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FEASIBILITY STUDY FOR CONDUCTING HYDROPONIC RESEARCH AT THE A.S.C.C. LAND GRANT STATION

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HYDROPONICS is the science of growing plants without soil. It began over 100 years ago when German plant physiologists grew plants by placing roots in a solution in order to learn the kinds and amounts of nutrients needed by plants.

Most hydroponics today is done by gravel culture. Plants are grown on gravel (or sand, perlite, etc.), and a nutrient solution is washed over the roots. Many nutrient solution "recipes" exist. All may grow plants, but only a few grow certain plants economically. Many recipes are trade secrets.

The nutrient solution must be checked often to see that it is "balanced". Certain nutrients must be replaced more often than others, and the entire nutrient solution is usually replaced every two weeks. If plants show signs of lacking certain nutrients, crop yield may be low even if the missing nutrients are immediately supplied. Therefore, successful hydroponics farming requires constant checking and a good knowledge of plant physiology and chemistry.

ADVANTAGES AND DISADVANTAGES

Here are some advantages and disadvantages of hydroponics farming. For a more complete list, see Table 24, page 97 of reference 3.

Advantages

1. Excellent disease and weed control
2. No soil-related problems.
3. A year-round growing season.
4. Unblemished fruit.

Disadvantages

1. Expensive pumping equipment and nutrient solutions.
2. Labor intensive requiring considerable skill.
3. Constant monitoring with little margin for error.
4. Bland taste and poor shelf life of fruit.

QUOTES FROM REFERENCES

Of the seven references cited in this report, some scientists give qualified support for hydroponics, while others felt the commercial application of hydroponics was a bad idea in most cases. Because it is difficult to keep facts free from opinion,

including my own bias, the reference section contains the pages where the following quotes, taken in context, occur.

"While on a visit to Hawaii in January of this year, I inquired into what success, if any, anyone had in hydroponics farming there. I was told that one fellow has been trying for several years and was optimistic. But he was not in it for the money; mainly as a hobby. Anyway, he eventually quit."

"According to sources at the University of Hawaii, no one in the Pacific has had long term success. Some people do well over the short run, but all eventually quit."

"The only commercial success that I know of is in Queensland, Australia. Sugarcane farmers were forced to abandon that crop when the market collapsed. They now grow Aloe vera, which contains a burn medication, for a pharmaceutical company."

Tom Davidson
Lecturer, Soil Science
University of the South Pacific
Alafua Campus, Western Samoa

"Hydroponics will remain impractical long after aquaculture has moved strongly into food production markets."

Robert B. Delano, President
American Farm Bureau Federation

"Most soilless culture systems WORK.... However, there is a significant difference between a WORKING system and one that is COMMERCIALLY successful."

"Few, if any, of the current commercial soilless growing systems on the market today meet the criterion of cost effectiveness."

"The future of the hydroponics technique as it is conceived and practiced today is yet to be settled. Present techniques are not suitable for commercial application and the IDEAL hydroponics system has yet to be devised."

J. Benton Jones, Jr.
Professor of Horticulture
University of Georgia

"Scientists have not been able to prove that hydroponics produces sturdier plants and better and larger crops."

"In places where soil is not available, such as ships at sea and ice-covered Arctic areas, hydroponics is an effective way to grow plants [commercially]. But growing plants with soil is generally a much more dependable way to produce crops."

William Raymond Kays
Head, Horticulture Department
Oklahoma State University

"Controlled Environment Agriculture (CEA) has become particularly popular in areas where prime farmland and water for irrigation are in short supply, or where the climate is too dry, too hot or too cold to support a productive growing season in the field."

Wendy B. Murphy

"Plants may grow extremely well by hydroponics and are as nutritious and healthful for human consumption as any other plants,..., but I remain unconvinced that the practice is economically sound. [A] crop can be produced much more cheaply by conventional methods [for example, a greenhouse], than by hydroponics. The same control over temperature, insects and other factors must be applied in both cases. There may be situations where hydroponics is appropriate, (for example, a South Sea island without soil), but several people have lost their life savings in hydroponic greenhouse ventures that failed."

Frank B. Salisbury
Professor of Plant Physiology
Utah State University

"The high capital costs of controlled-environment agriculture dictates that the crops produced must be of high value. Vegetables must have a high yield and demand a premium price."

George W. Ware
USDA, Retired

RESEARCH POSSIBILITIES

There is an ongoing need to develop better nutrient solutions, plant varieties, pumping equipment and management practices for hydroponics farming. Such research is currently being pursued by both academia and commercial companies throughout the world. Perhaps Land Grant's role in hydroponics research should be limited to:

1. Becoming acquainted with the mechanics and logistics of hydroponics farming.
2. Developing a good management practice for a particular crop for our area.
3. Keeping current of hydroponics research done elsewhere.

Because hydroponics farming is labor intensive, requires constant monitoring and considerable skill, one specially trained person should be responsible for all work in this area at Land Grant.

Because of the high risk involved in a hydroponics venture, we should not encourage growers to enter this area of farming. We should make clear from the outset that any advice we may offer is based on the best interpretation of facts. We should not be held accountable, however, if our advice (or failure to advise) results in financial loss to the grower.

CONCLUSIONS

As mentioned earlier, it is hard to separate fact from opinion in a discussion about hydroponics. But most authors agree that hydroponics stands the best chance of success when four factors are present:

1. There is no soil and, therefore, no alternative to hydroponics other than transporting topsoil to a site.
2. Year-round cultivation is desirable.
3. Premium prices can be expected for the crops grown, (mainly tomato, lettuce and cucumber in the United States).
4. The skilled labor is available.

It is my opinion that hydroponics is not feasible in American Samoa. This opinion is based on the following facts:

1. We have soil.
2. We have a year-round growing season.
3. Air-shipped vegetables from New Zealand and California can compete with hydroponics on the local market.
4. Very few farmers have the skill, training or disposition needed to successfully run such an operation.

REFERENCES

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