

A Study on Future Prospects of the Hydroponic Farming “As Agri-Entrepreneurship in the 21st Century”

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ABSTRACT

The main focus of this study is to analysis the potentials of hydroponic farming as an entrepreneurial opportunity. This study is based on both primary and secondary data. Respondents were taken through the random sampling method through a structured questionnaire. 50 sample sizes from the rural, semi-urban and urban areas. The analysis indicates that the demand for pesticide-free, high-quality produce makes hydroponics a sustainable and lucrative industry. Hydroponic farming is profitable in Bharat, provided that there will be a well-planned investment, market-driven crop selection, and efficient operations.

Keywords: Hydroponic Farming, Agri-Entrepreneurship, Efficient Operations, Market-Driven Crop Selection, Structured Questionnaire.

Introduction

Hydroponic farming is a novel and promising method for effective, environmentally friendly crop production. The term "hydroponics" originates from the Greek words "hydro" means water and "ponos" means labor.¹

In a hydroponic system, plants receive their nutrients from an observed, balanced nutrient-rich water solution delivered directly to their roots. This direct delivery ensures that plants receive optimal nutrition and minimizes water wastage; some studies show that hydroponic farming can use up to 90% less water than traditional soil-based farming. This efficiency is essential for areas facing water shortages and supports sustainable agricultural practices. Furthermore, the monitored environment of hydroponic systems allows for year-round production, regardless of seasonal changes or adverse weather conditions.

This method of farming is particularly beneficial in urban areas where agricultural land is limited and traditional farming is impractical. Vertical farming is a popular hydroponic system that involves stacking multiple layers of plants in a vertical arrangement, thereby maximizing space usage in densely populated cities. By bringing farming closer to urban centers, hydroponics also reduces the pollution associated with the long-distance transportation of crops.

The integration of technology in hydroponic farming—such as automation, sensors, and monitoring systems—enables real-time data collection and precise environmental management.

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¹Fraz Ahmad Khan (2018) A review on hydroponic greenhouse cultivation for sustainable agriculture, Volume: 2 Issue: 2, 59 - 66, 10.04.2018, <https://doi.org/10.31015/jaefs.18010>

Utilizing the Internet of Things (IoT) and Artificial Intelligence (AI), alongside data analytics and machine learning, has further optimized system performance and decision-making.

When taking economic and environmental aspects into account, cost-benefit analyses highlight the potential for hydroponic farming to provide better returns on investment and a significantly reduced environmental impact compared to conventional agricultural practices.

Importance

- **High Yield:** This method has an ability to grow crops 30-50% faster than their soil-grown versions of same crop. Also, they rarely lose crops because of problems like pests and contamination, which helps to harvest more crops and greater profits for farmers.
- **Resource Efficiency:** The usage of water is more than 20% less as compare to traditional farming methods, because in hydroponic farming the recirculation process is used to giving water in plants. Additionally, there is no acres of land is necessary for farming.
- **Produces Higher Quality Food:** Crops have carefully controlled environment and balanced nutrients solution in their water supply. There is no reach of pollution, pesticides, and other contamination, which allows them to offer higher-quality crops as compare to same soil-grown crops.
- **Controlled Environment:** Technology in a hydroponic farming creates the perfect environment conditions according to the crops at their space, so, there is no more dependency on external climate. Also crops are not affected by harsh environments, with poor soils or extreme weather condition.
- **Pest & Disease Control:** Hydroponic farming eliminating soil-borne problems, which reduces the use of pesticides and herbicides.
- **Food Security and Shortens the Supply Chain:** Hydroponic farming provides an opportunity to grow fresh fruits and vegetables within minutes or hours distance of the consumers reach. Ensures a steady, local supply of fresh produce, reducing transport costs and reliance on seasons. This also, shortened the supply chain by cutting out middlemen.

Cost and ROI

Hydroponic farming requires a different investment structure compared to traditional soil-based agriculture. The hydroponic farming in Bharat remains a high-capital but high-return business, with establishment costs and profitability closely dependent on technology and crop selection. The setup cost and ROI varies from small home setup to large commercial units.

