Fresh water acquaponic

Description

Aquaponics is a revolutionary type of horticulture. Basically, it adds fish breeding to hydroponics (aquaculture + hydroponics), inspired by traditional forms of agriculture such as the Sawas of Southeast Asia and the Chinampas of the Meso-Americas. It is a type of closed-loop food system. The fish excrements supply the fertility for plant growth, and the fish are fed with food scraps and insects grown in compost (soldier flies). If the fish are bred for consumption, it theoretically doubles the production of total food (calories) per m2 compared to the two growing systems operated apart.

Fig 3.50 Fresh water aquaponics, Photo by Julie Ann Riemersma

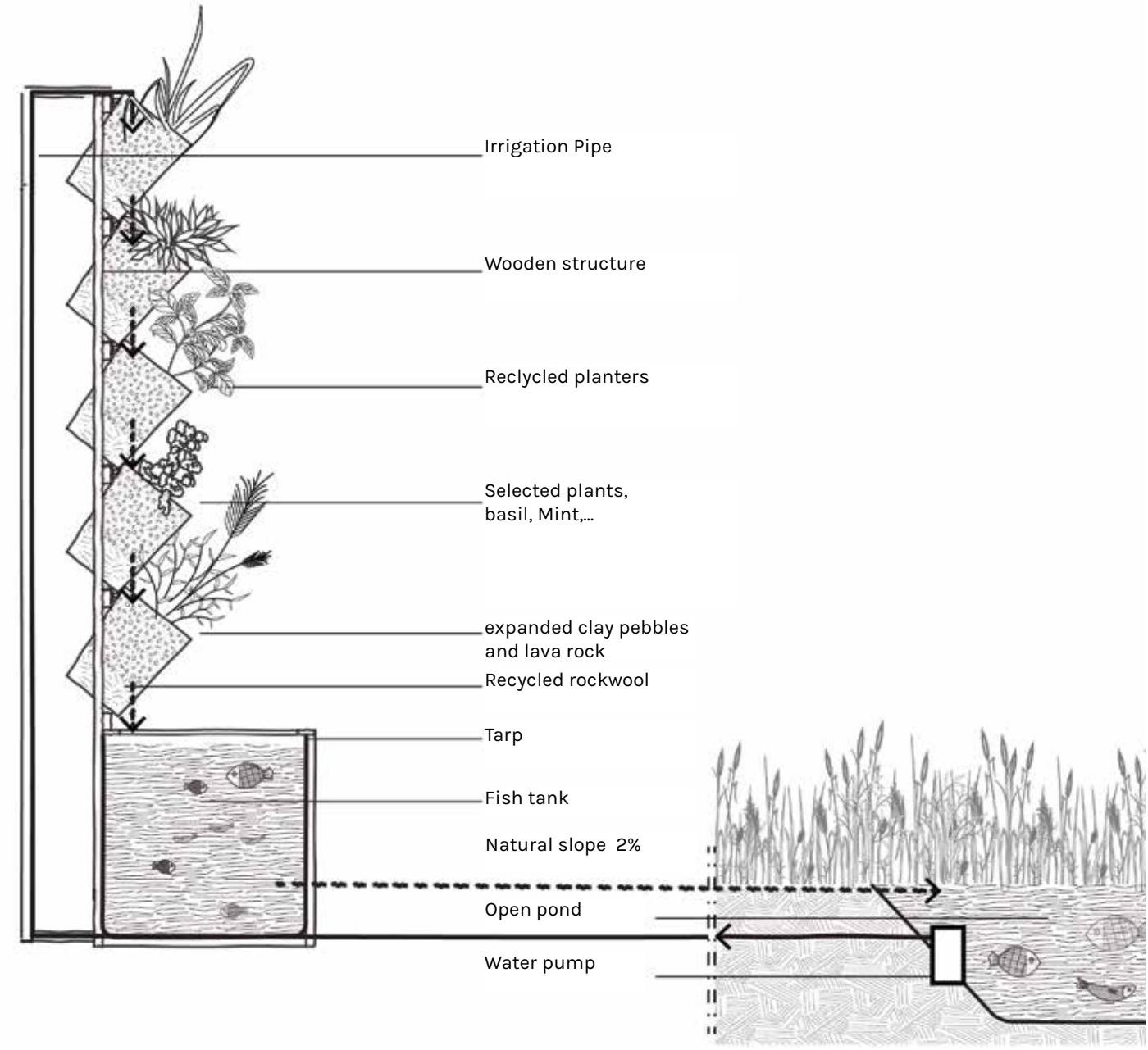
Functioning

There are many types of aquaponics, such as floating raft production, or on a substrate with flood and drainage irrigation. We choose for vertical gardening with buckets, in which the fish water runs through the pebbles in the buckets from the top downwards, and back into the fish basin.

The solar pump works during the daytime for 15 minutes per hour, which is sufficient to keep the pebbles wet.

Because the greenhouse is not systemically heated during winter, we chose for native, easy to keep fish (carp and roach). So, when plant production comes to a stand-still, the fish also go into "winter sleep" (hibernation).

Fig 3.51 Fresh water aquaponics section scheme,
Illustration by Alessandro Rosa



Materials and construction

- Planters: recycled from shut-down marijuana plantations, left by the police

- Substrate: recycled rockwool, expanded clay pebbles and lava rock (8-16 mm). Lava rock is cheaper than clay pebbles, but it can create basic water (high pH). We found that a 50/50% mix resulted in pH stable water.

