SIMPLIFIED HYDROPONICS IN ECUADOR

A recent case study in Ecuador demonstrates that hydroponics can provide effective alternatives that can be integrated into food security and nutritional programs for poverty-stricken populations, and in particular for children.

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Ecuador is located in the north-west of South America. It is a country of overwhelming beauty, but one that faces serious socio-economic limitations. In 1996, 27% of its urban population had their basic needs unfulfilled, and 34% of poor urban homes were unable to cover the cost of basic family needs.

The diet of poor people in Ecuador consists basically of rice, potatoes, yucca, bread, margarine, a very low proportion of protein, and almost no fruit or vegetables. The national vegetable intake per capita in Ecuador is 30 kg/person/year, compared to the average for Latin America of 60 kg/person/year.

The Government of Ecuador, conscious of these problems, has prioritised nutrition and food security for children aged from 0-6 years in the most vulnerable areas, and requested that the Food and Agriculture Organisation of the United Nations (FAO) formulate and execute a project of technical cooperation involving the transfer of simplified hydroponics technology to pilot sites in eight strategic locations of the country.

The project was launched in May 2000 and was jointly operated by the FAO and the National Institute for the Child and the Family (INNFA). This national institution implements direct action on behalf of 44,000 children in 1,200 Child Development Centres (CDC) with the co-participation of their families and the community.

Furthermore, FAO has made an agreement with the Urguayan Hydroponics Association (ASUDHI) to employ an international consultant who is an expert in the production of hydroponics vegetables and social community projects.

Project objectives

The main goal of the project was to instigate the production of high-quality vegetables on a permanent basis, through providing training in simplified hydroponics (SH). The aims included:

- To increase the availability of food for children under 6-years-of-age attending the INNFA Child Development Centres.
- To help their families organise and run farming mini-enterprises to help improve their income and living standards – ensuring their food security and income generation.

Strategy

The strategy was based on the idea of strengthening the local community organisations through intensive training of monitors and community leaders. This involved:

- Application of SH technology for the production of fresh vegetables.
- Promotion of a socio-organisational process to allow participants to administer the project, focusing on the establishment of hydroponics "mini-enterprises", with the support of the community.

Simplified Hydroponics

Since 1991, the FAO Regional Office for Latin America and the Caribbean (FAO/RLC), has been very active in the development and promotion of the uses of SH as part of a food security strategy for low-resource populations in peri-urban and urban areas.

Several training materials are available free of charge on the website of FAO/RLC (www.rlc.fao.org), covering the main issues of the SH system, while numerous training courses for monitors have been facilitated in Chile, Brazil, Peru, Costa Rica and Uruguay.

Conceptually, SH is a low input branch of hydroponics, developed in Latin America. It uses the general concepts of hydroponics but differs from High Technology Hydroponics (HTH) used in the USA, Europe and Australia as follows:

- HTH is oriented to the market to maximise the enterprise cost/benefit ratio. It uses high technology and little labour. It is located in rural areas.
- SH's main aim is for a family to be able to feed itself and to produce a small income. It is appropriate for low-resource populations. SH uses very low cost, simple technology; requires almost no investment; and uses family labour. Generally, it is located in urban or peri-urban areas, although it is also suited to rural conditions.

Advantages of Simplified Hydroponics (SH)

There are many advantages connected with this type of hydroponics. These include:

- It is a low-cost and easy-to-learn technique. A self-taught, inexpensive training course on popular hydroponics gardens provides the basic technological pack for SH. This has been promoted by the FAO/RLC as part of the strategy for urban agriculture to produce vegetable crops in limited urban and peri-urban spaces. It requires no previous knowledge, and concrete results may be seen by local communities within a few weeks.
- Allows the production of vegetables without soil in containers with water, or in low-cost natural substrates (sand, rice hulls, pumice stone, etc.). It allows the growth of a wide variety of vegetables such as lettuce, tomatoes, carrots, garlic, watercress,



aubergine, beans, parsley, radish, leek, strawberries, melons, flowers, aromatic and medicinal plants, etc.

