



Our
sustainable
solutions for
aquaculture



A water treatment technologies report

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Introduction

Regenerative Aquaculture
by design

Nuagua's mission is to accelerate the world's transition to sustainable and regenerative food production by using a biomimicry mindset in the aquaculture industry.

We use technologies that are respectful to the environment, such as water recycling systems or RAS plants, or highly efficient aeration and water treatment units “lungs and kidneys” for keeping the process conditions optimal while producing ten times more as compared with traditional fish farming methods and without drawing on resources or polluting the environment.

RAS Plant

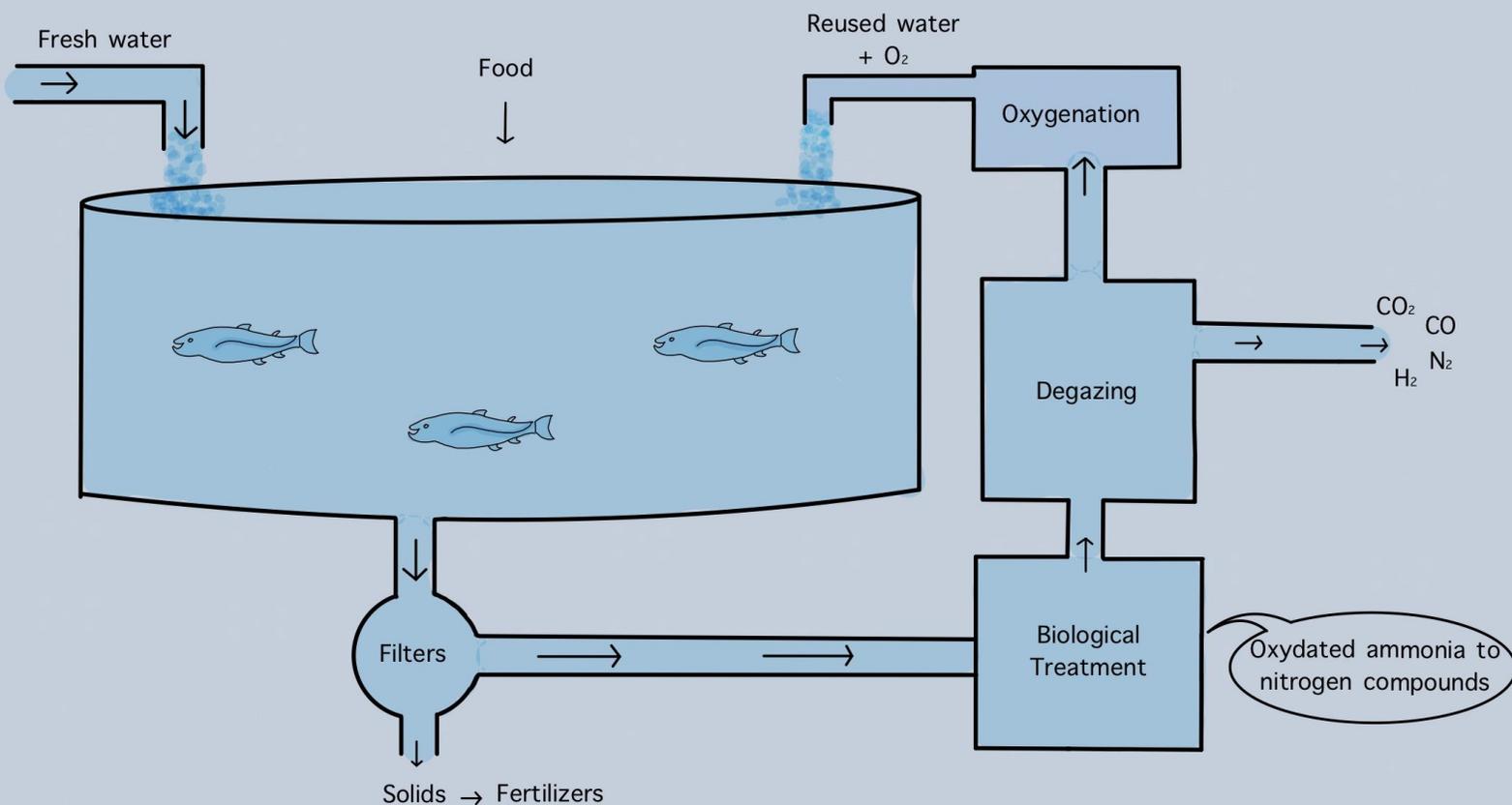
The principle of the RAS (Recirculating aquaculture system) plants is to recover the waste water from the production tanks, to treat it mechanically and biologically without adding chemicals, in order to reintegrate it into the production tanks. Thus, by reusing water, there is a double win with i) no discharge into the environment and ii) we do not draw on resources like water because it's being reused. In addition, RAS plants offer total and permanent control of the production conditions, which allows for real-time adaptation achieving the best possible yield.

