MOON-GROWN PLANTS AS A RESOURCE

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Introduction: Reliable, sustainable on-site farming will be essential for any permanent human inhabitation of the Moon. Plant uses for human life support and environment maintenance are recognized in current research programs [1] but as yet little attention has been given to the many other uses of plants in Earth's present economy, some of which will have to be duplicated on the Moon. This paper gives a brief survey of a few of the most obvious needs and advocates modest preparations including small demonstrations to show that important plants can be grown, harvested and processed at acceptable cost in lunar conditions. At first these demonstrations can be robotic, as described in previous papers [2.3] but eventually local human supervision will be necessary.

Plant Uses Beyond CELSS

Look around you here on Earth and spot products and applications of plants. Timber products are ubiquitous, Can we ever expect to see forestry on the Moon? Perhaps lunar settlers will have to make do with fast-growing plants such as bamboo, an excellent structural material, and reeds, ingeniously used in construction by the Marsh Arabs of Southern Iraq.

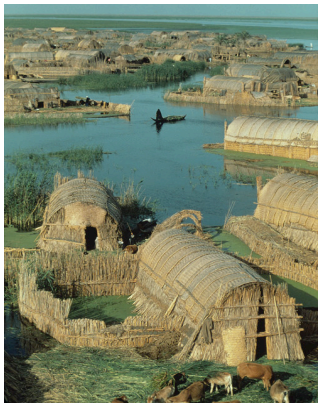

Figure 1. An example of Marsh Arab buildings

Other common plant uses include pulp for paper and a multitude of applications in the field of inks and dyes. Often replaced of Earth by petroleum-based synthetic products, on the Moon these ancient plant uses may be revived. Another good benefit from the character of plant fiber, including springiness and scent, is the Japanese tatami mat for pleasant sleeping. With a six-fold reduction in body weight, Japanese mats should be even more delightful on the Moon.

The lunar demonstrations advocated in this paper should be preceded by a full-scale study of which plants and which applications might fit best into a lunar economy.

How to get from here to there

Assuming the ultimate goal to be a thriving lunar agriculture sustained over the long term, let us now examine a sequence of activities, supportable at each stage, that could provide needed knowledge and maintain public interest through the achievement of stepwise milestones.

The first need is a credible plan taking account of the known lunar environment, known human life support requirements and aspects of life going beyond just survival; for example the psychological benefits of gardening and fruit cultivation with the aid of natural pollinators such as bees and other insects. The result of this planning could be a list of the first-priority plant and insect species to become the subjects of research and demonstrations.

Next, preliminary small-scale experiments should be carried out on Earth and in existing facilities aboard the ISS. This research would fit within existing program budgets and it could be amplified by an accompanying international education and outreach effort employing student volunteers. Many existing curricula in primary schools include work with germinating and growing plants.

A critically necessary element in precursor plant research is lunar gravity, 1/6 g. Up to now this element has been largely lacking, even though small centrifuges do exist in the ISS. On Earth a partial simulation may be provided by forcing plants to grow horizontally in a thin layer of soil in a vertical-axis centrifuge.

Eventually a robotic plant-growth test series on the Moon will be needed. An early example is underway as an auxiliary payload aboard an X Prize lander, but as yet there is no coherent program plan for this stage in the research.

REFERENCES

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