Developing Pion Hydro Farm: A Hydroponic Garden and Minimarket Start-up

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Abstract

As a form of efficiency from traditional farming systems, hydroponics is an urban farming system that does not use soil media. The current conditions in Indonesia and the narrowing of the Malang City area necessitate using hydroponics as a solution. Pion Hydro Farm as a start-up assists urban farms in meeting food needs and becoming a destination for young farmers. The method employed in this paper is an experimental study carried out in the Malang district of East Java, Indonesia. There are four stages in making this start-up business, starting from using simple materials such as waste oil gallons and palm oil, purchasing four wick hydroponic systems growing media, purchasing hydroponic production equipment in a 36-hole hydroponic starter kit, and purchasing a hydroponic "A" style with 180 planting holes. The investigation was furthered by creating a minimarket design that aims to accommodate Pion Hydro Farm production. It seeks to create a good farming system integration and make reaching the intended market easier. It aims to improve farming system integration and make it easier for Pion Hydro farm to reach its target market. Pion Hydro farm promotes itself as a viable solution for addressing people's daily vegetable needs and a leader in catering to the younger generation.

Keywords
Agriculture, Hydroponics, Interior Design, Minimarket and Start-Up.

1. Introduction
A conventional farming system still dominates agriculture in Indonesia (Sibarani & Somboonsuke, 2020). Traditional agriculture uses traditional techniques that utilize high production sources to obtain high outputs quickly. Traditional methods also have a lot of negative impacts on human health and the living environment (AlShrouf, 2017). It is due to the dominance of pesticides and the pruning of large amounts of green land to produce superior or quality agricultural products (Riedo et al., 2021). Therefore, conventional farming systems require shifting from the "Green Revolution" design to building a more modern agricultural system to create sustainable agriculture (Aulia Hidayat et al., 2020; John & Babu, 2021).

This transition led the author to switch to the agricultural industry sector using an urban farming system. *Urban Farming* is an agricultural system that utilizes limited land in urban areas by implementing the planting techniques that apply sustainable agriculture to complete the future needs (Andini et al., 2021; Indah et al., 2020). The concept of urban farming is the transition from conventional agriculture to urban agriculture, with the only difference being the farmer and the planting medium (Zuraiyah et al., 2019). This transition is the author's initial step to being a young farmer and initiating modern planting media techniques to support food needs in Indonesia.

The author applies hydroponic as the urban farming system. Hydroponics is a type of gardening that uses plant media other than soil, such as pumice, gravel, sand, coconut fiber, wood, or foam (Khan et al., 2021; Sharma et al., 2018). Hydroponics means planting in water containing a mixture of nutrients (Saputro et al., 2020). The author also understands that hydroponics uses a cultivation technique with drip irrigation media. This system produces plants free of harmful pesticides and provides an adequate planting control efficiency (Shinde & Marathe, 2021). This cultivation technique has advantages such as growing healthier and more nutritious vegetables without pesticides and being environmentally friendly (Kumari et al., 2018).

The sub-sector that the author produced using the hydroponic technique is horticulture. The growth in the total distribution of the horticultural industry in 2021 increased by 1.77% compared to 2020. However, it dominated in Java areas and declined in Bali and Nusa Tenggara. In 2021, Java had 54.74 percent of other horticulture firms, with a percentage of vegetable plant businesses of 25.43 percent. The share of commodity vegetable firms in the vegetable sector, both other and commodity companies, is 17.39 percent to 25.43 percent, with commodity vegetable companies dominating the horticulture sector (Petani Digital, 2021).

The author observed that the industrial growth of the horticulture and vegetable sector is pretty good. The vegetable sector has a significant contribution. The author viewed this opportunity to increase the contribution of vegetable production and industry engaged in the horticulture sector. The pandemic also causes the growth of this business due to the increasing horticulture demand (Nurhayati & Kartika Rinda, 2021; Sofyandi et al., 2021). The consumption of horticulture can impact people's health because it contains vitamins and boosts the immunity system. It will increase industrial growth due to an inclined consumption level (Suryathi & Resiani, 2017).