- **Small/Urban Setups:** A small rooftop or indoor system (500–1,000sq.ft.) typically costs between ₹5 lakh and ₹15 lakh.
- **Commercial Scale (1-Acre):** Setup costs for a standard one-acre farm range from ₹1.1 crore to ₹1.5 crore. High-tech or fully automated units can exceed ₹2 crore.

Key Components

- **Infrastructure:** Polyhouses (₹20L–₹60L per acre) and hydroponic systems like NFT or Dutch buckets.
- **Technology:** Automation, climate control, and water treatment systems (₹15L–₹25L per acre).
- **Operational Costs (OpEx):** Monthly expenses for a one-acre farm range from ₹80,000 to ₹1.9 lakh, covering electricity, labor (4–5 workers), seeds, and nutrients.¹

Return on Investment (ROI) Analysis

While the payback period depends on the scale of the farm, most commercial hydroponic farms in Bharatachieve ROI within 3–5 years. Here's a rough estimate for a 1000 sq. ft. commercial farm:

Initial Investment: ₹10–15 lakh

Annual Revenue: ₹12–18 lakh (based on crop selection and yield)

Operational Costs: ₹5–7 lakh per year

¹As per the report of inhydro, March 4, 2025, "Is Hydroponic Farming Profitable In India? A Deep Dive Into Costs & Roi".

Annual Profit: ₹6–11 lakh
Breakeven Period: 2–4 years¹

Literature Review

A Study on Hydroponic Farming published in international Journal for Multidisciplinary Research explores the comprehensive review of the advantages and limitations of hydroponics farming. The study examines the advantages of hydroponics, such as its potential to produce higher yields than traditional farming methods, the ability to grow crops in areas with poor soil quality, and the reduced use of water and pesticides. It also discusses the limitations of hydroponics farming, including the initial investment cost, the need for technical knowledge and experience, and the reliance on a consistent supply of electricity and water.²

A Study of Hydroponic Farming and Its Impact on Consumer Buying Preference. The study was conducted in India. Respondents in this study were 102 respondents. The main objective of the study is to explore the impact of hydroponics on consumer purchasing preferences. The results of the study show that there is a significant relationship between hydroponics and consumer purchasing preferences. Consumers are more likely to buy produce grown using hydroponics, In addition, the study revealed that consumers are willing to pay a higher price for hydroponically grown crops because as it is considered fresh, healthy and environmentally friendly.

Assessing Opportunities and Difficulties in Hydroponic Farming, the study was conducted at different Indian climatic, weather and seasonal conditions. During the study they grew different vegetables, flowering plants and shrubs successfully by the use of mainly three techniques of hydroponics namely Kratky, Wick and DFT methods. The main objective of the study is to spread awareness about novel types of advanced future agricultural techniques or farming among the farmers and masses, who have an interest in agriculture but cannot fulfill their ambitions towards agriculture farming due to scarcity of agricultural land. The results obtained from the growth of vegetable and plant through hydroponics methods convince them to follow an idea to use of such agricultural techniques.

A Study on Hydroponic Farming in Indian Agriculture, The main aim of the study was to understand and create awareness about hydroponics and to analysis the challenges faced by hydroponic farmers in India. The study conducted field survey Google form which was filled by 100 respondents in the Bangalore region. The study observed that the awareness about hydroponics among the people was less; many people did not have a clear picture about Hydroponics. The study found that many people do not prefer Hydroponics farming as the initial investment cost is very high and the financial support provided by the subsidies in the Government for Hydroponics farming are very less compared to traditional farming. Even though there is huge demand for Hydroponics produce as it is organic, medium and small-scale farmers faced the majority of difficulty in distribution and marketing. Among all the hydroponics produce greens have a huge demand.³

Financial Viability of Hydroponic Firms in Bengaluru, this research study conducted on 23 hydroponic firms for analysing the financial viability of hydroponic firms in Bengaluru during 2022-23. The study revealed that, hydroponic firms' gross returns varied depending on its size, from Rs.11.00 lakhs to Rs.1.35 crores. The net returns were in the range of Rs.6.76 to Rs.68.16 lakhs. The study concluded that investment in any scale of hydroponic farming is a profitable business venture in Bengaluru.

