

A SWOT Analysis of the Hydroponics Entrepreneurship as Sustainable Income in Covid-19 Pandemic Adaptation

Analisis SWOT Kewirausahaan Hidroponik sebagai Penghasilan Berkelanjutan dalam Adaptasi Pandemi Covid-19

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ABSTRACT

The COVID-19 pandemic made us adapt to changes. One kind of adaptation that provides opportunities is hydroponics entrepreneurship as sustainable income generation. The sustainability context in this research is about how impactful hydroponics is with regard to economic, social and environmental aspects. This study aims to give a comprehensive understanding of the potential of hydroponics entrepreneurship, located in urban areas of Indonesia, as sustainable income generation. The research is a qualitative study that was conducted in Jakarta, Bogor, Depok, Tangerang and Bekasi. The data collection was conducted through literature review and in-depth interviews with 25 respondents. The literature review aims to give an understanding of the sustainability context while the interview focused on the Strength-Weakness-Opportunity-Threat (SWOT) analysis of hydroponics entrepreneurship activity. The findings of the interview show that the quality of hydroponics products and customer responsiveness in the two study areas may become the strengths of hydroponics. Meanwhile, the efficiency of production and innovation turn out as the weaknesses of the activities. Furthermore, the hydroponics grower can find opportunities in political, social, technological, and legal aspects, but they should be aware of the economic and environmental threats. In conclusion, hydroponics is a promising sector for income generation in the two study areas but considering both helpful aspects such as quality, customer responsive, technology, political environment, social condition, and legalization and harmful factors such as efficiency, innovation, economic condition, and environment are essential for the hydroponics growers.

Keywords: hydroponics, sustainability, West Java, DKI Jakarta

ABSTRAK

Pandemi COVID-19 telah menyebabkan perubahan yang membutuhkan adaptasi. Salah satu adaptasi yang memberikan peluang adalah berwirausaha hidroponik sebagai sumber pendapatan tetap yang sustainable. Konteks sustainability yang digunakan dalam penelitian ini adalah sejauh mana produksi hidroponik dapat memberikan dampak dari segi ekonomi, sosial, dan lingkungan. Penelitian ini bertujuan untuk memberikan pemahaman yang komprehensif tentang potensi kewirausahaan hidroponik yang terletak di perkotaan Indonesia sebagai sumber pendapatan yang berkelanjutan. Mengenai metode penelitian, penelitian dilakukan di Jakarta, Bogor, Depok, Tangerang, dan Bekasi. Pengumpulan data dilakukan dengan melakukan studi pustaka dan wawancara mendalam dengan 25 responden. Tinjauan pustaka dilakukan untuk memahami konteks sustainability, sementara wawancara mendalam difokuskan pada Strength-Weakness-Opportunity-Threat (SWOT) analysis kegiatan kewirausahaan hidroponik. Hasil penelitian menunjukkan kualitas produk hidroponik dan respon pelanggan di dua wilayah studi dapat menjadi kekuatan hidroponik. Sedangkan efisiensi produksi dan inovasi merupakan kelemahan kegiatan. Selain itu, petani hidroponik dapat menemukan peluang dalam aspek politik, sosial, teknologi, dan hukum, tetapi mereka harus mempertimbangkan ancaman ekonomi dan lingkungan. Kesimpulannya, hidroponik adalah sektor yang menjanjikan sebagai penghasil pendapatan di wilayah studi tetapi mempertimbangkan kedua aspek yang bermanfaat (seperti kualitas, respon pelanggan, teknologi, lingkungan politik, kondisi sosial, dan legalisasi) serta faktor-faktor berbahaya (seperti efisiensi, inovasi, kondisi ekonomi, dan lingkungan) sangat penting bagi petani hidroponik.

Kata kunci: hidroponik, keberlanjutan, Jawa Barat, DKI Jakarta

INTRODUCTION

Throughout the past few months, the coronavirus disease 2019 (COVID-19) pandemic has been causing an unexpected global crisis. It disrupts every industry and business sector across the globe, not to mention the enormous amount of six million detected cases and over 371,000 deaths worldwide on 1 June 2020 (Pulighe and Lupia, 2020). Consequently, large and populated cities are almost completely dependent on external resources such as food, water, materials, and energy flows. According to Pulighe and Lupia (2020), these irregularities might

negatively affect the projected global population if the citizens in urban areas grow to 6.3 billion people in 2050. Weber (2017) also discovered that as the world's population grows, sustainable food production and consumption have emerged as a complex biological problem.