BENEFITS

Minimum water requirement.
Full control of production parameters;
Stable and predictable production (100% fish
escape control)
Optimal sanitary conditions

RAS Plant

Water regeneration in RAS plants is based on several treatment steps. First step is the extraction of the biggest solids with a size around 40 to 90 μm by using mechanical filters. In the second step, water is biologically treated by turning ammonia to nitrites and then into nitrates. The third and last step of this water regeneration treatment is oxygenation. The water undergoes degassing to remove CO_2 , N_2 , CO , and H_2 . Then the water is enriched with oxygen through diverse methods, such as oxygenation cones, nanobubbles or Jet aeration with microbubbles..



Bioflocs with jet aeration

Making **bioflocs** means **producing microorganisms in-situ** by allowing suspended growth to develop so it can **become** an **additional food source for fish**. The very diverse organisms in bioflocs, feed on the leftovers and solid waste such as dead and living organic matter, phytoplankton and bacteria that reside in water become an additional source of food, which can be translated in terms of savings.

However, there is a need to clean up this water in a precisely controlled manner in order to reuse it in the system in order to build a circular economy. Jet aerators can be used as a double purpose device since it can perform both the aeration and mixing in one step. The use of Jet aerators allows for re-converting ponds into bioreactors by creating controlled mixed regions and directing the flow to create a pattern.