Objectives

- To evaluate the future potential of hydroponic farming as an entrepreneurship.
- To study the importance of hydroponic farming.
- To examine people opinion towards hydroponic farming.

Hypothesis

- **Null(0):** There is no significant potential for hydroponic farming as an entrepreneurship near future

¹ As per the report of inhydro, March 4, 2025, "Is Hydroponic Farming Profitable In India? A Deep Dive Into Costs & Roi".

² Vyshnavi , Dr.Asha S , Sanjana Agarwal , Harshit Dubey , Chinmay Jain L "A Study On Hydroponic Farming"International Journal for Multidisciplinary Research (IJFMR)E-ISSN: 2582-2160 - Website: www.ijfmr.com

³ Vishwanath Kumar H M, Ajay R, Praphul Kumar K, Cheshire H (August 16-18, 2022) "A Study on Hydroponic Farming in Indian Agriculture"-Indian International Conference on Industrial Engineering and Operations Management Warangal, Telangana, India@IEOM Society International

- **Alternative(1):** There is significant potential for hydroponic farming as an entrepreneurship near future.

Data Collection

The primary data was collected in the form of questionnaire. The survey was conducted through Google forms. The Secondary data was taken through research papers, internet, magazines, books etc.

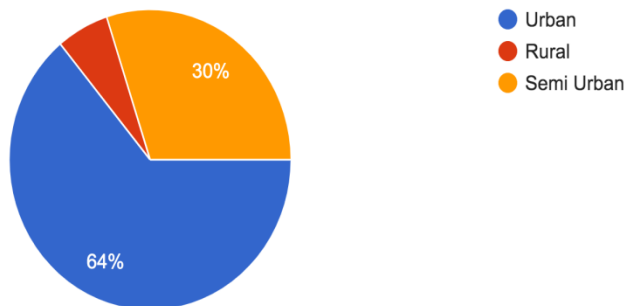
Research Methodology

The purpose of the study is to examine future potential of hydroponic farming as a fast growing entrepreneurial idea and also highlight the people opinion towards hydroponic farming. For this purpose the data is collected from different cities of Bharat through questionnaires, interviews, and documentation. In this study 50 samples have been taken as per the random sampling method and type of research is quantitative as well as qualitative research. This study consisted of both dependent and independent, the independent variables are the product nutrition, taste, fad, availability, price, beneficial for the environment, cost and ROI of establishment whereas, the dependent variable are people's urge to establish hydroponic farming as an entrepreneurial activity. For hypothesis testing the Welch two-sample t-test was used. Interpreted data have been presented in the form of charts.

Data Analysis and Interpretation

Which area do you belong ?

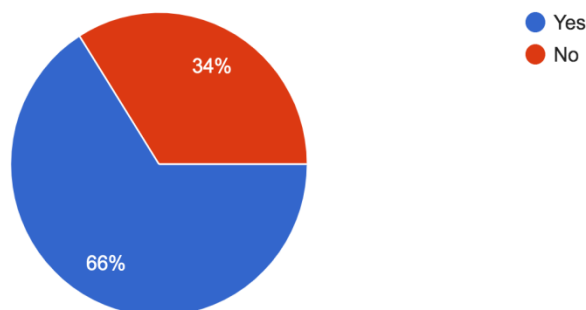
50 responses



It was observed that most of the respondents were belong cities that is 64% respondents were belong to urban area whereas 30% from semi urban area and only 6% from rural area.

Have you ever heard about hydroponic farming ?

