FoodRoof Rio: How Favela Residents Grow Their Own Food

Imagine living in Cantagalo since you were born. The daily routine of playing games, or trying to find your parents, if still alive, hoping to stay away from drugs trafficking, but also attracted to the excitement and its golden promise. At the end of the day you're feeling hungry so you try to find a snack, some chips and lemonade to feed you. Or you try your first booze, and get dependent on 'others', whoever they may be, as they have some kind of power over you. These people provide a safety net of sorts. But, you're still stuck with old food traditions, such as alcohol, pre-wrapped cakes and candy.

Now imagine the house where you were born stands in Hardenberg, where the cows graze around your village. From day one your parents feed you with the best milk products, fresh vegetables and meat. When you start your study in Velp you're interested in making the world a bit more sustainable, but the main thing you want is to build something nice. A roof garden – or something else fancy. But lately, you're more into fast food and having a beer with your friends. Not the most healthy diet, but who cares? That is something to worry about later.

These worlds came together in Rio de Janeiro, where Bart and Marc, from Velp in the Netherlands met Asunçao, born in Cantagalo, Brazil, and where they built the first FoodRoof in the world.

A FoodRoof?

Professor Rob Roggema at VHL University of Applied Sciences invented the FoodRoof, which supports residents of the favelas in Brazil to grow their own food. A FoodRoof is a completely closed aquaponic system, producing fish, vegetables, fruit and herbs, it is lightweight, easy to construct and fits on a (small) roof. With more than 50% of the world population living in the city, and roughly another 50% living with limited access to a healthy diet, the question is no longer if we can produce enough to feed the world, but how and where we must grow food to feed everyone. The answer could well be that we shouldn't become more efficient, large-scale and more productive, but we need to reach the places where people suffering from eating unhealthy food live. Instead of asking people to eat healthy food, teach them to grow it themselves. In order to do this, we need to go deep into these communities and create productive pieces of city-landscape. That's what we did in Cantagalo favela.

Cantagalo

Standing on Ipanema beach you can be unaware of Cantagalo favela (Figure 1), hiding behind the tall luxury buildings along the coast. But the heart of the favela is only a 10 minute stroll away. Up the hill the seemingly randomly placed houses follow the pattern of the slope.

Figure 1. Google map image of Cantagalo favela

The houses in the favela were built with whatever material was available or could be obtained for nothing, but they're mostly extremely well constructed. The main incentive for constructing strong buildings is so the owners can rent additional floors, simply to earn extra money. This has led to a diverse housing stock, with one characteristic in common: flat roofs, or the opportunity to create one. Due to overcrowding in the favela, roofs offer the only productive spaces.

To support the residents of the favelas food needs to be grown in the vicinity where it is consumed. It requires a system that fits in the urban environment, provides fresh and healthy food, must be simple and safe to operate, and is easy to construct and cheap. Aquaponic systems are lightweight and sustainable with closed cycles of nutrients, water and energy, and consist of fish breeding, water storage and the growth of fresh vegetables and fruit.

We have identified 3 success factors for designing, planning and realising a FoodRoof:

1. **Work with the strengths within the community.** They need to be the owners of the project. When the local residents are made co-creators of the project they become committed, are open for collaboration and support and feel more responsible for maintenance.

2. **Use local food potentials.** In the case of favelas there is not much space, but the roofs are flat and strong enough. There is no soil, so an artificial system is preferential. To design the roofs, the micro-climate, natural shade, humidity, but also the place where rain water can be caught and stored, determine the design.

3. **Support start-ups first** and then accelerate to extend the project beyond the initial pilot to the entire favela.

In order to help residents construct a FoodRoof by themselves, 2 students from VHL University of Applied Sciences have developed a manual, giving explicit, visual and clear directions on how to construct the roof step-by-step. This bilingual manual contains easy to understand 'IKEA-like' information with images of tools and materials needed for the construction (Figure 2).

Building the FoodRoof

The theoretical background and even the shopping list of required materials may be complete and ready, this doesn't mean the construction of the FoodRoof is easy.

Figure 2. The 'IKEA' manual, with required tools and materials

We set ourselves a target of 'one-week one-roof'. Within a week materials needed to be purchased, tools needed to become available, the materials needed to be transported to the house and on to the roof and the system needed to be constructed.

Without the help from local architect Marcelo, we wouldn't have been able to achieve the result. When the only available drill wasn't suitable, Marcelo brought his own, when the fish needed to be bought from outside the city Marcelo arranged the purchase and transport. When we were short on clay balls, Marcelo knew the flower stall where they provided us with 700 litres. Meanwhile, Bart and Marc constructed the system on the roof. The manual proved to be an excellent help explaining to the installer, local residents and shop owners what was needed and how things should be constructed. When the system was nearly ready, there was no water available in the favela to fill the tanks. Luckily the next morning the water supply was functioning again. On day 5 the system was in operation and ready to show to a delegation of the Dutch Consulate, the other favela residents, the State Government of Public Works and colleagues and friends. The first FoodRoof in the world was realised.

What can 'we' do?

This first example FoodRoof houses the aquaponic system, a system which is well known in many western countries. The application of this technique in a new context, in challenging spatial and social conditions, that benefits local residents who have no access to healthy food is truly innovative.