- Promotes the use of recycled materials, thus making low-cost materials such as wood and disposable containers, useful.
- It is ideal for food production in urban and suburban areas (Urban Agriculture). It offers the advantage of using places that have not previously been considered appropriate for food production (courtyards, small gardens, walls, balconies, rooftops).
- High efficiency in the use of water, but there is a requirement for uncontaminated water availability.
- Direct income for family or community micro-enterprises.
- Allows the production of high quality, harmless food. The resultant fruits and vegetables have a high biological and nutritional value. Since they are grown by each family, they are harvested immediately before their use, thus, products are fresh, keeping their nutritional and medicinal qualities intact. Also, it allows soilless cultivation that is free from contamination. In order to ensure the purity of the final product, it is essential that only drinking water and/or clean rainwater is used.

Beneficiaries of the Project

The project was undertaken in urban, rural and peri-urban areas of Ecuador, with a high percentage of the population living in poverty (60-80%) and indigence (6-60%).

Direct beneficiaries of the project were children aged 0-6 years from low-resourced homes attending the Child Development Centres (CDC) on a daily basis, together with their families. The whole community also benefited from the projects indirectly.

Project Locations

The SH modules were located in eight locations distributed in different geographical areas representing contrasting (mountain and coast) environments with very different climates and heights. On the coast, at sea level, the hot climate varies between humid and dry; on the mountains, at 3,400 metres above sea level, the climate is temperate with very cold nights.

Results and social impact

Hydroponics modules supplying fresh vegetables to the CDCs:

- Pilot hydroponics (SH) modules were each implemented close to eight selected Child Centres (CDC) and equipped with 400-700m^2 greenhouses with basic irrigation setting, rainwater collection tank and water supply. Simple chlorine water-treatment helped guarantee the availability of potable water for irrigation and to provide for post-harvest washing. This followed guidelines from the national health organisation.
- Monitors: Two people per SH module (including women) were chosen by the community and trained by the FAO Project Consultants to work in the modules. Intense technical follow up during two years facilitated an increased level of monitor expertise, allowing them to be able to expand and diversify production, focusing on micro-enterprises development.
- Farming enterprises: an increasing number of farming micro-enterprises (formed by members of the community) have been established on the basis of promising productive results.
- Community role and participation: the communal participation in the project was active, ensuring follow up and success. In all cases, the community supplied land for the module, as well as materials and labour to build the greenhouses.
- 70% of the fresh vegetable crop production resulting from the eight SH modules, was devoted to supplying 54 Child Development Centres, comprising 2,567 children. The remaining 30% of production was sold among neighbours of the community or in the market. In this way, the needed income to sustain the modules was generated to continue their operation once the startup inputs from the FAO project terminated.

Module Production Plan

Each SH module tailored their own production plan based on:

- Food requirements for the CDC.
- Market studies of the community and its surroundings.
- The potential of production, considering vegetable species and improved cultivars, and its adaptation to the area, water quality, climatic conditions, and pest and local diseases.

Nutritional contribution of the SH modules to CDCs consisted of:

Quality of the Product

- Delivery of vegetables of excellent nutritional value (fresh, healthy, with no waste, higher content of vitamins, etc.).
- Uncontaminated by pesticides or microbes.

Product diversity and continuity

- The variety of vegetables available for the CDCs has been widened.
- New products have been included in the childrens diet, such as watercress soup, rich in Vitamin A, B2, C, D, E and minerals, such as iron, calcium, phosphorus, iodine and manganese.
- Year-round, fresh, high quality vegetable production has been planned and achieved, ensuring constant supply to the CDCs.

Nutritional status of children at the CDCs

Although an improvement in the children's nutrition at the CDC's involved in the FAO project was recorded, more time is needed to observe significant changes in quantitative growth indexes, such as weight/height, weight/age, and height/weight.