Businesses worldwide have led to increasing awareness of food availability, which has always been one of the primary needs in the history of mankind. Pulighe and Lupia (2020) discovered that border lockdown and movement restrictions are leading to an increase in food losses and export costs, especially for vegetables and perishable goods. In an instant, mobility restrictions and social distancing presented by the

governments and local administrators, including the shutdown of onsite dining services, have tragically impacted the manual of the human race. One of the consequences is when people are racing toward the supermarket to perform bulky buying, especially for edible goods such as frozen foods, packaged foods, dairy products, and bottled water.

Based on research by Kharisma and Abe (2020), 27.4% of Indonesians living in urban areas were at a degree of food insecurity at the time before the pandemic hits Indonesia; this has certainly worsened due to the pandemic. According to Sri Mulyani, Minister of Finance of Indonesia, in an interview with *Inews.com* (2020), about 32% of households in Indonesia experience food shortages due to disruption in the logistics system and decreased purchasing power following the COVID-19 pandemic. Indonesia's self-sufficiency was 0.95% and is predicted to be 0.83% in 2030 (Rozaki, 2020). Under normal circumstances, Indonesia cannot meet its self-sufficiency. Thus, under COVID-19 conditions, the country is estimated to be even more incapable.

In addition, the World Bank (2020) states that COVID-19 is expected to allocate up to sixty million people to a higher unemployment rate and cause slower economic growth, due to lockdown and social restrictions imposed by governments in lowering the spread of the virus. Globally, ILO (2020) has predicted that there will be 195 million unemployed due to the crisis, whilst the Indonesian Government approximated that 2.8 million people in Indonesia had lost their jobs since April 2020. Laborers in sectors that are heavily dependent on "crowds" or high-potential customers are at a higher risk to be unemployed from social distancing. As of March 2020, J-PAL COVID-19 Survey (Hanna and Olken, 2020) shows that around 56% of men and 57% of women were no longer working. In terms of revenue, people have been able to return to work, but many people are earning less. Around 31% of the employees stated that their income has declined by more than 50% while 8.6% has dropped by up to 50% (Ngandi et al., 2020). Therefore, the impacted ones are looking for new opportunities to gain a sustainable income for their living.

COVID-19 pandemic has changed several interests and behaviors that might be adapted in the post-pandemic era. One of them is the increased interest in hydroponics activities. As people across the country are forced to stay home to subside the COVID-19 pandemic, many seek solace. Based on Baker et al., (2021), 26.98% of respondents carried out this activity before the pandemic and 39.76% later. Those living in Java are more active in gardening activity, followed by Sumatra and Sulawesi. Interestingly, 60% of home garden respondents' gardeners have an income of less than 4 million, 32.6% have 4–10 million income and 7.4% get above 10 million (Baker et al., 2021). Therefore, gardening activity or urban farming might answer the impact of the pandemic in terms of income sources.

Hydroponics vegetable production is getting more popular because (1) urban farming's material is easy to get; (2) inputs such as fertilizer and seeds are available and (3) urban areas have limited land for agriculture practice. Meanwhile, hydroponics only needs piping construction and roofing. Furthermore, urban farming has been growing rapidly in Indonesia. One of the communities, *Komunitas Hidroponik Indonesia* of Facebook, has more than 200,000 members. A similar community has over 100,000 members as well, with more than 400 feeds daily.

One good behavior that was raised during the pandemic is healthy food consumption. The demand for vegetables has increased during the pandemic. Supported by Andini (2020), the vegetable seeds sale increased by 1000% in the marketplace. Based on the interview with the modern market retail such as Superindo, which is more relevant to the organic vegetable market, the sales of vegetables during the

pandemic are higher. That is more likely caused by the rise of the people's concern during a pandemic and work-from-home era, who choose to cook their food. Regarding vegetable production, the revenue trend from Indonesia's vegetable production will increase gradually from 2020 to 2025. The revenue for the fresh vegetable market was expected to hit US\$ 22,337 million in 2020. The business is projected to rise by 1.5% next year (CAGR 2020-2025). In deeper insight, leafy vegetable production is predicted as the biggest contributor, while rooting vegetables, mushrooms and other fresh vegetables as the second and third contributors, respectively (Statista, 2020).

