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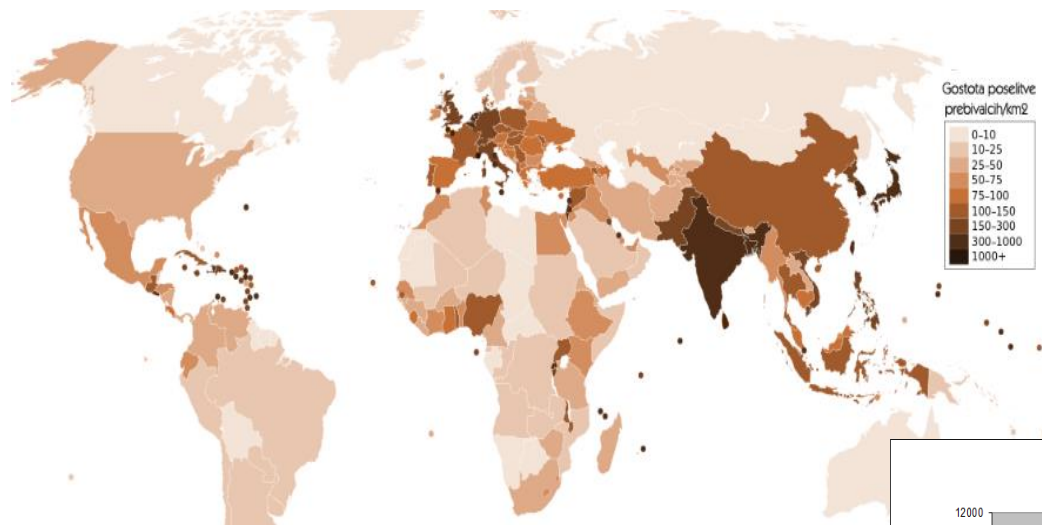
# Aquaponics - innovative example of urban Horticulture

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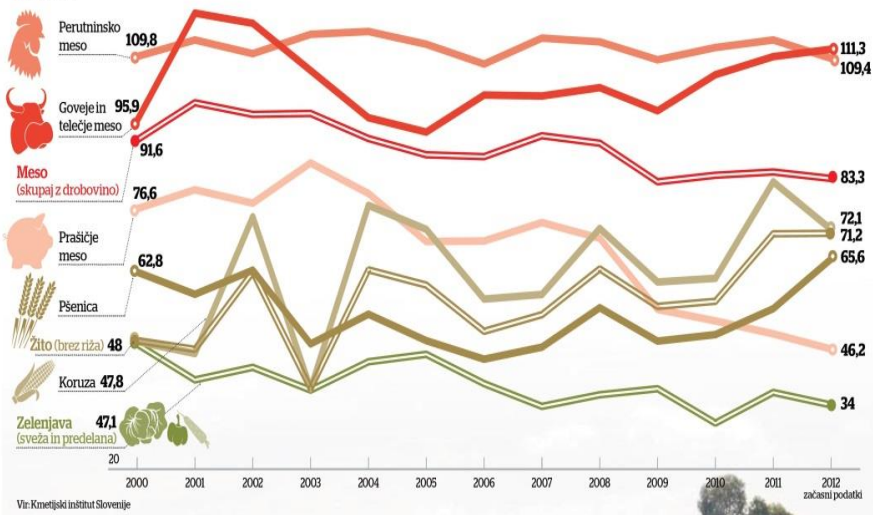
University of *Ljubljana*  
*Biotechnical* Faculty

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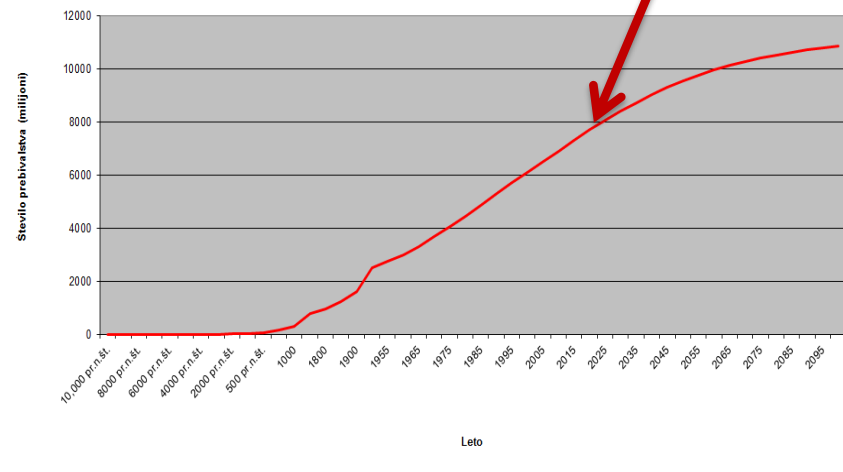