- Rack: untreated wooden beams, with 2 metal ls as top support for the planters

- Pump: 200 Watt bilge pump

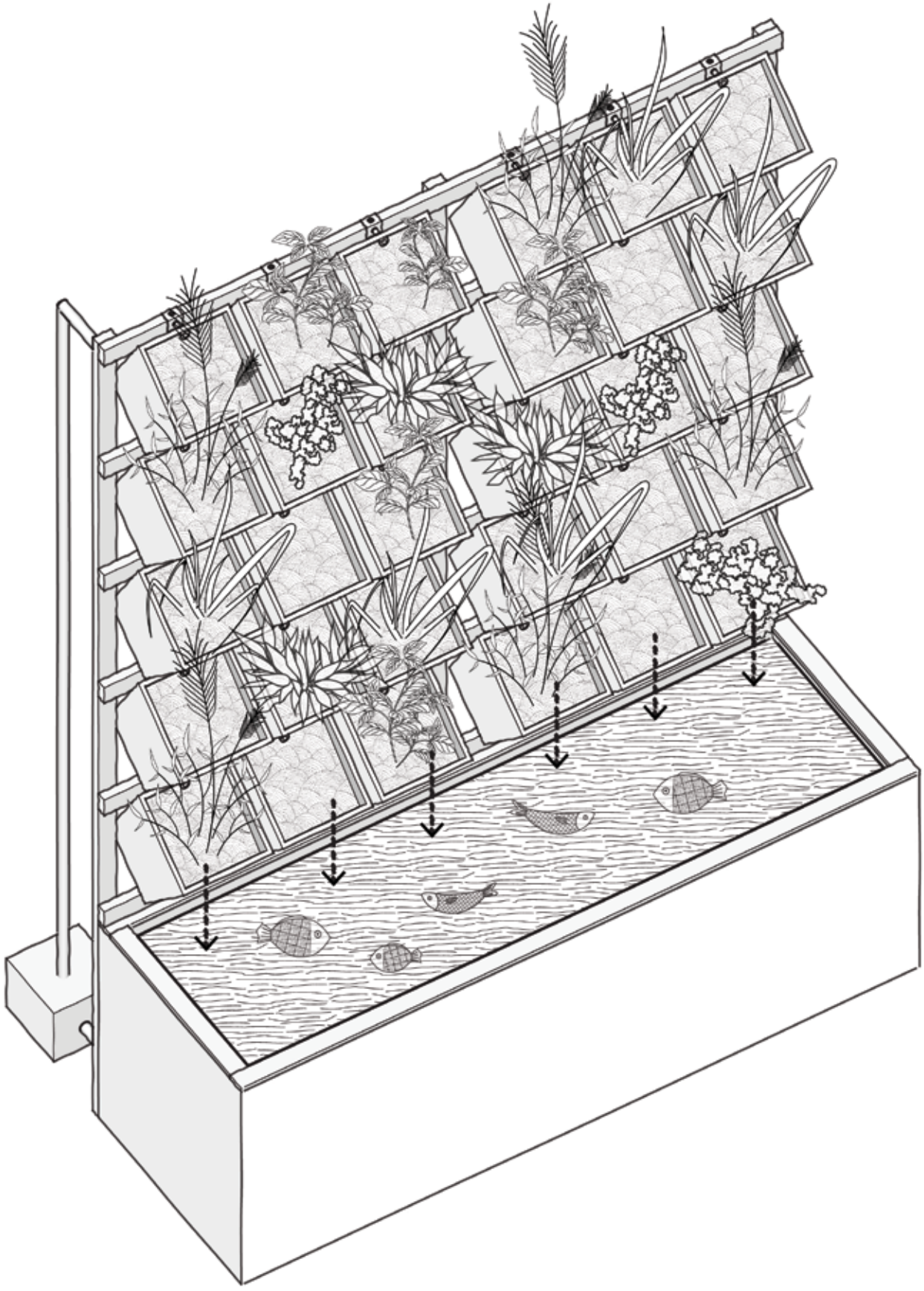
- Tubes: 20 mm PE tubing, with holes and little reeds sticking out for each of the top row planters.

- Aquarium and mix tank: Wooden boxes with pond liner

Maintenance

The motivation to choose this system was not so much the fish production - we keep the quantity of fish to the minimum and don't eat them - but rather an easy to maintain vertical garden. The system is fairly self regulating. If plant growth doesn't seem right (slow growth, yellowing of leaves), some check-ups can be done regarding nutrient availability, for example with an EC meter. The EC meter measures conductivity of salts in the water and is thus a measure for salty nutrients. If the reading is lower than 1, there can be a problem, and a chemical analysis can be done to look at the levels of Potassium - which is one of the most important salts. Chemical test sets are quite cheap if not used regularly.

pH is easy and cheap to measure with lakmoes/litmus papers. If the pH is higher than 7, the water is basic, and nutrients become less available for plants; therefore acidity needs to be added. One of our experiments in acidifying the water comes from our compost. We treat compost tea (drainage water from work compost, see next chapter) with EM1 (a mix of lacto fermenting bacteria) and sugar beet juice. The compost tea with EM1 can be added in the mix tank, making the water more acidic because of the lactic-acid. In case the acidity needs to be raised, only some more sugar beet juice needs to be added to the water to activate the EM1 again. EM1 can be made DIY. The reason for this experiment is that it seems more natural than alternatives (just pouring some salpeter acid in the mix tank). This also provides nutrition to the plants while keeping the fish population to a minimum, so you avoid not having enough fish-sourced "manure" for the plant production.



Next page Fig 3.52 Freshwater aquaponics axonometric view, Illustration by Alessandro Rosa
From top to bottom Fig 3.53 and Fig 3.54 Freshwater aquaponics, Photo by Edwin Dominguez
3.55 Freshwater aquaponics construction and frame structure, Photos by Alessandro Rosa