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AUTONOMOUS AQUAPONIC SYSTEM TO RECREATE AN ECOSYSTEM FOR MARS SETTLERS

Abstract

Today, many projects initiated by space agencies and private contractors emerge with the aim of establishing a human colony on Mars. Among the major challenges to overcome, protecting astronauts against cosmic rays and their food autonomy can be improved.

The use of water as a barrier against cosmic rays, could jointly solve both problems. Indeed access to large quantities of water coupled with an efficient mode of cultivation and offer great food autonomy to future colonies. We wish to raise an ambitious concept of culture to create an autonomous and sustainable ecosystem use two millennia solutions: **aquaponics** and **compost**.

Aquaponics is to grow above ground plants (with or without substrate) through the water coming from the fish farm. The fish waste is converted by bacteria into nutrients used by plants to grow this way requires to set up a complete ecosystem in order to live in harmony plant, bacteria and fish. It must also provide food for fish at the initialization of the cycle, but it can then be replaced and this is where the compost is within the cycle.

Indeed two types of compost could be used, one for recycled plant material with worms to feed the fish. In addition, a "tea of worms" may be harvested and used as a fertilizer to complete plant food. Then the second compost allows recycled excrement of humans in fertile ground, it added to the soil of the planet colonized expands the culture area. We can see aquaponics and compost as a powerful engine that transforms, using a bacterial biodiversity, animal and plant, where all waste food it's use at each stage of the process.

The main difficulty is the time of the establishment of this **ecosystem**. Indeed, modules containing plants and fish should be sent before the arrival of humans. So during the trip and waiting for early humans, fish and plants will begin to grow and therefore save time for growth. These modules will be fully autonomous in the first phase of the cycle, finally astronauts will complete the loop by bringing the last pieces of the ecosystem, composters, their consumption and waste.

We can create a completely stand alone system that will provide food self-sufficiency and protection for early settlers through this essential resource. The technology to implement such an ecosystem is now known, and used automated on earth so we can use it on Mars.