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Utilizing Limited Land for OrganicHydroponic Farming

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ABSTRACT
This journal article explores the role of the younger generation in shaping the future of Indonesian agriculture. The objective is toassess the level of interest among youth in the agricultural sector and to scrutinize the initiatives undertaken for its advancement. The article refers to prevailing literature in agricultural science, particularly focusing on journals published within the last five years. It accentuates the burgeoning interest of the younger generation in advancing agricultural techniques, including but not limited to hydroponics, aquaponics, aeroponics, and vertiminaponics. Additionally, it emphasizes their proactive engagement in disseminating positive insights about modern agricultural practices within the community.

Keywords: agriculture, hydroponics, organic, youth,

INTRODUCTION

Youth are people who are developing physically and emotionally and are the human resources for development that will replace previous and current generations (Ilahude & Miolo, 2019). The ability of young people to commit to change in various fields, including the agricultural sector, iscrucial to the future of a nation. Currently, there are few initiatives by young people who are directly involved in theagricultural sector.

Many people perceive farming as a simple process of planting crops on large tracts of land and engaging in labor-intensive activities. However, the modern agriculturalsector has undergone significant advancements and innovations, such as the use of hydroponic, aquaponic, and aeroponic techniques. These techniques have been developed with the aim of allowing anyone to become a farmer without having to worry about the work and toproduce products that are more beneficial to farmers compared to traditional methods that have been practiced for a long time. As an important sector in a country's economy, agriculture is also a lucrative occupation. The use of hydroponic farming, for example, can increase crop yields, overcome limited land area, reduce water consumption, and produce higher yields.

LITERATURE REVIEW

The author has reviewed several previous studies. Previous research is used to get a comparison by finding ideas that can be used to conduct further research, besides that it can be used to show the originality of a research conducted. The author lists the results of research that has been done previously using existing journal publications and makes conclusions from the outline of all journals used. The author cites research conducted by (Ilahude & Miolo, 2019) entitled Increasing Student and Youth Creativity in Developing Organic Hydroponic Vegetable Plants. Thepurpose of this study was to see how much youth interest inthe agricultural sector has increased with the use of hydroponic techniques.Data is taken based on what has been in previous research journals so that the data that has been collected is compared between each other so that it can be included in the data collection analysis. The search results provide information about data collection methods and tools for research. Data collection is a crucial stage in research that enables researchers to find answers to research questions. There are different types of data and different data collection methods accordingly. Researchers may face challenges in selecting the most appropriate type of data collection based on their research questions. The possible methodologies for gathering data are then explained based on these categories.

METHOD

The type of writing used in this journal is referencing existing journals and using several agricultural science references that have been obtained previously. The methodology used in the research is qualitative because it considers several cases that are deliberately chosen by researchers. Data collection techniques based on one of the journals are field identification in the form of documentation, direct observation and resource person interviews using questionnaires related to the supply chain that involves observing and recording behaviors or events as they occur. The advantages of using direct observation include the ability to collect data in real-time, the potential for high validity and reliability, and the ability to capture behaviors that may not be reported by participants.

The method for drawing conclusions based on one of the journals used is that the data is analysed descriptively qualitative and quantitative. Qualitative data testing is used to describe and find out information on the condition of the vegetable supply chain flow. While measurements with quantitative data are used to analysis the level of supply performance using Delivery Performance analysis with the Scheduled Order to Costumer Request (SOCR) calculation method. With the following calculation formula:

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$$\textbf{SOCR} = \frac{\boldsymbol{OSCRD}}{\boldsymbol{TOS}} \; x \; \mathbf{100\%}$$

SOCR =Scheduled Order to Customer Request/ Schedule delivery of vegetable supplies periodically according to the number of customer orders.

OSCRD =Order Scheduled to the Customer's Request Delivery Date / Number of vegetable orders that can be delivered in one delivery at one time delivery schedule.

TOS = TotalOrder Scheduled / Total number of orders that have been scheduled

Delivery performance analysis is used in supply chain management to assess how successful the supply chain is atproviding products and services to the customer. Itintegrates the measurement of performance from the supplier end to the customer end, providing an indication of the overall efficiency of the supply chain. This analysis involves measuring various factors such as on-time delivery, product quality, and reliability to evaluate the performance of the supply chain. It helps in benchmarking expected performance levels, understanding the efficiency of suppliers, and identifying areas for improvement in the supply chain process.