Based on the positive industrial growth, the horticultural agricultural sector has undoubtedly become a positive contributor to Indonesia's economy during the pandemic. Moreover, helping several industrial sectors that experienced a drastic decline due to the pandemic. Agriculture GDP increased by 2.59 percent in the fourth quarter of 2020, according to the Central Statistics Agency (BPS) (Ministry of Agriculture PR, 2021). Due to the pandemic era, the number of horticulture commodities increased by 7.85 percent. Horticulture contributed 3.01 percent and 1.84 percent growth in the first and second quarters of 2021, respectively, to national GDP growth. The horticultural industry sector contributed positively to Indonesia's GDP growth (Melani, 2020).

1.1 Current Problem in Hydroponics Business

The background of the study led the author to analyze the practical problems deeply. The author conducted research in the East Java area, specifically Malang. The author found that the impact of the pandemic caused a high demand ranging from 70% to 200% for hydroponic vegetables (Kementerian Pertanian Republik Indonesia, 2021; Ministry of Agriculture PR, 2021). According to our findings, several farmers believe that vegetable crops are not adequately integrated with customers. 80% of farmers only focus on targeting the B2B segment so that there is an imbalance between the needs of hydroponic vegetables.

The second problem, based on data from the Central Statistics Agency (BPS) of Malang in 2020, the total population of Malang is approximately 874,890 million people. About 400 thousand persons, or nearly half of the people, are of working age, ranging from 25 to 50 years (Badan Pusat Statistik Kota Malang, 2021a, 2021b). This community has a per capita expenditure level for the vegetable commodity group of 6.35% per month, with the number of vegetables reaching more than 50 Quintal in 2020. However, the amount mentioned earlier is only for conventional vegetable commodities and several types of particular variations. Many of them needed extension services to switch on the hydroponic vegetables. Hydroponic vegetables are not only intended for specific target groups but can be expanded to reach a larger market.

The third issue is that Indonesia is primarily an agricultural country (Pradana et al., 2019) with an essential role in the national economy. The amount of citizens or workers who make a living as farmers (Aninsi, 2021) demonstrates this. However, it is regrettable that Indonesia faces a shortage of young farmers, particularly in the next 10-15 years. According to BPS data, 33.4 million farmers worked in the agricultural sector in 2020, down from 34.58 million in 2019 (Radar Tegal, 2020). In reality, this figure is down from 35.70 million farmers in 2018. The author confirmed this by looking into the interests of the young people in the area. Many of them are influenced by modernized livelihoods and a lack of the media or platform required to become farmers. Some of them believe that farming is nasty and physically demanding work that is unsuitable for the millennial and Z generations.

1.2 Research Objectives

This research aims to provide information on how a start-up business starts from zero to the product sales process. Moreover, based on the background mentioned earlier in the study and the problems, the author created Pion Hydro farm as the business idea for the future of Indonesia agriculture. The author adjusts the conditions in Indonesia and the current issues. The author runs a business idea in Malang, the author's town. The business idea has also begun to be realized in the small-scale development stage to implement the process to realize this idea. As the pioneers, the author hopes the young Indonesian farmers can complete the food needs in Indonesia and build a young farmers' community to be the best human resources farmer in our nation, Indonesia.

In developing the Pion HydroFarm business, the author wishes to contribute to the food security in one area and be an excellent example of hydroponic farmers to young Indonesians, who are known to have low interest in running a business in the agricultural industry sector. The benefits of running Pion Hydro Farm are endorsing the increase of the life expectancy of Indonesians by consuming a variety of highly nutritious and pesticide-free vegetables, reviving a modern agricultural ecosystem for novice farmers, and supplying healthy vegetables to the agrarian businessman.

2. Methods

In this research, the author used an experimental method. The author studied literature from various sources as secondary data to support the research. The author used several reliable sources such as several websites from the government, news, journals, and other supporting sources regarding the current condition of Indonesian agriculture. On the other hand, the author also conducted surveys and interviews with several hydroponic farmers in Malang City for secondary data. This step the author took to obtain detailed data on the problems experienced by farmers and the conditions of the hydroponic market.