### Kako se je gibal samooskrba od leta 2000

▼ v odstotkih



Gibanje števila prebivalstva v svetu



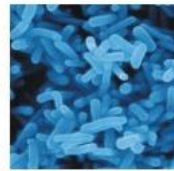
# AQUA

Aquaculture – Raising fish  
in a controlled environment



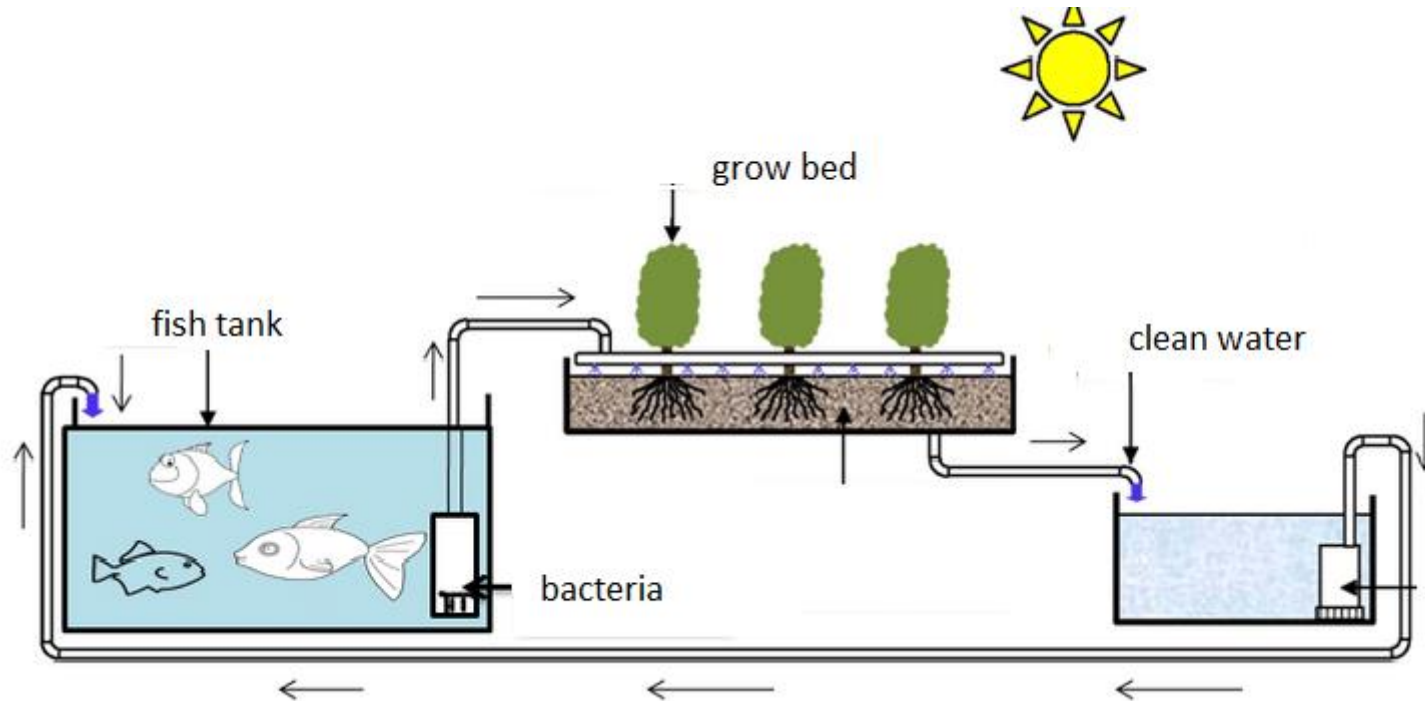
# PONICS

Ponics – Is Latin “to work”,  
Growing in soil-less media



Fish eat and produce ammonia  
Beneficial bacteria convert ammonia into nutrients  
Plants absorb the natural fertilizer  
Water is continuously recirculated through the system