RESULT AND DISCUSSION

Ilahude & Miolo (2019) define youth as individuals who undergo physical and emotional development and are valuable resources for national development, replacing previous and current generations. It is crucial to maintain objectivity and avoid biased language when discussing the role of youth in national development. With the advancement of science and technology, young people require skills in utilizing, processing, managing, and classifying natural and human resources. The agricultural sector has seen development in recent times, particularly through the use of organic hydroponic techniques. These techniques are known for their efficiency and environmentally friendly nature.

Figure 1. Applicatiom of Hydroponic Techniques inAgriculture, (Universitas Airlangga, 2021).

Hydroponics can be defined as farming using soil-less water growing media (Ilahude & Miolo, 2019). The medium is flexible, cheap, simple and easy to use. The development of hydroponic techniques is not just one, but there are several techniques developed based on it, namely aquaponic techniques and vertiminaponic techniques (Setyorini et al., 2023).

Figure 2. Planting System in Narrow Land with Vertiminaponic Technique, (Ervinasp.com September 18, 2016)

Description: This is a combination of a vertical vegetable cultivation system based on plastic gutter pots with aquaponics with planting media used in the form of zeolite stones and compost.

Aquaponics is a form of agriculture that combines raising fish in tanks with hydroponics, which is the practice of growing plants without soil. The aquaponic technique is a combination of hydroponic techniques and fisheries in one system to optimize the performance of a small area of land as a maintenance medium (Cahyanto & Murwanti, 2022). Aquaponic techniques offer a promising solution for sustainable food production in urban environments, as they optimize land use, promote integrated farming, and promote community engagement. This innovative farming method demonstrates the potential to address various agricultural and food security challenges, particularly in urban settings.

The use of aquaponic techniques on small land can still produce fish and vegetables at the same time, making it an ideal method for urban farming. Urban land that is not too large can use this technique as a means of farming, providing fresh, locally-grown produce to the community. Limited land presents a challenge for urban residents to engage in planting(Nurjasmi & Fitri, 2020).

The nutrient-rich water from raising fish provides a natural fertilizer for the plants, and the plants help to purify the water, making the fish and plants healthful and safe to eat. Aquaponics can be used to sustainably raise fresh fish and vegetables for a family, to feed a village, or to generate profit in a commercial farming venture, year-round, in any climate. It is a great example of year-round, indoor farming, and it can be done anywhere, providing fresh local food that is free of pesticides, herbicides, and chemical fertilizers.

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One of the most compelling economic advantages of aquaponics is the significantly increased crop yield and faster growth of fish and plants. It uses 1/6th of the water to grow 8 times more food per acre compared to traditional agriculture, and it provides an all-natural fertilizer source from fish waste, eliminating the reliance on mined and manufactured fertilizers. Aquaponics is efficient, sustainable, and highly productive, and the produce is free of pesticides and herbicides. Aquaponics also offers health benefits, such as the production of organic, chemical-free produce.

The growing demand for food, driven by population growth and environmental concerns, has led to the development of innovative farming techniques and technologies. Precision agriculture, smart irrigation, biotechnology, and automation are some of the key areas where technology has been integrated into farming practices to increase productivity and sustainability in food production Hydroponic and aquaponic techniques can increase productivity and efficiency for farmers, making them a great alternative for those with limited land or yards. Aquaponics is a mutually beneficial combination of aquaculture and hydroponic systems that can achieve food security and provide an alternative solution for those constrained by limited land. These techniques can also be used as a source of income.

Seeing that most of the residences of city residents are minimalist housing or apartments that are not so large that they have limited land (Cahyanto & Murwanti, 2022). Residents can increase land efficiency by using hydroponic and aquaponic techniques so that it can be a means of adequate additional income so that it becomes an alternative for owners of limited land or yards. Hydroponic and aquaponic farming can be combined with integrated farming, organic farming, and sustainable agriculture to increase agricultural yields. Organic farming can benefit local plant diversity and improve soil properties and productivity in vegetable production.