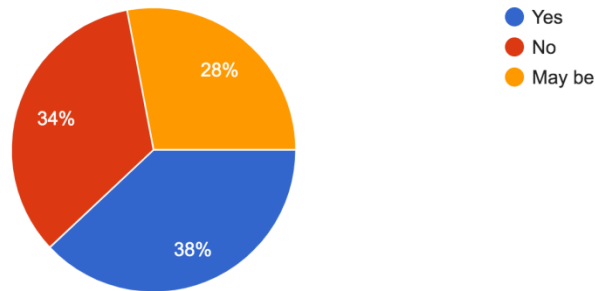
50 responses



It was observed that 66% respondents have knowledge about hydroponic farming whereas 34% have no knowledge about hydroponic farming.

Have you consume hydroponic produce ?

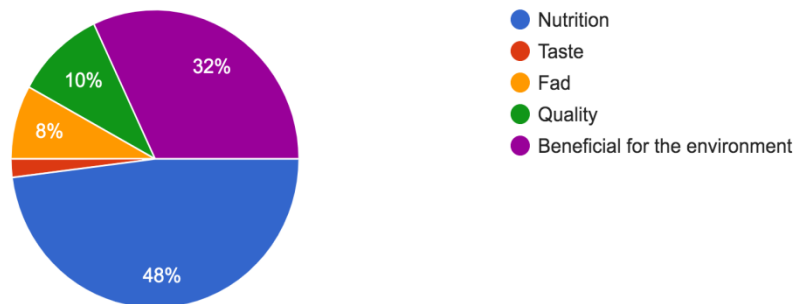
50 responses



It was found that 38% respondents consume hydroponic produce whereas 34% were not consume the hydroponic produce and 28% respondents were may consume the hydroponic produce.

Which factor's influence you to buy hydroponic produce ?

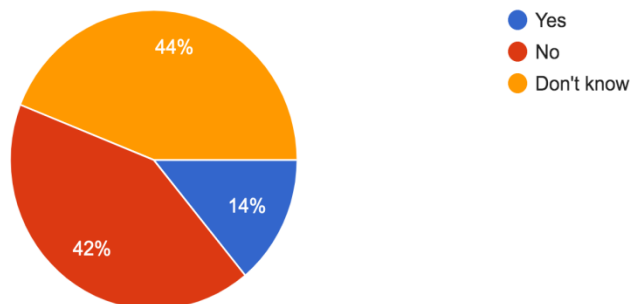
50 responses



It was found that 48% respondents were buying hydroponic produce because of its nutritional quality, 32% respondents buys because this produce are beneficial to environment, 10% respondents buys for its good quality, 8% respondents buys for flexing and only 2% respondents buys for taste.

Are hydroponic produce easily available in your area ?

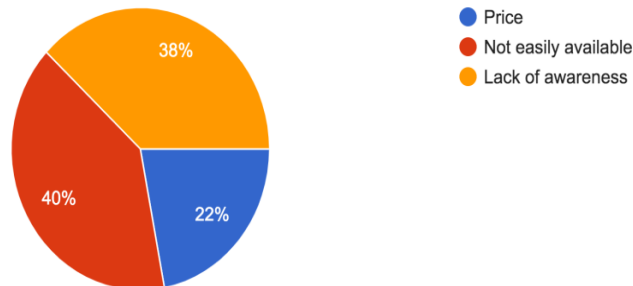
50 responses



It was observed that only 7 respondents said that hydroponic produce were available in their respective areas, 21 respondents said that they don't have any idea about the availability of the products whereas 22 respondents said that hydroponic products are not available in their area.

What factor do you think discourage hydroponic produce purchase ?

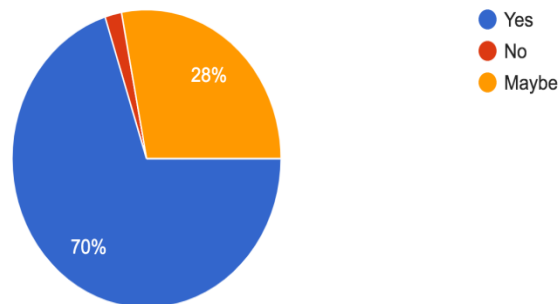
50 responses



It was found that 40% respondents said that hydroponic produce are not easily available in their area, 38% respondents had lack of awareness about hydroponic produce whereas 22% respondents were unable to buy hydroponic products due to its high price.

