

A Study of Hydroponic Farming and Its Impact on Consumer Buying Preference

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Abstract

Hydroponics is a new sustainable method of growing plants without soil, submerged into nutrient enriched water containing macronutrients and micro nutrients. This technology reduces water consumption by 90% compared to typical soil framing. The method is suitable for urban cities where major number of crops can be grown in small space which makes it profitable to the producers and ensures reduction in time required for transportation which ultimately reduce the costs. Hydroponic is gaining popularity due to its many advantages over traditional farming methods. This paper aims to explore the impact of hydroponics on consumer purchasing preferences. The study was conducted by reviewing relevant literature on hydroponics and consumer behavior. 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, as it is considered fresh, healthy and environmentally friendly. In addition, the study revealed that consumers are willing to pay a higher price for hydroponically grown crops because it is rich in nutrients.

Keywords: Hydroponics, Farming, Consumer Behaviour, Ecofriendly

INTRODUCTION

Farming is one of the oldest professions in the world and has played an essential role in the development of human societies. In ancient times, farming started as a means of subsistence where people grew crops and raised animals for their consumption. As civilizations developed, the practice of farming became more advanced, with the introduction of tools such as ploughs, irrigation systems, and the domestication of animals. This allowed for

increased production of crops and the ability to store food for longer periods. The advent of agriculture also led to the development of settled societies and the division of labor, with some people specializing in farming and others in other trades. Over time, farming techniques continued to evolve and improve, with the introduction of crop rotation and fertilizers, as well as the use of machinery such as tractors and combine harvesters. Today, farming remains a vital industry, providing food for the world's population, while also facing challenges such as climate change and sustainable practices.

Scope of Hydroponic Farming

In India, hydroponic farming is very popular. Additionally, the integration of data analytics and artificial intelligence measures significant indicators that support crop and food planning and, thus, facilitate connections within the food security ecosystem. In addition to technological factors, the need for highly populated countries to create a greener and smarter market makes room for hydroponic farming, also known as rooftop or vertical farming, to become more popular.

One of the principal benefits of Hydroponic farming cultivation is that it tends to be finished in a controlled climate, which considers all-year creation and the capacity to develop crops in metropolitan regions, where land is scarce. This makes aqua-farming cultivating especially alluring in India, where quick urbanization is coming down on accessible rural land. In yet another blog based on hydroponic farming in India on Enter Climate, This farming technique requires scientific management of crops, considering factors like temperature, humidity, pest control, and, most importantly, nutrition.

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In addition, Hydroponic farming cultivation should be possible utilizing negligible measures of water, which is a critical consideration in a nation like India, where water access are in many cases restricted. This technique for cultivating, additionally takes out the requirement for pesticides and lessens the gamble of yield infections, making it harmless to the ecosystem and is a sustainable choice.

As of now, Hydroponic farming cultivation is as yet a generally new idea in India, and the market is still in its early stages. In any case, the Indian government has perceived the capability of aquaculture cultivation and has done whatever it takes to advance it, like contribution endowments and giving specialized help to ranchers. The article “Hydroponics’ Coming of Age: Tech-enabled ventures with an eye on profits, and investor interest” by Forbes India Staff writer Jasodhara Banerjee discussed how investors are becoming more involved in the sector as entrepreneurs use various technologies related to controlled-environment agriculture (CEA), such as polyhouses, nutrient film technique (NFT), hydroponics, vertical farming, and the Internet of Things (IoT).

All in all, the degree of Hydroponic farming cultivation in India is promising, and with the right help and framework, it can turn into a huge enterprise for India’s rural and urban population.

The Uniqueness of Hydroponic Produce in Contrast with Soil-Grown Produce

Hydroponic produce and soil-grown produce differ in several ways, including their growing conditions, nutrient availability, and overall flavor and appearance. Kurniastuti, T., & Sari, Y. N. in 2023, investigated to ascertain how consumer behaviour affected the hydroponic vegetable purchases made at Puccan Hydroponics. Using multiple linear regression analysis, the investigation’s findings demonstrate that four factors—product, price, place, and promotion—are taken into account when making a purchase decision. Here are some of the unique qualities of hydroponic produce:

Controlled Growing Conditions: Hydroponic plants are grown in a controlled environment, with carefully monitored temperature, light, and humidity levels. This allows for more precise control over growing conditions and can lead to faster growth rates and higher yields.