On the other hand, aquaponics is a production system that addresses all the above-mentioned issues by combining the cultivation of plants in a soilless setup with the rearing of aquatic organisms in recirculating aquaculture systems. Organic farming benefits plant diversity at both local and landscape scales, indicating that organic farming can influence diversity also at larger spatial scales and outside the organically managed land. Different types of soil amendments and mulch ground covers can also benefit soil chemical and biological properties, crop development and yield, and disease and pest issues in organic vegetable production.

Hydroponic and aquaponic systems can be used in farming integrated systems for zero waste, which can empower communities to utilize organic and plastic waste to produce probiotics, hydroponic devices, maggot cultivation, and liquid organic fertilizers. Aquaponics is a mutually beneficial combination of aquaculture and hydroponic systems that can achieve food security and provide an alternative solution for people who are constrained by limited land. Decoupled aquaponics is a new approach introduced in aquaponics research for the optimization of crops and fish production conditions. Organic hydroponic vegetable gardens are also more fertile than ordinary gardens.

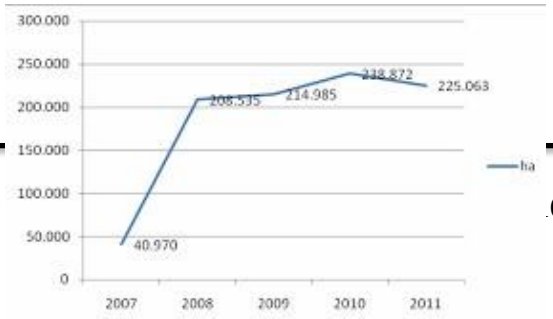
Figure 3. Development of the Number of Organic Farmers in Indonesia 2007-2011 (SPOI 2011)

Description: The diagram explains the increase in farmers' interest in hydroponic agriculture. There was a significant increase in hydroponic land area in 2007-2008.

Organic farming emerges as a highly commendable and judicious choice, as indicated in their insightful journal. The products cultivated through organic farming practices are not only known for their inherent health benefits but also for their safety and ecological advantages. (Adelawati, n.d.) research underscores the profitability of organic farming, particularly when implemented on smaller fields, where both the quantity and quality of the produce prove to be notably advantageous. Moreover, the attributes of organic farming extend beyond mere agricultural considerations. This method provides consumers with an assurance of the safety of the goods they consume, emphasizing attributes related to food safety. Additionally, the nutritional attributes of organic produce are highlighted, emphasizing the high nutritional value inherent in these products. Furthermore, the ecological conscientiousness of organic farming is emphasized, with products earning an environmental label that attests to their environmentally friendly cultivation practices. In essence, (Adelawati, n.d.) research underlines how organic farming not only delivers healthful and safe products but also aligns with consumer preferences for high nutritional content and environmentally responsible agricultural practices.

Some examples of crops that can be grown in aquaponics systems include:

1. Leafy greens: Lettuce, spinach, and kale are popular choices for aquaponics systems due to their rapid growth rate and ability to thrive in nutrient-rich water
2. Fruiting vegetables: Tomatoes, cucumbers, and peppers can be grown in aquaponics systems, providing a variety of fresh produce
3. Root crops: Carrots, radishes, and beets are well- suited for aquaponics systems, as they can grow well in nutrient-rich water.
4. Herbs: Basil, mint, and parseley are common



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herbs can be grown in aquaponics system, adding flavor and freshness to dishes.
5. Fishes: Fish such as catfish can be raised in aquaponics system, providing a source of lean protein.

The nutrient cycle in aquaponics systems is a closed-loop process that involves the continuous circulation of water, nutrients, and organic matter between fish, plants, and beneficial bacteria.