If given opportunity, will you shift your consumption towards hydroponic produce?

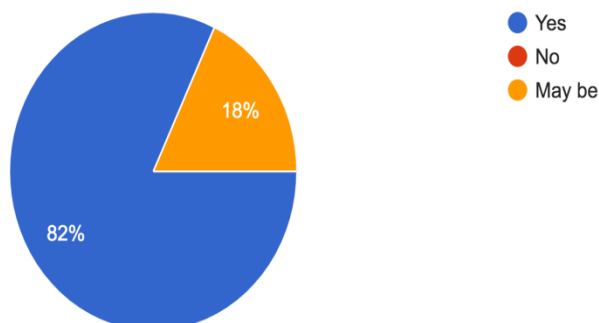
50 responses



It was observed that 70% respondents are ready to shift their consumption towards hydroponic produce, 28% respondents may shift their consumption whereas 2% respondents are not want to shift their consumption towards hydroponic produce.

Do you think hydroponic farming will have ample business opportunity in future ?

50 responses



It was found that 82% respondents said that there will be ample future business opportunity in hydroponic farming whereas 18% respondents also said there may be an opportunity for hydroponic farming business.

Hypothesis Test

pValue: 0.0453

Statistic: 12.3299

df: 1.0555

95% confidence interval: [3.3425, 71.6575]

Test Result: Reject null in favor of alternative at 5% significance level.

Findings

- It was found that the availability of hydroponically grown products is limited to only certain parts of urban and semi-urban areas.
- There is lack of availability of hydroponic produce and also there is lack of awareness among the people about the benefits of the hydroponically grown produce.
- It was found that people are more concerned about their health; they are always in search of healthy and good quality food items, which creates ample opportunity for hydroponic business in Bharat.
- As per the hypothesis testing, factors such as quality, availability, nutritional value of hydroponic products, taste of these products, less use of water, environment sustainability and the fad amongst the people create business opportunity for hydroponic farming and its products.

Conclusion

Hydroponics is more than just a farming technique; it is a game-changer for Bharat's food future. As consumers pivot toward 'clean' nutrition, the opportunity to scale high-margin, soil-less farming has never been greater. With a well-planned investment strategy and a focus on technology-driven efficiency, hydroponics offers a rare intersection of environmental sustainability and significant commercial profitability in the Bharatiya market {Indian market}.

References

1. Kiran Murlidhar Shende, Sarika Joshi, Pooja Mhetre, Rasika Gumaste (2023) "A Study of Hydroponic Farming and Its Impact on Consumer Buying Preference"- Atithya: A Journal of Hospitality 9 (2), 45-52 <http://publishingindia.com/atithya/>
2. K.V.Chaithra, G.Ranganath, M.R.Girish, R.Mohan Kumar And Dronachari Manvi (2024), "Financial Viability of Hydroponic Firms in Bengaluru", Mysore J. Agric. Sci., 58 (4) : 24-34
3. Ganapathy Rajaseger, Kit Lun Chan, Kay Yee Tan, Shan Ramasamy, Mar Cho Khin, Anburaj Amaladoss, Patel Kadamb Haribhai (2023, Sep 30), Hydroponics: current trends in sustainable crop production-National Library of Medicine (NLM)(PubMed Central)
4. Kalpana Sagarand and Km Priti (2025, May28) Soil-Free Harvest: Unlocking the Future of Food with Hydroponics, Current Agriculture Research Journal Volume 13, No. 2.
5. Bhavesh A. Dodiya, Dilip R. Vahoniya, Alvira Rajwadi, Bhautik Bagda (2025 July,04) Hydroponics: A Sustainable Way of Farming, Journal of Scientific Research and Reports Volume 31 [Issue 7]
6. <https://www.dmifinance.in/hydroponic-farming-in-india/>
7. <https://eewafarms.com/hydroponic-farming-in-india-science-sucess/>
8. <https://risehydroponics.in/>
9. <https://getfarms.in/entrepreneurship-opportunities-in-hydroponics-farming>.