The author used primary and secondary data to conduct several experiments over several months to obtain the best outcomes. The author began to plant a tiny garden in the house's backyard. It has been upgraded to a larger scale so that it is possible to trade in the market we are targeting. Through the initial steps and challenges, the author learned about the industry and the conditions of farmers. PkPk, Tukang Dodolan, Griya Hidroponik Suhat, Tanduria, and 1 Head of the Hydroponic Community who has a farmer's team in the Lawang city region were interviewed by the author. On average, the five entrepreneurs operate in the home industry. The five entrepreneurs have been in business for almost five years. The author also provides hydroponic vegetables from the backyard and is a pioneer for farmers and the community, particularly in urban areas, to improve Indonesian agriculture and create a healthier society.

In addition to generating agricultural items, the author designs a minimarket as a location to sell hydroponic agrarian products. This design is the first step in the author's plan to create a minimarket to showcase hydroponic items, particularly those from Pion Hydrop Farm. The design employs natural materials with a sustainable material approach.

3. Results

Currently, many new hydroponic farmers started the action with a similar goal. The author responded to the phenomena by creating farmer groups and young generations' communities. This community's objective is to make this farmer group part of us as partners and enable them to share experiences on hydroponic activity. The young people are our tool to educate the public by emphasizing the value benefits of hydroponic vegetables and the urban situation that requires a new food security system. This innovation will be a Pion farm community. The author wants to start to produce hydroponic products and create our market.

3.1 Starting a Hydroponics Garden

The author also innovates the quality of the product, sales methods, the use of technology, etc. However, the primary focus is to recognize our customers and partners as our family by implementing a relevant vision, mission, and objective of Pion HydroFarm. Innovation is also based on the decision to create a story from the brand, which can then make a market-based. The market based is the basis for our loyal customers who consume our products. This strategy is also a part of positive word-of-mouth marketing.

The Pion Hydro Farm’s economic development began with a modest initial experiment on April 13th, 2020, the first phase. The larger scale of cultivation has been the fourth phase up till now. On a broader scale, the fourth phase will continue to be developed. The next step is to establish a minimarket to simplify the distribution of Pion Hydro Farm products.

The first stage on April 13th, 2020, can be seen in Figure 1. The author started to study hydroponics from simple materials such as waste gallons of oil and palm oil which we turned into hydroponic planting media. It produced 16 planting holes. At this stage, the author tried to understand the basics of growing with hydroponics, such as how to do seedling, harvest, use nutrients, measuring ppm, water ph, sunlight, and oxygen which are very useful to take us to the next stage.

Figure 1. The first stage of Hydroponic production uses improvised materials

In the second stage, on 1st June 2020, the author upgraded by purchasing four wick system hydroponic growing media to validate the knowledge gained from the initial hydroponic learning stage. This system produced the harvest stages in the third picture as our first experimental vegetables, namely lettuce and mustard greens. Figures 2 and 3 show a visual representation of the process and yields.

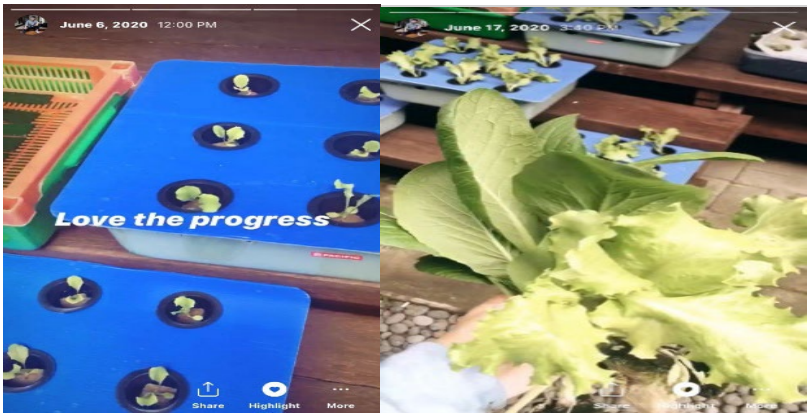

Figure 2. The second stage of production uses the Wick system (left), and the third stage of the yield of lettuce and mustard choy sum (right)

The third stage, upgraded on 13th August 2021, can be seen in Figures 4 and 5. The author invested the hydroponic production equipment in the form of a hydroponic starter kit having 36 holes. The author experimented with planting various vegetables such as; water spinach (Ipomoea reptans Poir), mustard choy sum (Brassica Chinensis var. parachinensi), mustard pak choi (Brassica rapa L), red spinach (Amaranthus gangeticus), green spinach (Amaranthus tricolor L) and lettuce (Lactuca sativa L.). However, there was a crop failure, so there was a change for the experiment for two months with a scheme of 6 planting holes for red spinach, 12 planting holes for mustard greens, and 24 planting holes for lettuce.