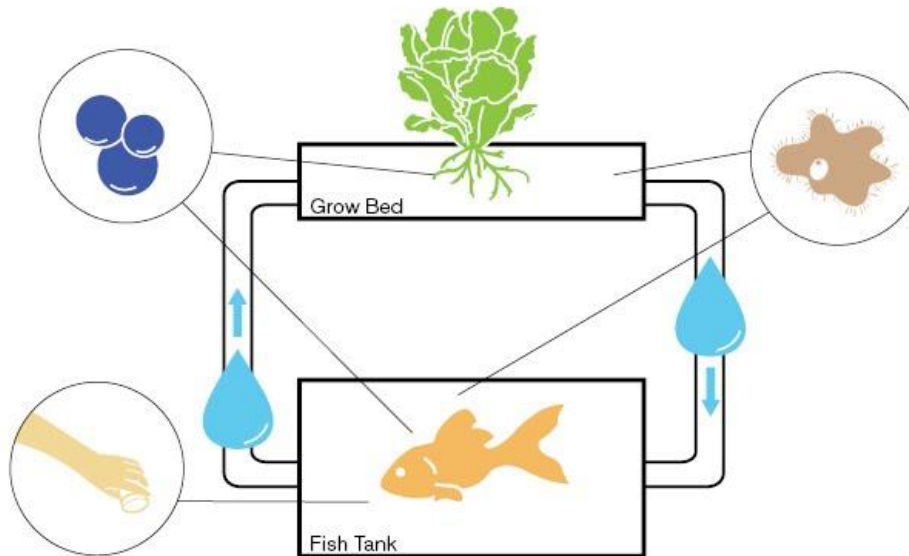

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### How Aquaponics Works


Fish are fed food and produce Ammonia rich waste. Too much waste substance is toxic for the fish, but they can withstand high levels of Nitrates.




The bacteria, which is cultured in the grow beds as well as the fish tank, breaks down this Ammonia into Nitrites and then Nitrates.



Plants take in the converted Nitrates as nutrients. The nutrients are a fertilizer, feeding the plants. Also, the plant roots help filter the water for the fish.



Water in the system is filtered through the grow medium in the grow beds. The water also contains all the nutrients for the fish



Oxygen enters the system through an air pump and during dry periods. This oxygen is essential for plant growth and fish survival.

## PLANT

Plants that will do well in any aquaponic system:

- any leafy lettuce
- pak choi
- kale
- swiss chard
- arugula
- basil
- mint
- watercress
- chives
- most common house plants

Plants that have higher nutritional demands and will only do well in a heavily stocked, well established aquaponic system:

- tomatoes
- peppers
- cucumbers
- beans
- peas
- squash
- broccoli
- cauliflower
- cabbage

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### FISH



Trout



Tilapia



Carp



Bluegill



Channel Catfish



Crayfish (Yabbie)



Koi



Goldfish



Jade Perch



Silver Perch



Barramundi



Murray Cod

- Fish to plant ratio

We use: grams of fish feed per day/m<sup>2</sup> of growing area

**Weight of fish feed per day** ..... feed is the primary source of nutrients.

**Plant surface area** ..... is the most meaningful solution for assessing plant nutrient uptake.



## Hoagland nutrient solution

- **N** - 210 ppm
- **K** - 235 ppm
- **Ca** - 200 ppm
- **P** - 31 ppm
- **S** - 64 ppm
- **Mg** - 48 ppm
- **B** - 0.5 ppm
- **Fe** - 1 to 5 ppm
- **Mn** - 0.5 ppm
- **Zn** - 0.05 ppm
- **Cu** - 0.02 ppm
- **Mo** - 0.01 ppm

### Ratios!

**N : K = 1:1**

**N : Ca = 1:1**

**N : P = 6:1**

**N : Mg = 5:1**

OK for fruiting vegetables, lettuce  $\frac{1}{4}$  strength

NOT OK for fish - 210 ppm N  $\approx$  955 ppm NO<sub>3</sub> (x4.55)