Besides challenges and adaptation, several opportunities can be considered. As for food insecurity, food production is mainly located in rural areas, while food consumption is dominant in urban areas. People living in urban areas encounter several critical issues about food, such as a long food supply chain, limited agriculture spaces, industrial food dependency, and fresh and healthy food stock (Indrawati, 2018). However, urban areas have the potential to be an option to overcome the problem. First, urban areas have potential space to grow the plant. For instance, three types of spaces can be potentially used: private spaces (around the house), semi-public spaces (schools, government and/ or private offices, campuses, flats), and public spaces (RPTRA, mall, *Gang Kampung*). Even though big cities such as Jakarta have a dense population, the use of occupied spaces for planting plants is still possible.

In terms of sustainability, hydroponics has a positive impact on the economy, society and environment. Concerning the economic aspect, hydroponics as a part of urban farming empowers local economies by creating jobs and access to healthy food. Regmi et al. (2020), show that urban farming, particularly hydroponics, can be an income source for households and a good solution for alleviating poverty. Regarding the environmental aspect, hydroponics can answer water and chemical usage and carbon emissions issues. Tolga and Basar (2020) also discovered that the hydroponics system reduces water usage by 95% and, at the same rate, provides efficiency in the crop, hence sustainability is highly supplied. The reduction of CO₂ emission by hydroponics is hard to calculate precisely but some estimations have been made. Lukić et al. (2018) said that food transportation from the farm (after harvest) to the table costs about 36% of total CO₂ emissions for vegetables, amounting to 0.13 kg CO₂-eq/ kg production. When the food can be delivered shortly to customers, the CO₂ emission is possible to decrease. The food mileage will be reduced by providing a closer food source for people living in urban areas.

Hydroponics is commonly cited as community empowerment towards job training and other educational programs. Harisdani et al., (2018) conducted agricultural training by introducing hydroponics to the development community in Indonesia. This training gives the community understanding of how they can engage with food production.

All the opportunities mentioned give space for hydroponics to become a sustainable source of income. The opportunities have not been taken optimally by society. In this research, the researcher sees some gaps. First, there is still limited research that focuses on giving solutions to economic households, particularly on income sources for agriculture sectors. Sunardi and Lesmana (2020) referred to the entrepreneurship issue in response to the pandemic. Although they do not focus specifically on agriculture sectors, yet more on the science power concept that discusses the management system to encourage people to conduct entrepreneurship. Second, some research about agriculture entrepreneurship based on hydroponics production conducted in several places outside Indonesia. Third, in

Indonesia, the researchers are more focused on community engagement. Even though the entrepreneurship aspect is mentioned in their study, the term is not discussed thoroughly.

Hydroponics is an option for a sustainable source of income as a pandemic adaptation. The researcher tries to address two main research questions: (1) To what extent does hydroponics production become a sustainable source of income in urban areas? (2) What are the helpful and challenging aspects of hydroponics production to become a sustainable income source in Indonesia's cities? Hopefully, this research can provide a more comprehensive understanding of hydroponics production in Jabodetabek

METHODS

Conceptual Framework Design

To conduct this study, the researcher developed a conceptual framework as presented in Figure 1. The researcher sees that the pandemic has two sides: challenges and opportunities. Looking at the opportunities, hydroponics seems to have the potential to deal with the challenges. To understand deeply the value of hydroponics, the researcher relates the production system with the sustainability aspect.



Figure 1. SWOT Analysis

Data Collection

To collect data, this research uses a literature review and in-depth interviews. The literature review in this study aims to understand the context used such as hydroponics and sustainability. In the hydroponics context, the literature review focused on the technical aspect of hydroponics, while sustainability is about the definition and three main pillars. Moreover, the literature review also aims to answer to what extent hydroponics production becomes a sustainable source of income in Indonesian urban areas. The researcher reviews journal articles, research papers, annual reports, books, or survey reports to find the correlation between hydroponics and sustainability based on three aspects. The researcher collected sources from Google Scholar, published later than 2017 with keywords: sustainable, hydroponics and sustainable hydroponics in Indonesia. Afterwards, the sources were picked based on the citation frequency.

The interview is semi-structured with questions developed by the researcher (Table 1). Open-ended questions were used in the interview so the respondent could describe their experience and personal perspective comfortably.

In this study, the four factors of Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis are divided into the internal environment and external environment. Figure 1 illustrates how the SWOT analysis was conducted. To investigate the internal environment, it focuses on four areas: efficiency, quality innovation and customer responsiveness. In addition, external environment identification should look at the market situation and the industry (Naradda, 2020). According to Fozer et al. (2017), Political, Economic, Social, Technology, Legal and Environment (PESTLE) analysis can be a good tool for conducting the SWOT analysis. The analysis focuses on six main subjects: Political, Economic, Social, Technological, Legal, and Environmental. The SWOT analysis helps the researcher to find helpful and challenging aspects.

