

Hydroponics is More Profitable than Traditional Farming

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Abstract

Our research highlights the significant advantages of hydroponic farming over traditional agricultural methods to explain why it is more profitable. Hydroponics, as supported by studies from Akinmeji (2018) and Folorunso (2023), offers a cost-effective, space-efficient, and sustainable approach, utilizing low-powered microcontrollers and eliminating the challenges posed by soil-based farming such as pests and contamination. There are many environmental issues associated with traditional farming, including greenhouse gas emissions and soil erosion. Hydroponics ensures efficient water use, higher yields, and adaptability across diverse settings. Our literature-focused study, conducted during a two-week STEM Bridge program, proving hydroponics as the future of profitable and sustainable agriculture.

Introduction

Farming has been a tool utilized for many years to provide sustainable amounts of food for generations. However, traditional agriculture may no longer be the best option for growing crops. Conventional agriculture causes increased greenhouse gas emissions, soil erosion, water pollution, and threatens human health. Hydroponics as an advanced technique for vegetable production: (Akinmeji, 2021). Although this tool has been useful there can be a more cost-efficient way to farm: hydroponics. This new technology of farming allows innovation in agriculture.

This new method of farming is hydroponics, which is basically the growing of crops and plants without using soil (Shama, 2018) The main purpose is to maximize the use of space and significantly reduce plant contamination and increase the growth of plants. Hydroponics is superior than regular farming because it requires less water, it produces a greater yield of fruits and vegetables, and the plants are more tightly packed (Damasevicius, 2021)

Additionally, the problem of scarcity and unavailability of rare vegetable varieties with high demand can be shrunk to its barest minimum with the implementation of the automated system (Folorunso, 2023). And finally: soil based agriculture is now facing various challenges such as urbanization, natural disaster, climate change, indiscriminate use of chemicals and pesticides which is depleting the land fertility. This matters because these problems make traditional farming very unprofitable and opens the door to use hydroponics as these problems are irrelevant because hydroponics uses water rather than soil.

Materials and Methods

We have researched and reviewed the differences between hydroponics and Traditional agriculture articles giving us the following data. When searching for information, Google was used to find trusted sources such as The Future of Farming from Princeton University and looking into Traditional agriculture from Agricultural Land loss and Conservation by the State of California. We had to make sure that we were using relevant time periods (no longer than 10 years ago) for our research so that it is not outdated.

We gathered research from a couple very good articles and sources that all supported each other so that we knew that the information was true and solid for us to use. We did not use articles that did not align with the consensus of the other articles. Additionally, we made sure that the articles we were gathering research from were trusted and reliable sources and if they were not they were ignored. Through this screening and filtering of articles, we were able to narrow them down to a few that were great research articles for us to trust and extract information from.

Results

Hydroponics are cost friendly in contrast to Agriculture farming because the required materials are less expensive. Studies have shown that both small (€42,895) and medium-farmers (€331,465) benefit greatly from the usage of hydroponics, showing a 15% discount rate while still remaining economically viable. (Folorunso, 2023) As stated in "A cost effective design for hydroponics farming," it states that the required microcontrollers for hydroponics are low powered and cable for different elementary processes which are compatible with the software (Akinmeji, 2018). This can ensure proper communication channels and most importantly they are relatively cheap. Additionally, they stated in the same article that with this technology and design, it is shown to be effectively operated with little or no human interaction with minimum cost and resources. According to Table 2 (shown below) there are various types of crops that can be used to grow in hydroponic systems (Folorunso, 2023). Shown in Table 4, it states there is a significant return on investment in hydroponic farming with both small and medium scale hydroponic systems (Folorunso, 2023)

Table 2. Various species of plants grown under soil less hydroponic system

Type of crops	Name of the crops
Cereals	Rice, Maize
Fruits	Strawberry
Vegetables	Tomato, Chilli, Brinjal, Green bean, Beet, Winged bean, Bell pepper, Cucumbers, Melons, green Onion
Leafy vegetables	Lettuce, Spinach, Celery, Swiss chard, Atriplex
Condiments	Coriander leaves, Methi, Parsley, Mint, Sweet basil, Oregano
Flower / Ornamental crops	Marigold, Roses, Carnations, Chrysanthemum
Medicinal crops	Indian Aloe, Coleus
Fodder crops	Sorghum, Alfa alfa, Bermuda grass, Carpet grass

Table 4

Annual revenue for small- and medium-scale hydroponic systems. The net returns, revenues, and yields are Mean ± SD values of small-scale (n=6) and medium-scale (n=4) farmers over a period of 12 months. The numbers in the brackets represent yield/value per unit area (m²).

Produce	Yield (Kg)	Income	
		Revenue (€)	Net return (€)
Small-scale	11,500 ± 1801.76 (54.2) ^a	11,227.4 ± 1685.56 (53) ^a	1,289 ± 852.26 (6.1) ^a
Medium-scale	73,700 ± 22,201.87 (65.6) ^a	86,796.6 ± 19305.49 (77) ^a	32,007 ± 27091.5 (28.5) ^a

^a indicates yield/value per unit area (m²).

Conclusion

The results directly support our hypothesis that hydroponic farming is more profitable compared to traditional farming. Hydroponic farms take up far less space and need no soil. They can be grown almost anywhere, including harsh climates and dense urban settings. Hydroponic plants are protected from pests, weeds, most diseases, and contamination. In conclusion, hydroponics is the future of farming and that it is far more profitable, efficient and sustainable than traditional farming.

Further areas of research include experiments comparing traditional and hydroponic farms (using the same crops and timespan) to show definitive results about which is more profitable. Also, there needs to be more community involvement and education since hydroponics is a relatively new area of study. Some limitations to our study include the fact that this was a literature review and not an actual experiment. In addition, this study was done during a two-week STEM Bridge program and the research needed to be completed in a certain amount of time, so the research couldn't be as in depth as it could have been.

References

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