1. Fish production: Fish are raised in tanks within the aquaponics system, where they produce ammonia as a byproduct of their respiration.
2. Nitrogen cycling: Ammonia is converted into nitrite (NO2) by beneficial bacteria, which then reacts with oxygen to form nitrate (NO3), a form of nitrogen that plants can use as a fertilizer.
3. Plant uptake: As plants absorb nutrients from the water, they take up nitrate and other essential nutrients, such as phosphorus and potassium, to support their growth.
4. Beneficial bacteria: The same beneficial bacteria that converted ammonia to nitrite and nitrate also helps to remove excess nutrients, such as nitrate, from the water, ensuring that the water remains balanced and suitable for fish and plant growth.
5. Fish feeding: Fish are fed periodically, and their waste, in the form of uneaten food and excrement, provides additional organic matter and nutrients for the beneficial bacteria to process.
6. Water circulation: Pumps are used to circulate water between the fish tanks, the plant beds, and any additional components, such as biofilters or media beds, ensuring that all elements of the system remain balanced and efficient.

When defining the structural components of an aquaponics system, it is useful to group them into three essential parts, as explained in academic literature. The base trio consists of the fish tank, the plant bed, and the water. circulation system. Each of these components plays a crucial part in coordinating the delicate balance and ideal performance of the aquaponics system as a whole.

One of the system's main elements, the fish tank, provides a home for the aquatic life. Along with housing the fish, this vital reservoir serves as the center of gravity for the aquaponic cycle's start. At the same time, a second essential element—the plant bed—allows plants to be grown without soil by drawing on the nutrient-rich water from the fish tank. In aquaponics, fish waste supplies vital nutrients for plant growth, while the plants assist purify the water for the fish. This symbiotic relationship is embodied in the synergy between these two components.

The third essential element is the water circulation system, which facilitates this complex interaction. The dynamic balance necessary for the health of both cultivated plants and aquatic life is preserved by this system, which guarantees the constant and effective flow of water between the plant bed and the fish tank. As scientific research on aquaponic techniques has established, the aquaponics system thrives because of this complex network of components, highlighting the subtle relevance of each part in maintaining the overall balance and effectiveness of the system.

The main components of an aquaponics system can be categorized into three primary elements: the fish tank, the plant bed, and the water circulation system. Each of these components plays a crucial role in maintaining the balance and efficiency of the aquaponics system

1. Fish tank: The fish tank is the heart of the aquaponics system, where fish are raised and produce ammonia as a byproduct of their respiration. The ammonia is then converted into nitrite and later into nitrate, which serves as a fertilizer for the plants
2. Plant bed: The plant bed is where plants are grown, typically in a soilless medium such as rockwool or gravel. The plants absorb nutrients, such as nitrate, phosphorus, and potassium, from the water, which helps them grow and thrive
3. Water circulation system: The water circulation system is responsible for moving water between the fish tank, the plant bed, and any additional components, such as biofilters or media beds. This ensures that all elements of the system remain balanced and efficient

In addition to these primary components, aquaponics systems may also include

1. Beneficial bacteria: These bacteria perform essential functions in the nutrient cycle, such as converting ammonia to nitrite and nitrate, and removing excess nutrients from the water
2. Biofilters: Biofilters are used to further process and purify the water, ensuring that it remains suitable for both fish and plant growth
3. Pumps and aerators: Pumps are used to circulate water between the different components of the system, while aerators provide adequate aeration to achieve optimal oxygen levels for both fish and plants

The interconnected collaboration of these fundamental components functions seamlessly within a closed-loop process, resulting in the development of an environmentally sustainable and remarkably efficient aquaponics system. This groundbreaking system not only showcases its prowess in consistently producing fresh fish and vibrant plants but also does so seamlessly year-

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round, transcending the challenges posed by fluctuating climatic conditions and diverse geographical locations.

The integrative nature of the system, where aquatic life and plant cultivation symbiotically interact, exemplifies its resilience in creating a self-sustaining ecosystem. This innovative approach underscores its adaptability to a multitude of climates and geographical settings, ensuring a reliable and continuous output of fresh produce regardless of external variables. In essence, the harmonious synergy of these essential elements within the closed-loop framework not only reinforces the sustainability of the aquaponics system but also positions it as an exemplar of agricultural ingenuity capable of meeting year-round demands for both aquatic and plant-based products.