**BUGI**

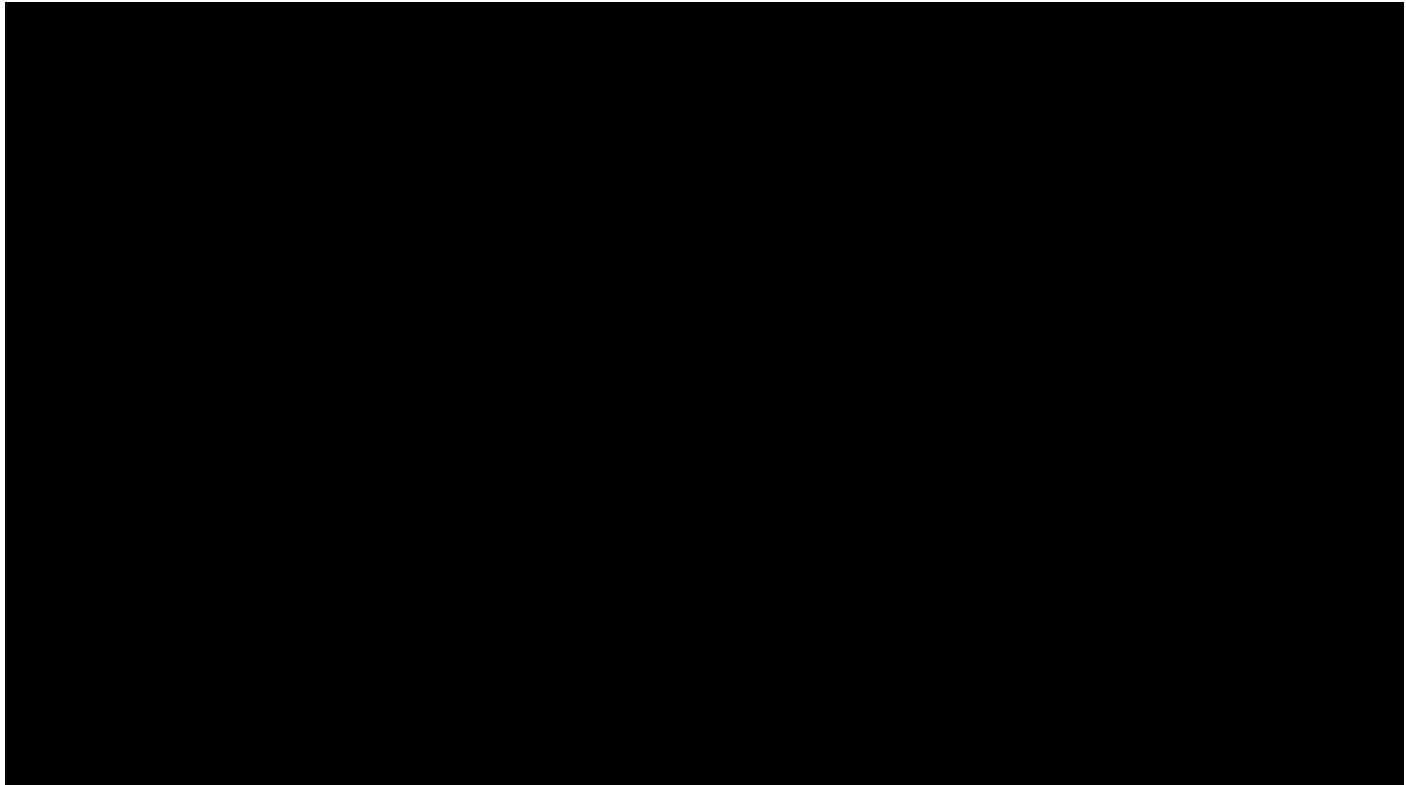
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**... USE AQUAPONICS IN URBAN  
AGRONOMY...**

- **Example 1**

-self care (small local care)



- **Example 2**

- in industrial part (Switzerland)



**BASEL** | **BERLIN** | **ZURICH** | **THE HAGUE**



**The first commercial aquaponic rooftop farm ever**

Since 2013, we operate UF001 LokDepot as our first commercial aquaponic rooftop farm. Based in the Dreispitz area south of Basel, just a few tram stops from the heart of the city, we operate a 250m<sup>2</sup> rooftop greenhouse with fresh fish and healthy vegetables.

Urban Farmers komercialna akvaponika together with the University of Applied Sciences (ZHAW) in Wädenswil in order to test functionality, robustness and quality of our production processes as well as to ensure delivery of our Fresh Revolution Basket.Pro allotments to leading restaurants in town.



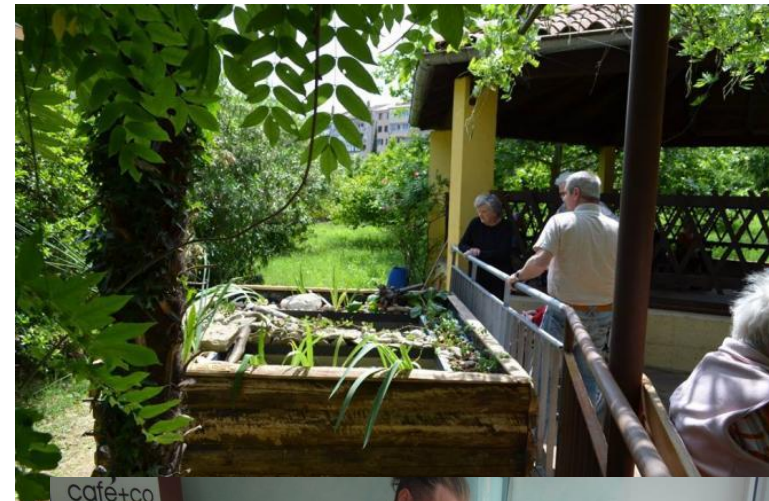
- **Example 3**

- the inclusion of different social groups



health centre for  
youth

senior citizens home





Thank you/hvala !!!