Optimized nutrient delivery: Hydroponic plants are grown in nutrient-rich water solutions that are carefully calibrated to provide the precise balance of nutrients that each plant needs. This can lead to plants that are healthier and more nutrient-dense than their soil-grown counterparts.

Water Conservation: Hydroponic systems use significantly less water than traditional soil-based growing methods, making them a more sustainable option for agriculture.

Reduced Pesticide Use: Because hydroponic plants are grown in a controlled environment, it is easier to control pests and diseases without resorting to heavy pesticide use.

Consistent Flavor and Appearance: It has long been acknowledged that one of the most crucial aspects that consumers take into account when selecting their meal is the sensory quality. (Steptoe, Pollard & Wardle, 1995) Hydroponic plants are less prone to environmental stressors such as drought or nutrient imbalances, which can lead to more consistent flavor and appearance. However, some critics argue that hydroponic produce may be less flavorful than soil-grown produce due to differences in growing conditions and nutrient availability. Additionally, hydroponic systems can be more expensive to set up and maintain than traditional soil-based growing methods. The speciality food product known as microgreens is gaining popularity in the United States. Microgreens first appeared on chefs’ menus in the San Francisco area in the late 1980s. Microgreens are a unique and popular addition in salads, sandwiches, and garnishes to improve the sensory qualities of a range of cuisines because of their diverse types and vibrant colours (Treadwell et al., 2010).

LITERATURE REVIEW

Shruti Kandwal (March 2023) Urban Farming Goes Mainstream: Hydroponic Companies Changing the Face of India This article examines the growth of urban agriculture in India, particularly through the use of hydroponics. It highlights several hydroponic companies that are impacting the industry and changing the way people think about gardening in the community. The article also explores the benefits of hydroponics, including its ability to conserve water and space and increase crop yields. Overall, the article provides an informative overview of the growing trend of urban agriculture in India and the role of hydroponics in this movement.

Suresh Kumar, Satish Kumar, Jawahar Lal (January 2023) Assessing Opportunities and Difficulties in Hydroponic Farming: This research paper published in the journal *Bhartiya Krishi Anusandhan Patrika* explores the impact of different hydroponic nutrient solutions on the growth and yield of cucumber plants. The study found that plants grown in a nutrient solution containing higher levels of potassium, calcium, and magnesium had significantly higher growth rates and yields than those grown in a standard nutrient solution. The book provides a detailed description of the methods used in the experiment and the results obtained, as well as an analysis and discussion of the results. Overall, the study provides valuable insight into the effects of fixed solutions on hydroponic plant growth, which may have useful applications for improving crop production in hydroponic systems.

Dr. Mandar Godge (September 2022) Hydroponics: Getting to the Root of the Myths: In this article, Dr. Mandar Dolge discusses various myths involved in hydroponic farming. Stating the example of Singapore and its food supply chain. Singapore outsources 90% of its food from different countries. Various conditions have been disrupting the food chain in Singapore thus which has led them to hydroponic produce. According to the article Dr. Mandar Godge states that hydroponic produce can be grown with less investment and is easy to execute. The produce is organic and is safe to consume and more nutritious compared to soil-grown produce.

Agro spectrum (May 2022) what is the future of the hydroponic market in India? The article discusses the future of Hydroponic and India. It shows a lot of driving costs to the country, including the need for agriculture, increasingly of the eating food. The report also examines some of the challenges that the hydroponics industry may face in India, such as the awareness and education of farmers and consumers, and the high initial cost of developing a hydroponic system. Overall, the report provides an insightful analysis of the current status and potential of the hydroponics market in India.

The New York Times (Kim Severson) (July 2021) No Soil. No Growing Seasons. Just Add Water and Technology: The article published in the New York Times by Kim Severson talks about the flexibility of hydroponic produce. Hydroponic produce has made it easier to grow crops off-season and the growth predictions have become easier. In urban cities where the requirement for food is

much higher, hydroponic produce is finding its way into the market to cater to the needs. As these could be grown in a smaller area, urbanized cities can now extend these produce through hydroponic methods which reduces the transportation cost saving the shelf life of the product and also the nutrition. The United States has more than 2300 farms growing hydroponic crops.