Moreover, the adoption of aquaponic and hydroponic techniques has proven to be particularly effective in addressing food security concerns and offering viable alternatives for regions facing land constraints. The versatility of both methods becomes evident in their integration into a comprehensive farming system, designed to minimize waste generation. This integrated approach empowers communities to harness the potential of organic and plastic waste materials, utilizing them for the production of valuable.

resources such as probiotics, hydroponic devices, maggot cultivation, and liquid organic fertilizers. In essence, it not only presents an environmentally conscious solution but also fosters community empowerment through sustainable agricultural practices.

Organic veggies and nutritional food products are becoming more popular, particularly among young people. Several studies have identified the elements affecting customer decisions to purchase organic products, such as family consumption behaviors, shopping habits, better health, and a desire for a healthy lifestyle. Consumer awareness and market dynamics also impact demand for organic products, with some research suggesting a considerable rise in organic vegetable sales, particularly during the pandemic.

Furthermore, research on the characteristics of consumers of organic products, such as age, employment, and marital status, has been conducted in various countries to understand their influence on the demand for organic vegetables. Through this analysis, researchers seek to comprehend how these factors can shape consumer behavior patterns in choosing organic vegetables, thereby providing a more comprehensive insight into consumer preferences and trends regarding organic food products.

Table 1. Result of Konjoin Analysis on Organic avaegetables.

No	Atribut	Level	Nilai Kegunaan (Utility Value)	Nilai Kepentingan Relatif (%)
1.	Harga	Harga lebih mahal Harga Bervariasi	-0,036 0,036	15,546
2.	Sertifikat Organik	Berlabel Tidak berlabel	0,344 -0,344	24,760
3.	Tampilan Fisik sayuran	Daun tidak berlubang	0,444	31,492
4.	Kesegara	Segar	0,395	28,202

Consumer desire to pay and trust organic products is a factor that affects their tendency to buy back organic goods. The nutrient solution can be formulated from organic fertilizer for use in hydroponic systems, and the resulting edible product can be better nutraceutical quality.

Aquaponics is not just a method of growing food, it is a holistic approach to addressing some of the most pressing global issues. By embracing aquaponics, we take a vital step toward a more sustainable and environmentally responsible future where local ecosystems flourish, and our plates are graced with fresh, organic, and nutrient-dense produce. The advantages of aquaponics are not only evident in its ecological and economic advantages but also in education and social fabric. As we continue to face challenges in food production and security, aquaponics presents a new wasy to grow sustainable fish and veggies, addressing many problems of traditional agriculture and fish farming while using 90% less water

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N Tidak segar	-0,396

(Results of research, journalmahasiswa.umsu.ac.id 2020)

CONCLUSION AND RECOMMENDATION

Description: Derived from the findings of research focused on organic vegetables, it is discerned that consumers prioritize certain factors, with a notable emphasis on the overall physical condition of vegetables, specifically those devoid of any perforations. Furthermore, freshness emerges as another pivotal criterion, with a substantial majority, exceeding a significant 25% margin, attributing considerable importance to the preservation of vegetable freshness in their preferences.

The preference for buying organic vegetables is influenced by factors such as safety, freshness, and nutritional value. Hydroponic systems, which allow for the growth of vegetables without soil, using water and nutrients, can produce healthy and pesticide-free vegetables. Additionally, liquid organic steels, such as coffee soil waste, can be used in hydroponic systems to reduce the use of inorganic fertilizers. Research has shown that consumers are willing to pay a premium for organic vegetables due to factors such as lifestyle, quality, and habit. Factors affecting willingness to pay for organic vegetables include concerns over environmental pollution, experience, income, and productprice.

Hydroponic systems, distinguished by their heightened sensitivity to environmental temperatures, have demonstrated the capacity to achieve superior yields and enhanced water productivity when juxtaposed with traditionalsoil-based systems. This heightened productivity, while advantageous, introduces a potential challenge in the form of nitrate accumulation within the cultivated vegetables, necessitating meticulous management strategies.

It is imperative to acknowledge that, despite the apparent benefits, hydroponic systems incur a relatively higher initial investment and total operating cost when compared to their soil-based counterparts. This financial consideration is a crucial factor for individuals or organizations contemplating the adoption of hydroponics, underscoring the need for a comprehensive evaluation of bothshort-term and long-term costs and benefits associated with this innovative cultivation methodology.

