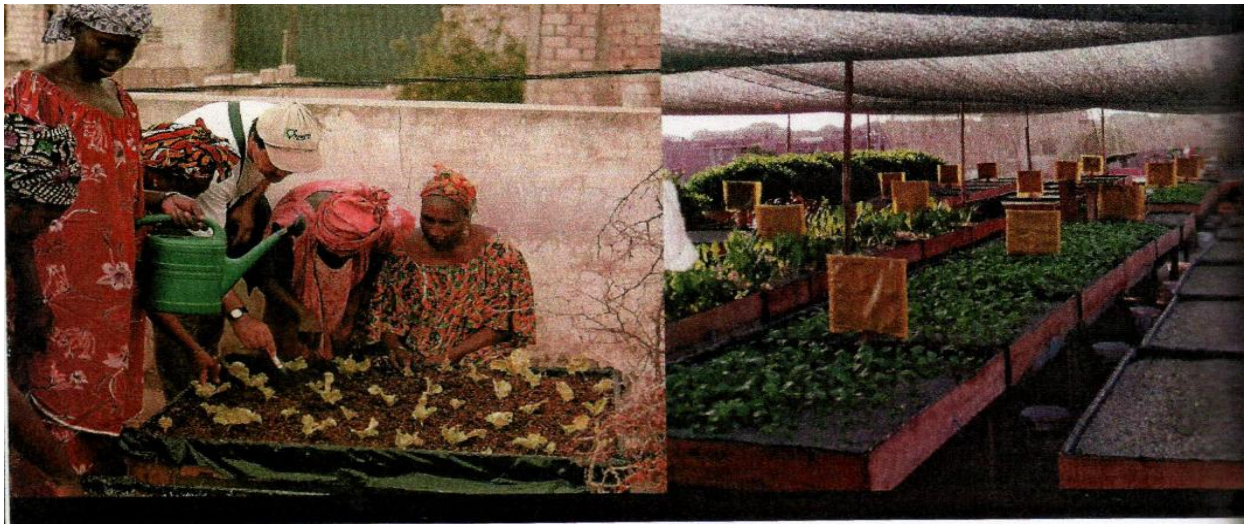
Growing food with hydroponics holds many advantages over soil-based gardening. Yields can be dramatically higher. Weeding is eliminated and physical barriers can help control pests. Growers can be placed at a convenient height for working. The work in maintaining a garden is reduced to starting plants, transplanting, and harvesting the food.

Traditional, Soil-based agriculture:

- Requires cleared land that reduces animal habitats, and therefore, animal populations
- Contributes to the loss of the topsoil layer from erosion
- Usually requires the use of herbicides, pesticides, and fertilizers, which can pollute the environment
- Requires nearly 300,000 gallons of water per year, per person
- Is dependent on natural climate fluctuations

A simplified hydroponic garden:

- Recycles nutrients-very little waste is released
- Can provide about $300 worth of food for only about $30 worth of nutrients
- Once established, can provide enough produce for an average-size family every day
- Produces food that is picked just before it is eaten, so vitamin values are retained and flavor are superior
- Uses only 5-10 percent of the water requirements of soil-based agriculture
- Can be climate-controlled
- Will produce food four times faster than tradition methods (when managed correctly)



Above left: The flood-and-drain growing beds are watered by hand every day. Above right: Commercial hydroponics growing operation using media available from the local area.

A Simple Hydroponic Grower

The two types of bed growers used in simple hydroponics have the same basic design. However, one is flood-and-drain system, with a drain hole near the bottom of the bed. The other type is a floating bed grower where the bed remains filled with nutrient water and lettuce plants float above. The flood-and-drain beds are hand-watered once a day with nutrient-infused water. The floating beds are hand-aerated by stirring the water twice a day.

The first bed growers were made from wooden pallets that had legs added to the bottom to raise the bed off the ground. The beds can also be built from scratch.

Growing Media Beds

This grower uses hydroponic media and includes a drain hole that is at last 2/3 –inch (1.5 cm) above the bottom surface. This allows for a thin water table at the bottom of the media that serves as a daily water store. The growing media beds are used for producing lettuce, tomatoes, bell peppers, herbs, and other vegetables.

These beds are watered by hand every day. Roughly, every 3 square feet (1 sq m) will require from ½-1 gallon (2-3 1/2 l) of water every day. Any runoff water is collected in a bucket and reused the next day.

Floating Beds

In a floating bed grower, the bed area is filled with standing water and a white Styrofoam board floats in the grower. Holes to support growing lettuce plants are burned into the board with a hot tool. In order to keep cost down, the bed does not feature mechanical aeration. Floating bed nutrient water must be stirred twice a day to provide a healthy root environment.

Constructing the Growing Bed

Bed growers are made out of wood and then lined with plastic. If you are using a wooden pallet that has already been constructed, all you need to do is attach legs to the corners of the pallet and line it with plastic. Then, if this is going to be a growing media bed, you will drill a hole for the drainage hose, fit the hose into the hole, and shrink the plastic to fit around the hose with a heating element. Shrinking the plastic around the hose will make sure that water is not wasted by dripping out of the hole. In many areas of the world, water is a precious commodity.

Building the grower from scratch is a little more involved, but not difficult. Start by creating the frame for the bed by nailing the end and side boards together. Then nail the bottoms slats onto the rectangular frame. Makes sure that the edges align and that all nails are driven completely in so that no rough edges could cause harm. Then nail the legs to each corner and line the bed with black plastic.

As previously stated, the media-based growing bed will be fitted with a drainage hose. If you wish to create a floating bed you must cut some holes into a sheet of Styrofoam for the plants to grow through. These can be cut by heating a piece of steel pipe and pushing it through the Styrofoam sheet. The spacing of the holes will depend on the type of crops being grown.

Building the growing beds is a fairly simple task. One of the main keys to success with simple hydroponics is daily diligence in maintaining the plants.

Peggy Bradley is a writer, hydroponic gardener, and the owner of Bradley Hydroponics. Cesar Hernan Marulanda Tabares is an expert in simplified hydroponics working as a consultant for both the United Nations Food and Agriculture Organization (FAO) AND Development Project (UNDP).