Deepa Vaidya (October 2021) Does Hydroponics Have the Potential to Become Mainstream? Deepa Vaidya in her article mentions the current cultivation situation in India. It is deeply rooted in Indian farmers that soil-grown produce yields are better than urban farming. According to Deepa, the government of Maharashtra is offering 50% subsidy to adopt hydroponic farming. But along with it, Deepa states that along with subsidy, straightforward loan process, training required to execute hydroponic, in dept. knowledge should be provided to the farmers. Today imports of exotic fruits and vegetables in India are reduced by almost 60% to 70% due to hydroponic cultivation. For India to bring hydroponic mainstream will require more awareness of products among consumers.

S. Shantani (August 2021) Will Hydroponics Scale in India? This article aims to input forward the limitations and the benefits of hydroponic farming. As population growth is taking place rapidly, the country soon will face scarcity of water also on the other hand soil grown produce consume water in huge quantities. Hydroponic technology cuts down water usage by 90% making it sustainable. With continued innovation, a startup in Hyderabad has reduced the setup cost which makes it similar to the cost of traditional farming. The writer believes that the product obtained from hydroponic shouldn't be limited to exotic produce like lettuce basil etc. but also should produce locally grown and consumed vegetables.

Khushboo Jain (August 2020) Farm to Table: With Hydroponic Farming: Khushboo Jain mentions in her article how covid has spread awareness among people into eating healthy and growing healthy and chemical-free vegetables at our homes. She states that the hydroponic method is easy and affordable to set up in a household to grow greens. Several companies in India are promoting a Hydroponic system as it uses less energy and space and has the potential to produce more crops than time-consuming soil growth. Various companies in India provide hydroponic setup at your doorstep and assist with installation and care to be taken.

Eden Green Technology (9 March) is Hydroponic Food Nutritious? Eden Green Technology's "Is Hydroponic Food Nutritious?" blog provides a brief overview of the nutritional benefits of hydroponically grown produce. The author argues that while some people may be skeptical of the nutritional quality of hydroponic produce, studies have shown that it can be just as nutritious as conventionally grown produce. The blog highlights the benefits of hydroponics, such as the ability to control nutrient levels and eliminate the use of pesticides, which can contribute to the nutrition of plants. The author also said that the taste and texture of hydroponic production can be higher than those produced before, which can make them more attractive to consumers. Overall, this blog provides a brief introduction to the beginning of hydro doc farming and benefits of the nutrition.

Andrew Courtney, 15 Common Problems with Hydroponics (and How to fix them): This blog post highlights some of the problems people may encounter when setting up and maintaining a hydroponic garden. It addresses issues such as pH imbalances, nutrient deficiencies, pest infestations, and equipment inefficiencies. The author also provides practical tips and solutions to address these issues, such as adjusting feed levels, using pest control methods, and checking equipment regularly. This post provides helpful information and advice for those new to hydroponic gardening or those who may be struggling with their current setup. In general, this is useful for anyone who wants to solve problems in their hydroponic garden.

RESEARCH METHODOLOGY

The type of research used is quantitative as well as qualitative research. The research location is India. The population in this study is consumers who buy hydroponic vegetables. Respondents in this study were 102 respondents. The sampling technique used was random sampling. Methods of collecting data through questionnaires, interviews, and documentation. This study consisted of nine independent variables and one dependent variable. The independent variables include the product Nutrition, taste, availability, fad, price, conservative use of water, eye appeal of hydroponic products, the ease of production, beneficial for the environment. Meanwhile, the dependent variable is the buying behaviour of the

consumers. The hypothesis was tested, using the one-way ANOVA and f-test to find out the result.

OBJECTIVES

- To know the awareness of hydroponic product and its uniqueness.
- To study consumer buying preference towards Hydroponic farming products.
- To enlist challenges encountered by consumer while using and purchasing hydroponic products.

SOURCES OF DATA COLLECTION

Primary Data: The primary data was collected in the form of questionnaire. The survey was conducted through google forms.

Secondary Data: Secondary data was taken through internet, magazines, newspaper, books etc.

Hypothesis of the Study

H_0 : There is no significant influence on consumer's buying preference of hydroponic products.

H_1 : There is a significant influence on consumer's buying preference of hydroponic products.