Hydroponic systems can also be used to produce a variety of foods such as cakes and fresh and healthy beverages. The use of digested biogas as a source of nutrientsin hydroponic vegetable production is a promising method of integrating food production and organic waste management 3

The author reviews several previous studies, focusing on the development of organic hydroponic vegetables and their impact on increasing student and youth creativity in the agricultural sector. The research cites (Ilahude & Miolo, 2019)'sstudy on Increasing Student and Youth Creativity in Developing Organic Hydroponic Vegetable Plants, which aims to determine the increase in youth interest in the agricultural sector with the use of hydroponic techniques.

Data collection methods used in this study include field identification, direct observation, and resource person interviews using questionnaires related to the supply chain. Direct observation offers real-time data collection, high validity and reliability, and the ability to capture behaviors thatmay not be reported by participants. Descriptive qualitative and quantitative analysis is used to analyze the data, focusing on the condition of the vegetable supply chain flow and the level of supply performance using the Scheduled Order to Customer Request (SOCR) calculation method.

The aquaponic technique is a combination of hydroponic techniques and fisheries in one system to optimize the performance of a small area of land as a maintenance medium. Aquaponic techniques offer a promising solution forsustainable food production in urban environments, optimizing land use, promoting integrated farming, and promoting community engagement. This innovative farming method demonstrates the potential to address various agricultural and food security challenges, particularly in urban settings.

Aquaponics can be used to sustainably raise fresh fishand vegetables for a family, feed a village, or generate profit in a commercial farming venture year-round, in any climate. It is a great example of year-round, indoor farming, and it can be done anywhere, providing fresh local food that is free of pesticides, herbicides, and chemical fertilizers.

In conclusion, the use of hydroponic techniques and aquaponic techniques has the potential to significantly increase student and youth creativity in the agricultural sector. By utilizing these techniques, researchers can improve the efficiency and sustainability of the agricultural sector, ultimately contributing to the overall development of the agricultural sector.

Aquaponics is a growing trend in agriculture due to its economic advantages, including increased crop yield and faster growth of fish and plants. It uses 1/6th of the water to grow 8 times more food per acre compared to traditionalagriculture and provides an all-natural fertilizer source from fish waste, eliminating the reliance on mined and manufactured fertilizers. Aquaponics is efficient, sustainable,

and highly productive, with produce free of pesticides and herbicides.

The growing demand for food has led to the development of innovative farming techniques and technologies, such as precision agriculture, smart irrigation, biotechnology, and automation. Hydroponic and aquaponic techniques can increase productivity and efficiency for farmers, making them a great alternative for those

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constrained by limited land or yards. These techniques can also be used as a source of income for city residents with limited land or yards.

Hydroponic and aquaponic farming can be combined with integrated farming, organic farming, and sustainable agriculture to increase agricultural yields. Organic farming benefits plant diversity at both local and landscape scales, while hydroponic systems address resource-demanding issues by combining cultivation of plants in a soilless setup with the rearing of aquatic organisms in recirculating aquaculture systems.

Some examples of crops that can be grown in aquaponics systems include leafy greens, fruiting vegetables, root crops, herbs, and fish. The nutrient cycle in aquaponics systems is a closed-loop process that involves the continuous circulation of water, nutrients, and organic matter between fish, plants, and beneficial bacteria.

The main components of an aquaponics system can be categorized into three primary elements: the fish tank, the plant bed, and the water circulation system. These components play a crucial role in maintaining the balance andefficiency of the aquaponics system.

These components work together in a closed-loop process to create a sustainable and efficient aquaponics system that can produce fresh fish and plants year-round, regardless of the climate or location

The application of aquaponic and hydroponic techniques has also proved effective in improving food security and providing alternative solutions for those constrained by limited land. Both techniques can be used in an integrated system of farming for zero waste, which can empower communities to use organic and plastic waste to produce probiotics, hydroponic devices, maggot cultivation, and liquid organic fertilizers.