The relatively short timespan of the project (two years) precluded obtaining conclusive data. Further monitoring and evaluation was strongly recommended by the national institution.

Reduction in disease

Collateral results were observed in the children in the eight SH modules:

- Reduction of acute respiratory infections; acute diarrhoeas and skin problems within children in the same CDCs, in comparison to previous years and amongst children from CDCs with no SH module.
- Improvement in their general appearance, they used to be pale and sad, now they look healthy and happy.
- These improvements are very probably due to increased intake of a large diversity of superior quality vegetables that offered better quality and safety, resulting in more availability of vitamins and phyto-nutrients in their diet; as well as an indirect psychological effect caused by the importance given to the children and their participation in the project together with their families.

Effects on the children

Participation of children in recreational and educational activities related to the SH modules (planting and harvesting), promoted their motivation, educational values, and contributed to the development of abilities and skills according to their ages.

Generation of data from different regions

The great variability, both in terms of climate and elevation for the eight locations of the SH modules, was an initial difficulty that the project encountered. Information was collected and consolidated on hydroponics nutrients and other input availability including: varieties; climatic factors; incidence of plant pest and diseases; water irrigation quality (chemical and microbiological); and community organisation so as to increase the national know-how, and to facilitate the validation of the SH technology associated with social projects adapted to the different regions of Ecuador..

In addition to the community level impact, the project incorporated applied research activities. The production of soil-grown vegetables using irrigation is very difficult due to the fact that a significant part of the coast of Ecuador is affected by very salty ground water (EC 3-6 mS/cm) and prolonged droughts that have a deleterious effect on the physical and chemical properties of the soil. Thus, communities have little or no access to fruits or vegetables.

In view of this, and in order to study the feasibility of hydroponic production with salty water, a small experiment was carried out in the Commune of Tugaduaja, where it rains on average 76mm per year, and where available water has an EC of 3.73 mS/cm. In these conditions, the simplified hydroponics production system was integrated with shading, special varieties, and mixed rainwater. The resultant purification of the water enabled the cultivation of a significant range of optimum quality vegetables.

Training

Training courses and follow-up courses in SH for monitors, parents, and community members, comprising a total of 800 participants, were organised at the different project locations.

Simplified hydroponic topics covered: the nutritional value of vegetables, plant nutrition, integrated management of plant pest and diseases, post-harvest management of hydroponics products, water quality and safety, community organisation, and basic accounting for a micro-enterprise.

The transfer of the hydroponics technology to these regions exceeded expectations for simplified hydroponics. The monitors have easily incorporated the techniques involved and are now producing almost at peak productive capacity. These are preliminary stages, hopefully leading to the eventual establishment of higher productivity hydroponic techniques, such as NFT.

In particular, the training component of the program has been crucial to the project, and it is expected that a natural transition of knowledge and expertise within the rest of the community will take place.

Positive impact on communities

Accordingly to the evaluations, the SH modules and the food they produce have been well accepted by all the communities involved in the project, having the following impacts: the reduction of diseases in the children involved; the improvement of availability and access to food (food security) in the CDCs; an interest to continue and expand the experience to a larger greenhouse production area under their own funding; the introduction of new hydroponic technologies (tomatoes-volcanic rock substratum, lettuce-NFT tubes); and the consolidation of farming enterprises.

Conclusions

This project demonstrates that the simplified hydroponics system (SH) can be considered an effective alternative for integration into food security and nutritional rural and peri-urban development programs for low-resource populations living under poverty conditions.

The enthusiastic acknowledgement by the local communities of the high quality of fresh, non-contaminated vegetables produced by the SH modules, as opposed to the inferior produce available at local markets, has been a crucial factor for increased, ongoing activities.

Similar strategies can be utilised in countries with comparable situations, with the aim of improving the nutrition, food security and general welfare conditions of the population concerned.

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