BENEFITS

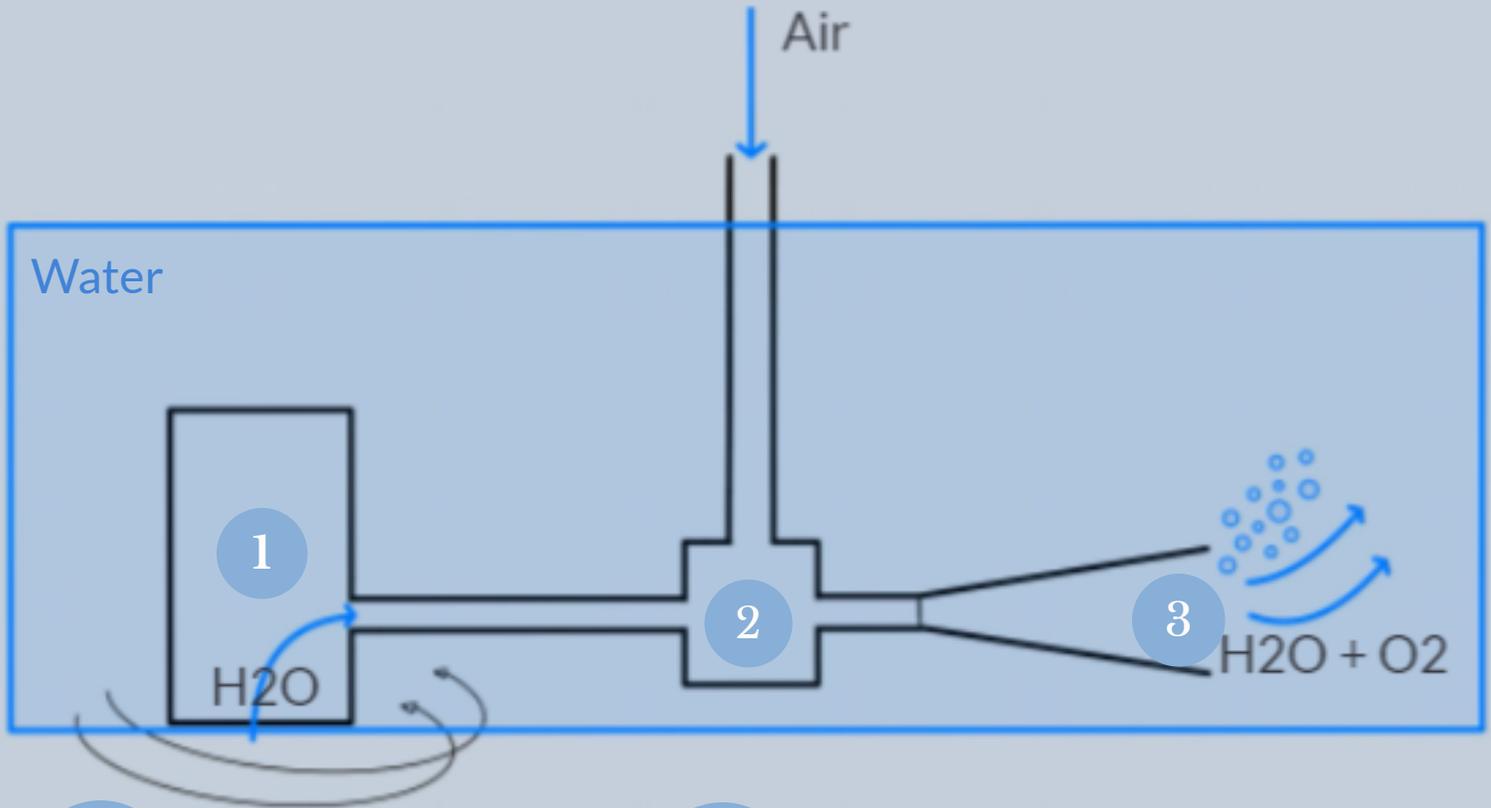
Flocs are rich in protein = excellent source of vitamins and phosphorus

Allowing microorganisms to proliferate = improve water quality

Higher performance indicators

Close to zero water exchange

Bioflocs with jet aeration



1

A submerged pump pulls water and sludge from the bottom

2

By using the Bernoulli effect, a suction is created. Air will be pulled directly from the surface and forced into special nozzle to create microbubbles. The mixture is channeled into a strong jet

3

The microbubbles will slowly rise to the surface of the water from the bottom of the pond. The microbubble have a large surface area and will surface very slowly to maximize oxygen transfer in the water. Creating a double solution of constantly mixing and directing water and achieving efficient oxygenation.

lungs and kidney

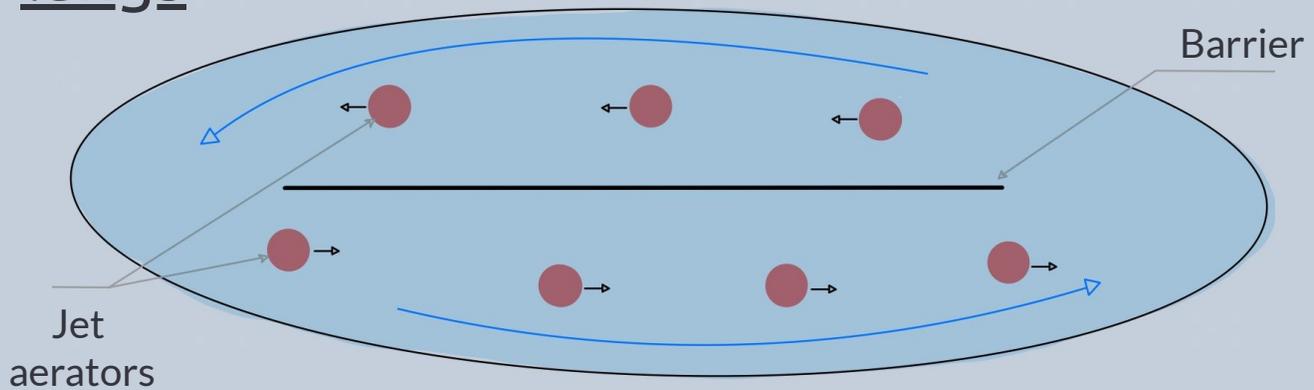
Making an analogy with human body's metabolism, **lungs** pump the air to oxygenate the system and the **kidney** ensures the filtration and cleaning of the blood.