When we talk about 'we', the Western countries, could learn 2 things from this. First, bringing a fixed solution, no matter how sustainable it is, to a new country does not make sense. Secondly, to reach the people you really want to reach, you need to be able to adapt, genuinely be interested in the people you want to reach and be creative and flexible. Western countries should learn that it is not enough to develop the solution only. This must be done first, in a controlled and safe environment.

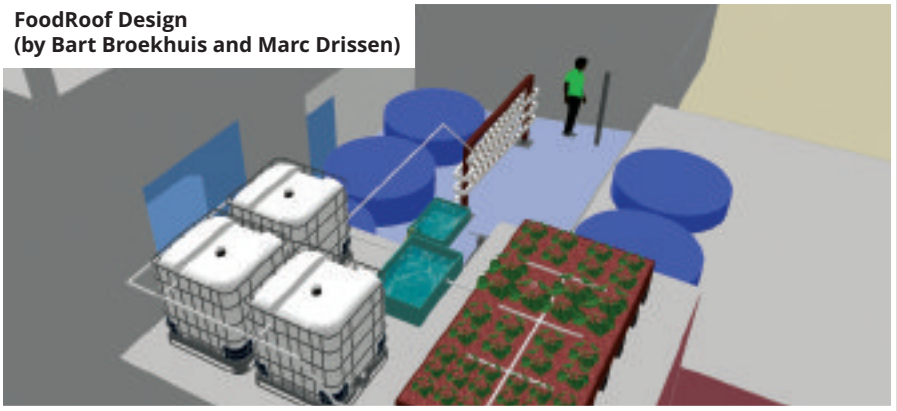
When the solution is tested and ready for implementation, the real innovation starts: be modest enough to allow modifications where necessary to the technique in order to make it work in its new environment. Many aid oriented organisations and regular businesses are not readily equipped to step in the latter role. But when the technique is sound, exported to a new context, and implemented with modesty, as the FoodRoof example illustrates, the benefits are there for the people that need it.

Therefore, Western countries need to enter deep into the community to reach the people's needs. This outreach must be executed in a genuine way, and not for profit, because otherwise the reception by the residents will be a "thanks, but no thanks", and no real change will occur.

Also, sending money only is not enough to make a change, as money can go missing due to corruption. Set clear goals and ambitions, but realise these through bridging cultures in an empathetic way. People with real interest and curiosity are sought and they don't come in hordes. Westerners often tend to be blinkered, pushing their knowledge and therefore their solutions, forgetting about the new context they enter.

The building process

FoodRoof Design
(by Bart Broekhuis and Marc Drissen)



How does the FoodRoof work?

The Aquaponic System of the FoodRooof consists of 5 elements:

1. Fish-tanks

There are 3 fish tanks on the roof (each tank has a group of fish of different size (small/baby-fish, medium growing fish, and large, ready for consumption fish). Each tank has an overflow from where the water flows to one central pipe and is led to the horizontal grow-bed. The fish produces waste in the form of ammonia. Residents eat vegetables and fish (as soon as the fish is big enough and ready for consumption) from the system. The fish eat the food waste. The fish food contains a lot of proteins, which are found in the waste from food such as bread, grain, fish waste, maggots or worms.

2. Horizontal grow-bed

The grow-bed is located next to the fish-tanks. It is a horizontal vegetable plant system, consisting mainly of clay-balls. The water is irrigated through the bed in which the crops are planted. When the water reaches a certain maximum level it leaves the bed through a siphon to the feeder tank. Water with ammonia is led through pipes to the grow bed for plants. Plants require water, light, CO_2 and nitrates. The bacteria which attach to the clay balls in the grow bed break the ammonia down to nitrates, which the plants subsequently use. The plants extract nitrates from the water and filtrate the water after passing the grow beds.

3. Feeder tank

This is a storage tank for water overflowing from the horizontal grow-bed. Using a pipe on the bottom of the tank, the water continuously flows to the vertical grow-bed. From the feeder tank the water is pumped up to the upper tube in the vertical grow system.

4. Vertical grow system

The second grow system consists of tubes through which water flows. The tubes have holes in which the fruit and herb crops are planted in small substrate cups. The roots of the plants must continuously be in the water. The water flows through the tubes into the pump-tank.

5. Pump tank

A pump tank is placed at the end of the vertical grow system, from here the water is pumped to the fish tanks. The pump gets power from a 12V battery, which is connected to a small solar panel. A solar pump is needed to circulate the water through the entire system and return water to the fish-tanks.

This system creates a closed cycle. Every month the system loses 10-15% of water due to evaporation. When water is added to the system it should not be taken from chlorinated city water, but instead, rainwater should be used.

A good idea might be to involve students to connect creating a productive city with learning. Students are generally flexible and curious, and this could add value to their career portfolio. This is similar to elite sportsmen, who are very well equipped to lead businesses, because they have learnt the lessons of losing and winning in their sports, and overcoming setbacks. When students are placed in the context of creating FoodRoofs they will need their practical skills, but they also gain other experiences and become human beings with empathy and creativity who can solve unprecedented problems quickly.

References

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