DATA ANALYSIS AND INTERPRETATION

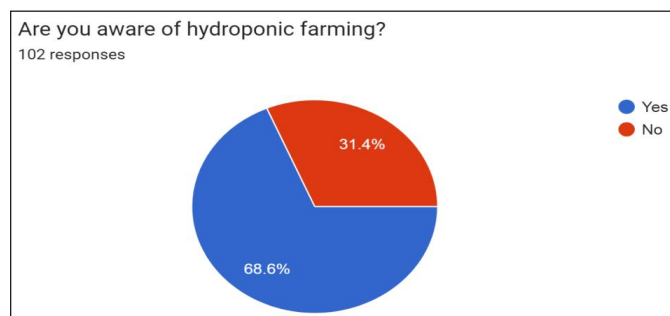


Chart 1: Awareness about Hydroponics

Interpretation: According to the above figure out of 102 respondents 68.6% are aware of hydroponic farming concept whereas 31.4% of respondents are not aware of it.

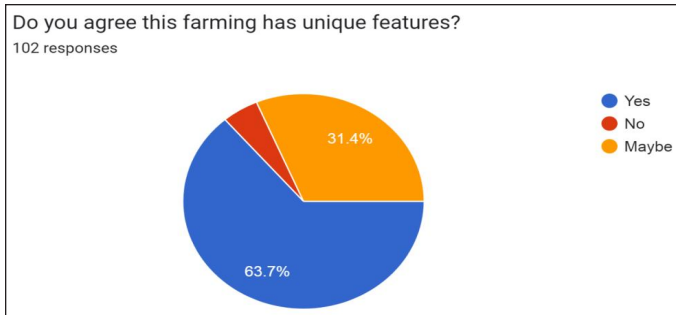


Chart 2: Agreement on Unique Farming

Interpretation: The above figure states that more than half of the respondents which are 63.7% agree and are aware that hydroponic farming has unique features and 31.4% are not aware of the features.

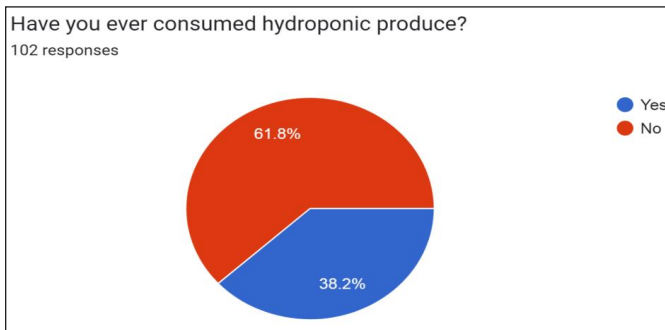


Chart 3: Consumption of Hydroponic Produce

Interpretation: According to the above pie chart 61.8% have not consumed hydroponic products and 38.2% have consumed hydroponic produce.

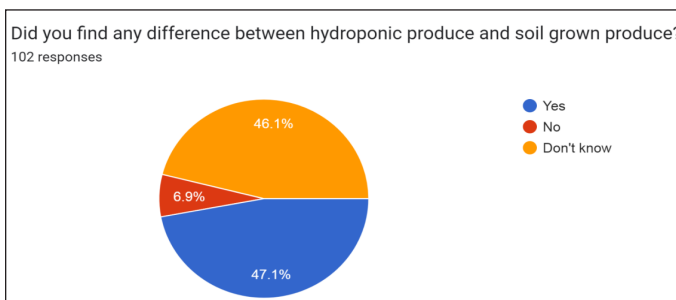


Chart 4: Difference between Hydroponic and Soil Produce

Interpretation: The above pie chart states that 6.9% of respondents believe there is no difference between soil-grown and hydroponic produce. Whereas from the

balance of respondents 47.1% of them found a difference between soil-grown produce and hydroponic produce and 46.1% are not aware.

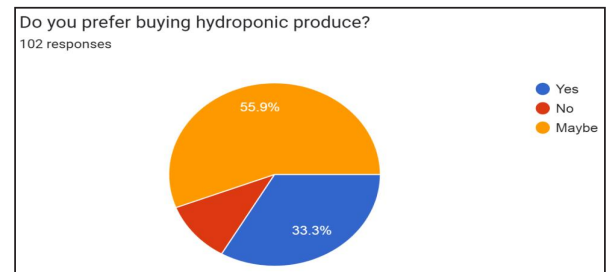


Chart 5: Consumer Buying Preference

Interpretation: The above figure states the buying preference of respondents. Where 33.3% will prefer buying hydroponic produce whereas 55.9% of respondents are not sure.