In terms of water treatment, lungs pump, oxygenate and returns water in the production tanks while kidney pumps water and treats it on biological treatment plant by removing ammonia and nitrogen and then returns water back in the production tanks.

BENEFITS

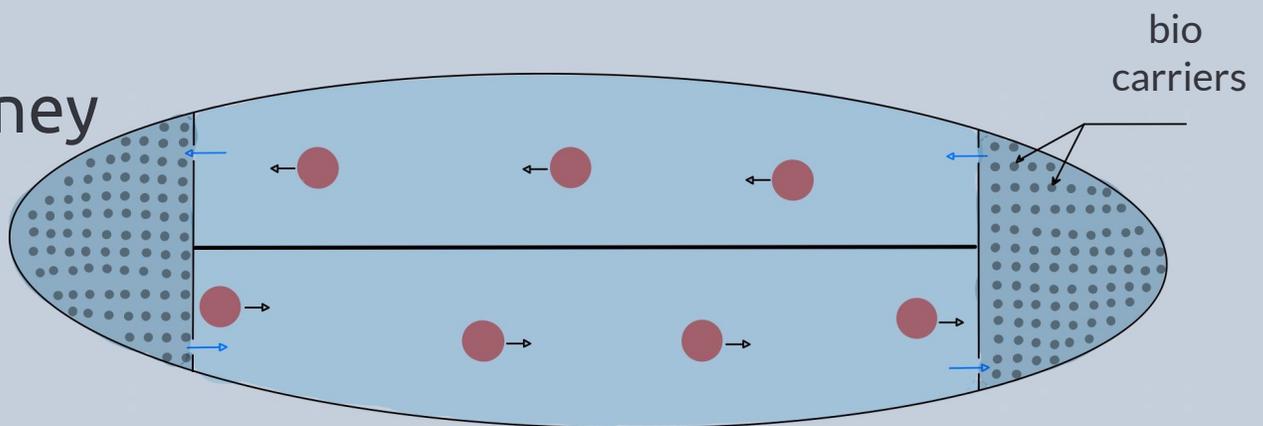
Mix, oxygenate and treat the water directly
efficiently at low CapEx and OpEx

- lungs



Here, we use the jet aerators previously described to do the work of lungs. The production basin requiring treatment is fitted with a barrier around which the pumps are arranged. This creates a circular flow around the barrier and the water is mechanically oxygenated by the work of the pumps. This device allows basin's water regeneration without pumping new water from outside.

- Kidney



Bio carriers are added to the tank in order to create an anaerobic zone where the special bacteria removes nitrogen out of the system by converting it into nitrogen gas. The bio carriers provide a surface for the bacteria to attach to act in our interest as a biological treatment. Once the nitrogen is removed, the treated water is returned to the system.

conclusion

Implementing knowledge and technologies from environmental engineering and biotechnology represents an unprecedented opportunity to dramatically increase productivity and profits in aquaculture.

By capitalizing on conditions in the global south with a biomimicry perspective, large water basins can be transformed into productive recirculating aquaculture systems at low CapEx and OpEx

Our mission to **accelerate the world's transition to sustainable and regenerative food production** is supported by these developed technologies.

Get in contact to collaborate.

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