Organic veggies and nutritional food products are becoming more popular, particularly among young people. Several studies have identified the elements affecting customer decisions to purchase organic products, such as family consumption behaviors, shopping habits, better health, and a desire for a healthy lifestyle. Consumer awareness and market dynamics also impact demand for organic products, with some research suggesting a considerable rise in organic vegetable sales, particularly during the pandemic.

Furthermore, the characteristics of organic food consumers, such as age, employment, and marital status, havebeen investigated in several nations to understand their influence on the demand for organic veggies.

The preference for buying organic vegetables is influenced by factors such as safety, freshness, and nutritional value. Hydroponic systems, which allow for the growth of vegetables without soil, using water and nutrients, can produce healthy and pesticide-free vegetables. Additionally, liquid organic steels, such as coffee soil waste, can be used in hydroponic systems to reduce the use of inorganic fertilizers. Research has shown that consumers are willing to pay a premium for organic vegetables due to factors such as lifestyle, quality, and habit. Factors affecting willingness to pay for organic vegetables include concerns over environmental pollution, experience, income, and productprice. Hydroponic systems have been found to be more sensitive to environmental temperature and can lead to higher yields and water productivity compared to soil-based systems.However, they may also lead to the accumulation of nitrates in vegetables, which needs to be managed. The initial investment and total operating cost in hydroponic systems are higher than those in soil-based systems.

Hydroponic systems can also be used to produce a variety of foods such as cakes and fresh and healthy beverages. The use of digested biogas as a source of nutrients in hydroponic vegetable production is a promising method of integrating food production and organic waste management 3 Consumer desire to pay and trust organic products is a factor that affects their tendency to buy back organic goods. The nutrient solution can be formulated from organic fertilizer for use in hydroponic systems, and the resulting edible product canbe better nutraceutical quality.

Aquaponics is not just a method of growing food, it is a holistic approach to addressing some of the most pressing global issues. By embracing aquaponics, we take a vital step toward a more sustainable and environmentally responsible future where local ecosystems flourish, and our plates are graced with fresh, organic, and nutrient-dense produce. The advantages of aquaponics are not only evident in its ecological and economic advantages but also in education and social fabric. As we continue to face challenges in food production and security, aquaponics presents a new way to grow sustainable fish and veggies, addressing many problems of traditional agriculture and fish farming while using 90% less water

Following are recommendations based on research on the development of organic hydroponics and the application of acoustic technology, as well as its impact on young student creativity in the petroleum sector:

1. Improved Education and Training: Accommodate the positive potential of hydroponics and aquaponics techniques to enhance the creativity of students and youth in the agricultural sector, as well as education and training in this area. Curriculum integration that facilitates understanding and practical use of these techniques can be undertaken by schools, higher instructors, and polytechnics.

2. Agricultural Entrepreneurship Program:

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Suggested are agricultural enterprise development programs that utilize hydroponics and aquaponics techniques. Financial resources and specialized training can help communities create innovative and long-lasting agricultural businesses.

3. Promotion of Hydroponics and Aquaponics Technology in the Commercial Sector: The application of hydroponics and aquaponics in thecommercial agriculture sector is carried out. The government and relevant organizations can optimize the use of these technologies to increase productivity and environmental sustainability.

4. The application of linguistic analysis to the development of hybrid and aquaponics technologies is recommended. Innovations in technology have the potential to create new opportunities, improve efficiency, and mitigate risks that may arise overtime.

5. Organic Product Market Development: Promote the sale of organic products, especially handmade goodsand abiotic products. Effective marketing and increased consumer awareness can increase customer demand and hinder the progress of the pet industry. Community Empowerment and Waste Management: Encourage community empowerment in managing organic and plastic waste through hydroponics and aquaponics techniques. Training programs and financial support can help communities produce valuable products from waste and create a cleaner environment.

6. Sustainable Research and Innovation Development: Facilitate sustainable research and innovation in agriculture, especially with regards to combining hydroponic and aquaponic techniques with organic farming and other sustainable farming methods.

7. Collaboration between Government, Education, and Private Sector: Encourage close collaboration between the government, educational institutions, and the private sector to create an enabling environment for the development of hydroponic and aquaponic methods. Joint training programs supportive regulations, and incentives are examples of this.

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