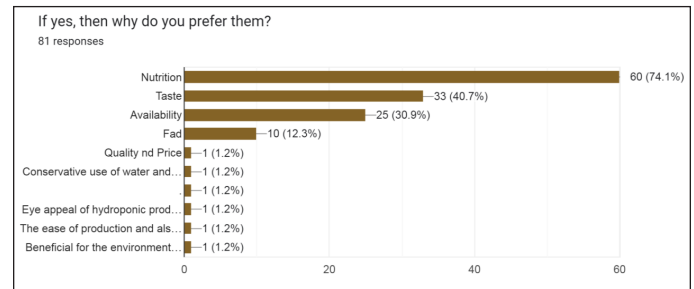


Chart 6: Factors Influencing Preference

Interpretation: The figure above states the reasons behind preferring hydroponic produce where 74.1% of respondents would buy it for its nutrition, 40.7% for taste, 30.9% for availability and 12.3% for fad. This states that most respondents are aware that hydroponic produce contains more nutrition compared to soil grown.

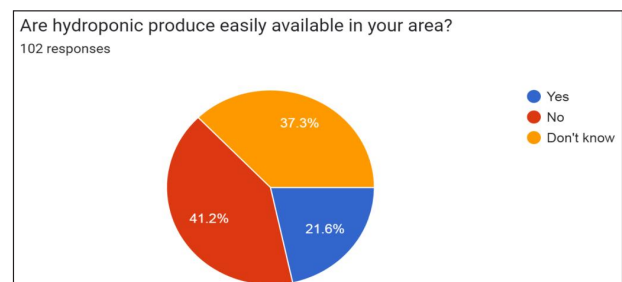


Chart 7: Availability in Local Areas

Interpretation: The above figure states availability of hydroponic in Pune area. From above respondent's

hydroponic produce is available in area of 21.6% of respondents. Whereas the produce is not available in 41.2% of respondent's area. 37.3% of respondents are not aware of the availability.

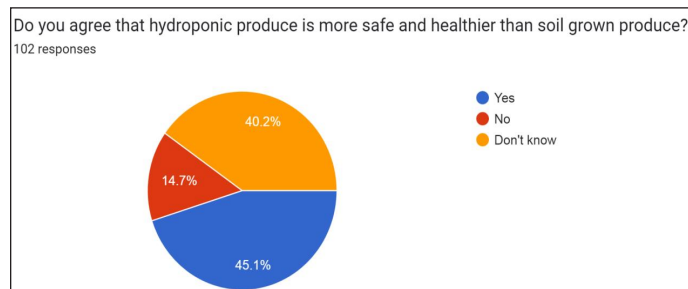


Chart 8: Health Benefits of Hydroponic Produce

Interpretation: From above figures 45.1% of respondents agree that hydroponic produce is safe and healthy to consume whereas 14.7% do not agree and rest 40.2% are not aware of it.

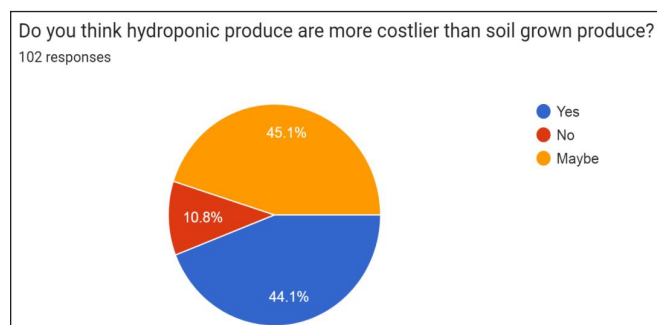


Chart 9: Cost Comparison with Soil Produce

Interpretation: As per the above chart 44.1% agree that hydroponic is costlier than soil grown. While 10.8% disagree with it on the other hand 45.1% are not aware of the cost of the products.

