

26th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Interactive Presentations - 26th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR
SYSTEM (IP)

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AUTOMATED AQUAPONIC SYSTEM

Abstract

Standing on the ground and looking at the stars, we often see two different worlds, but some of the problems we face on a daily basis concern both of them. Due to the prevailing conditions, in extreme areas such as northern Africa, Alaska, the Arctic or Antarctica, the cultivation of plants in the soil is very difficult, this problem also applies to space stations and other planets of the solar system. An automated, modular aquaponic system will allow for the cultivation of various plant species regardless of the conditions outside, limit human intervention to a minimum and allow the cultivation area to be adjusted depending on the needs. The system is not only automated but also modular, increasing the cultivation area is possible by adding cultivation modules to the main module, containing control systems for all other subsystems used, among others, to control the exposure using LED lamps with a colour of light adapted to the photosynthesis process of specific plants or filters that maintain the appropriate concentration of elements in water and air. Full automation and modularity allow you to adjust the cultivation area to the needs, and perform auto-calibration taking into account the temperature, humidity, composition of organic and inorganic substances in the water. Thanks to full automation, the cultivation system is self-sufficient, so the role of a human is reduced only to removing ready-made crops and fish (Tilapias) from the system. Our system offers the possibility of growing different types of plants depending on the needs, different vegetables and fish ensure a varied diet and provide an optimal amount of calories. The system enables highly efficient use of resources; continuous recirculation and closed-cycle water use minimize water loss, and since fish and plants are a natural ecosystem in aquaponics, no artificial fertilizers are needed. As previously written all controlled by the application on the user's phone, the simple interface of the application not only informs the owner about the system parameters such as; humidity, temperature, light, concentration of carbon dioxide, oxygen and other gases and compounds contained in water. Using the application, the user selects the type of cultivated plants, by pressing the lettuce icon, the operating mode of the system is selected, which maintains the appropriate parameters for the growth of this vegetable. The whole system will be tested during the analog astronaut missions at the Analog Astronauts Training Center in Poland.