Figure 3. Stages of production upgrade with 36 hole hydroponics starter kit

Figure 4. Stages of harvesting mustard greens, green lettuce, and red spinach

The fourth stage, the next production upgraded on October 30th, 2021, is shown in Figure 5. After experimenting with trials and errors, the author invested in hydroponic production equipment by purchasing a hydroponic "A" style with 180 planting holes to run as a hydroponic vegetable producer and enter the market. The main focus of our vegetable variants was on lettuce and mustard greens which arrived in December and were currently in the production stage.

Figure 5. The fourth stage by purchasing a hydroponic "A" style with 180 planting holes

3.2 Designing a HydroFarm Minimarket

Within 1-2 years, the author aims to rent the property and establish a more extensive garden to meet the industrial demand for roughly 1800 planting holes on a plot of ground of 10 x 15 meters. The author will continue to upgrade by adding planting holes after completing the aim. For the next stage, as depicted in Figure 6, the author will open a special minimarket in Malang to sell hydroponic vegetables grown in our garden and by local hydroponic farmers.

Figure 6. Designing minimarket
(Source: pinterest.com)

The author used a farmhouse style to design the minimarket. The author implemented efficiency by using sustainable materials for material savings at the construction stage of our minimarket. Using exposed red wall stone with epoxy finishing and wooden pallets in vegetable boxes is an example of using sustainable materials. The author used a farmhouse concept with red and grey rustic brick on the wall display minimarket. It creates an accurate appearance and highlights the natural texture and color of the bricks. On the other hand, the author used a dark wood grain to create a herringbone-shaped wall. This design is meant to evoke elegance, with a yellow hidden lamp pattern at the top of the wall. This design is intended to give the impression of luxury plus a yellow hidden lamp design at the top of the wall. Then, vinyl wood flooring combines a luxury and industrial design for the floor. It was also applicable to the design of the side walls in the minimarket.

The author employs iron with a black paint finish to reinforce the farmhouse design on the display wardrobe frame at the minimarket. Pinewood, obtained from pallet wood, is used for the frame cover. The choice of this material not only intends to strengthen the farmhouse style in the design, but it also aspires to be sustainable because no natural materials are required. To display vegetables on shelves, it needs baskets to accommodate them. The author chose to use pine wood material that uses natural wood stain finishing so that the original color of the pinewood is still visible. The purpose of giving wood stain to wood is to maintain its original color and maintain the condition and quality of the wood. Figures 7 and 8 show a more detailed view of Pion Hydro Farm's minimarket.

Figure 7. Fruit basket made of pine wood

Figure 8. The Pion Hydro Farm's minimarket entire interior appearance

4. Conclusion

Long-term food supply completion is hampered by the crisis of a low number of Indonesian farmers. The current situation necessitates a transition away from conventional agriculture to meet the need for sustainable agricultural goods, particularly vegetables. People are still addicted to eating conventional vegetables and will require education to modify their habits. The critical challenge necessitates the younger generation's engagement to meet the farming interest. The author became a hydroponic farmer to solve a broad and narrow problem as an example of the first phase. As a transitional option from conventional farming, hydroponics provides an effective growing medium as an urban farming method. The hydroponics concept serves as the essential foundation for presenting Pion Hydro Farm. It begins with a modest implementation stage and progresses to the planning step of building a minimarket store. It seeks to create a good farming system integration and make it easier for us to reach the intended market. Pion Hydro farm advertises itself as a viable solution for meeting people's daily vegetable needs and a forerunner in catering to the younger generation.

This study still uses the manual irrigation system. As a result, it requires an operator responsible for this hydroponic irrigation system. The following research can utilize technology in hydroponic irrigation systems using IoT. Watering can be done automatically by using a sensor to read the power of hydrogen (pH) of the growing media. Moreover, there are still imperfections in the minimarket design. Therefore, the following research can improve a more sustainable design by prioritizing green materials.

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