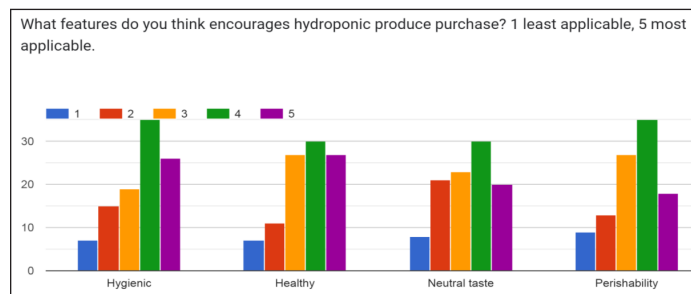


Chart 10: Buying Features

Interpretation: The above figure mentions few positive features of hydroponic produce where most respondents will prefer it for the hygiene and perishability of the hydroponically grown produce and health and natural taste is also a considerable determinant at the secondary level.

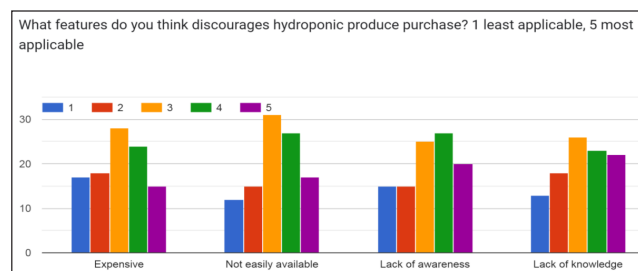


Chart 11: Features That Discourages Buying

Interpretation: The above chart states 4 negative features where most respondents would not buy it as it is not easily available, followed by, that it is a very expensive as compared to soil grown produce.

Hypothesis Testing

For testing the hypothesis, we are using the one-way ANOVA and f-test to find out the result.

Table 1

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	21.43001	101	0.457551	10.405386342	0.0412	1.01462
Within Groups	10.43202	510	0.045688			
Total	31.86203	611				

In the ANOVA table, we can see that the critical value of F is less than the calculated value. So, we reject the null hypothesis and accept the alternative hypothesis. Hence, we can conclude that there is a significant influence on consumer's buying preference of hydroponic products.

FINDINGS AND CONCLUSION

Findings

- Most of the people are aware of the hydroponic method while few of them are not aware about the technology.
- There is awareness amongst youngsters about the technology and this makes it sustainable for the environment.
- There is lack of availability of the hydroponic products and they are also expensive to purchase. The availability is limited to certain parts of the city.
- There is a lack of usage of the hydroponic produce. This is due to the difference of taste between the traditional and hydroponic products.
- The consumers lack knowledge about the product. And so would like to stick to traditionally grown produce as they find it safe and nutritious.
- Consumers who prefer hydroponic produce, prefer it for the nutritional benefits, better taste compared to traditionally farmed produce and also its easy availability in their areas.
- Hydroponic produce is not easily available in all areas.
- Consumers are not aware about its nutritional benefits.
- The cost of hydroponic produce is a factor for less preference as compared to the traditional produce.
- The cost and availability of the hydroponic produce is discouraging the purchases.
- The hygiene and less perishable nature of the hydroponic produce is encouraging the preference of consumer towards this produce.
- As per the hypothesis testing, variables such as price, quality, availability, nutritional value of hydroponic products, taste of these products, the trend or the fad amongst the people, conservational use of water, eye appeal and environment sustainability factors has a certain influence on the customer preference

towards buying of hydroponic products.

CONCLUSION

“Hydroponic farming and its impact on consumer buying preference” states that there is a need of awareness among consumers in the field of hydroponic products and its nutrition. Based on the responses from the consumer who are aware about the produce find that they are difficult to find in market which shows that there is lack of availability.

From the production point of view government needs to take initiative to provide education regarding soilless technology of farming, its sustainability, develop new schemes to support farmers and provide easy financial aid. This may result in spreading awareness as well as may encourage farmers in getting involved into the technology. As this technology is sustainable it will help reduce soil degradation by eliminating the use of harmful fertilizer also this technology uses almost 90% less water to grow crops. These setups are arranged vertically which allows farmers to utilize less space thus suitable for production of crops in urban area.

Thus, concluding that this technology has potential to overtake traditional farming which can result in better nutrition in food, hygienic produce, reduced pollution due to transportation and soil degradation.

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