Family Aquaculture in Cuba

Aquaculture is seen as an important alternative in Cuban food production. The MIP promotes aquaculture in Cuba though the concept of "Family Aquaculture" to improve the availability of food at household level, but also for the national and international market.

Aquaculture can be undertaken in monoculture or polyculture and may differ in intensity (from extensive, to semi-intensive or intensive). Extensive systems have low operational costs and density of seed. The cultured fish feed on the existing food in the usually large reservoir. Production in these systems is low and technical management is simple. Semi-intensive systems have a higher density of seed and are characterised by systematic management of fertilisers and supplementary food. Generally several species are produced (polyculture). Intensive systems use highly valued species in order to sell them at the market or for export. These systems often have a high fish density, strong water circulation, high quality of artificial food and aeration equipment.

Family aquaculture is a system in which one or more families use small concrete ponds or build simple ponds by digging , in a backyard or on common land. These concrete ponds can be, for example, the drinking tanks used in cow sheds, which have a small opening for entrance and exit of water. Using the water in reservoirs, these families can produce enough fish to contribute animal proteins to their diet, and possibly even help balance the distribution of fish in the area.

For this type of culture, Tilapia is recommended, both in monoculture or polyculture with species of the group of carps (cyprinids), such as the Common Carp, the Grass Carp, the Silver Carp and the Bighead Carp. These species live in tropical water and they can be fed with food produced by hand.

The following species are recommended: TILAPIA (Oreochomis aureus): COMMON CARP (Cyprinus carpio): GRASS CARP (Ctenophayngodon idellus): SILVER CARP (Hypothalmichtys molitrix): COLOSOMA (Colossoma macropomun): With photos

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Land and water

Sufficient land and water are needed to build a pond. The land used is between 300 m² and 0.5 ha. This size allows farmers to take better care of the fish, to catch the fish easily, and to produce enough to feed their families. The quantity and quality of water is also important. There must be a stable source of water coming from a higher place, so that it can get to the pond as a result of gravity. This water must not be affected by industrial pollution or sewage. The pond must have a slight slope so that flooding is avoided. Temperature, dissolved oxygen, transparency and ph (level of acidity or alkalinity of the water) are the four fundamental parameters to consider in quality control. Temperature is rather stable in Cuban climatic conditions, but in the summer the higher temperature can have negative effects on the oxygen, so these factors should be monitored in this season.

Furthermore, one must have access to manure and supplementary food for the fish. The soil of the ponds must be semi-permeable (with sufficient clay content) to avoid filtration.

Fish stocking

One can stock one or more species of fish. Polyculture is recommended, because it takes better advantage of the natural food in the water (small organisms). After fertilisation of the pond with animal manure, the water will start becoming green in two or three days. If the water is fertilised with vegetable waste, it will become green in one week. When the water turns green and is less transparent, it means that natural food is growing, which consists of tiny plants and organisms that grow in the water and give it this colour. At this moment, the pond is ready to receive the first fish. Table 1. Densities for the seeding of fish according to species in monoculture and polyculture (with fertilisation)

Table 1

Monoculture	
Tilapia	2-3 fish / m²
Polyculture	
Tilapia	1 fish / m²
Silver Carp	0.3 fish / m²
Bighead Carp	0.3 fish / m²
Grass Carp	0.3 fish / m²*
Common Carp	0.1 fish / m²
Colosoma	1 fish / m²

These densities are to be used in well-fertilised ponds. The recommended density of the Grass Carp depends on existing vegetation.

Fish feed

Food can be obtained from the natural elements in the water (of animal or vegetable origin), or it can be supplied by applying fertilisers to enrich the water, or by adding artificial food. Solar energy increases the nutrients in water through photosynthesis, contributing to the formation of organic material of vegetable origin, which is the basis of the food chain in the pond. To further increase nutrients and the natural food in the water, organic or inorganic fertilisers can be used. Organic fertilisers are green fertilisers or animal manure (or a combination of the two through composting). Fertilisation should be done four or five days before the fish are placed in the pond, so that the chemical conditions of the pond have stabilised and the food necessary for the fish has been formed. When the density of fish is increased, additional food should be added.

Integrated breeding

The breeding of fish can be combined in an integrated system with livestock, eg., like ducks, chickens, geese, pigs, rabbits, sheep, goats and cows. But one should always carefully consider which fertiliser to produce in the farmyards, in order to avoid pollution caused by nutrient excess. Fruit, plants and vegetables can be planted on the sides of the reservoirs to serve as food for the family, contribute

TABLE 2. Combined cultures of fish and small animals

Type of animal (Tonnes)	Density / hectare	Quantity of fish / hectare	Annual production
Pigs	40 - 100	3 000 - 10 000	0. 7 - 2
Ducks	500 - 1 500	2 000 - 4 000	1 - 3
Chickens	1000 - 3 000	3 000 – 10 000	1 - 4
Sheep	50 - 200	2 000 - 5 000	0.5 - 2

to the quality of the soil (through their waste) and avoid erosion. Examples of combined cultures of fish and other animals are listed in the table below.
After six months the fish can be harvested. If there is not enough water to refill the pond, or if only the bigger fish are to be harvested, it is not necessary to empty the pond. Partial fishing or harvesting of the pond is also done when not all the fish are of the desired size. If there is enough water and all the fish are of the same size, the pond can be emptied to harvest the fish more easily.

References
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Integrated Urban Aquaculture

Ten of thousands of tons of organic wastes are collected and transferred daily in the municipality of Playa to garbage disposal sites. In this way important resources are wasted, while decomposing products contaminate the coastal zone of Cuba. In addition, excessive and illegal fishing of various species (like the black sea urchin) and outbreaks of diseases cause deterioration of coral reefs and fish stock.

A dissemination project executed by the mentioned institutions below, aimed at showing urban communities, especially children and young people, how small actions from numerous groups of people can benefit the local and national environment, while at the same time stimulating food production and waste recycling. The project was carried out in a courtyard of 300 m^2 (called the "national reference" by the Cuban Movement for Urban Agriculture). In this area the production of vegetables, bananas, coffee, spices, herbs and medicinal plants is integrated with the production of earthworms, rabbits and freshwater fish (*Clarias gariepinus*, commonly known as catfish). Rainwater is collected from the roof of the house and fed into an earthen pond. Various species of fish, aquatic plants, snails and other organisms are grown in the pond, which is filtered by a biological system. The effluents, rich in nutrients, eventually return to the pond or are used in the irrigation system for the nearby vegetable garden and fruit trees. Organic wastes are used and are composted with a mixture of red African earthworms (*Eudrilus eugeneae*) and red Californian earthworms (*Eisenia foetida*). To start the culture, a breeding plot/ground was made by using a piece of asbestos roofing tile in the form of a cylinder, 2 m long and 0.9 m wide, that was covered with a makeshift ceiling including two micro-sprinklers for the irrigation. The earthworms' humus is used as fertiliser for plants and their biomass as feed for fish.

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Feeding the fish

Taking into account the confined space in which the project was developed, the results are considered to be positive. The project demonstrated that a family can satisfy part of its food needs using local resources, in a simple, healthy and environmentally sound way. The project further developed an atmosphere of social cooperation between neighbours, increased the environmental awareness and knowledge of children and young people and stimulated their commitment to the care of the coastal environment.

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