Research Areas

This study is qualitative research, focusing on five areas: Jakarta, Bogor, Depok, Tangerang and Bekasi (Jabodetabek). The five areas are selected by considering the impact level of the pandemic, the number of people losing their job and having decreased income and the number of existing hydroponics growers.

Table 1. The Questions included in the Research

No.	Questions
1	What do you think are the strengths of doing hydroponics entrepreneurship in the location?
2	What do you think are the weaknesses of doing hydroponics entrepreneurship in the location?
3	What do you think are the opportunities provided in the location to do hydroponics entrepreneurship?
4	What do you think are the threats posed by doing hydroponics entrepreneurship in the location?

Respondents

The in-depth interviews were conducted with 25 farmers in Jabodetabek. The sample was chosen by snowball sampling. Wahyuni (2019) explained that snowball sampling is a technique for researchers to identify potential subjects in studies, where the samples are quite hard to find or locate. Basically, in this study, the researcher has set up some criteria for the sample, comprising farmers having hydroponics with more than 25,000 planted holes (around 100 m²) and experience more than 1 year in hydroponics entrepreneurship. The farmers should also have at least a farm located in Jabodetabek. Since the hydroponics growers tend to consider hydroponics as a hobby, the researcher

assumed that meeting the farmers with those criteria would be difficult. They might be found, yet not in the chosen location. The criteria, therefore, were created to select the farmers.

In addition, to obtain more perspective, the researcher determines respondents for the in-depth interview with different backgrounds such as academics, companies, NGOs and governments who are interested in hydroponics production. The number of respondents was at least two people from each background. The objective of the in-depth interview is also to answer the sub-main research question, "What are the helpful and challenging aspects of hydroponics production to become a sustainable income source in Indonesia's cities?"

Data Analysis

The audio-recorded interview was transcribed into a Microsoft Word document. It was coded manually in three steps. The first step is the initial code to separate data into categories (word by word). The second step is focused code to develop categories for the pattern. The third step is theoretical code to correlate each pattern. The researcher did a thorough, detailed, and repeated reading of the field notes and listened attentively to recordings for a clearer understanding of the data obtained. Consequently, this helped the researcher to see themes, common patterns, differences, and unexpected phenomena and resulted in a more informed and conscious reorganization of data into themes.

Validity and Reliability

Validity is a form of triangulation in which various data points are used to gain credibility. In triangulation, the researcher uses different sources and different backgrounds such as scholars, the private sector, government and the community (particularly for questionnaires) to verify the obtained data or to get more perspective.

To do reliability, the researcher did three steps. First, some questions asked to different respondents produce the same feedback. Second, the same questions asked to the same respondents at dissimilar times will lead to the same feedback. Third, the similar question asked with dissimilar methods brings similar feedback.

RESULTS AND DISCUSSION

Overview

Figure 2 shows the overview of the study result. The findings show that quality and customer response turn out to be strengths. Technology, politics, social and legal are detected as opportunities. Efficiency and innovation are pictured as weaknesses. Finally, the threats consist of the economy and environment.



Figure 2. Overview

Strengths - Quality

This research focuses on the quality of the product, particularly on the harvested crop and the product's image. It shows that the quality of hydroponics crops in Jabodetabek is good. One of the factors influencing the quality is how they grow the crop. Respondents reported that the quality of produce depends on the seed quality.

"We have to make sure that the crops sold to consumers are the best ones, we do product sorting, selecting based on the size or weight and then packing based on the quality." (R8)

Most farmers grow hydroponics products with fewer chemical fertilizers and zero pesticides, herbicides and fungicides. Even if there is an insect infestation, the respondents prefer substituting chemicals with organic ones.

"People in general consider nutrition, pH, and water to be important. To control the pest, we prefer to use organic pesticides because apart from decreasing cost, it also improves the quality." (R8)

Another factor why the quality is good is due to the usage of quality seed. Respondents stated that the high-quality seed and packaging influence the product.

"The hydroponics are grown by using high-quality seeds. It should be the best one, I got it from either imported seeds or the Cap Panah Merah brand. The farmers regularly sort the products before marketing them to consumers. The best quality product will be sold at a high price and the lower one is at a lower price or conventional price. The packaging usually uses plastic having the farm's logo. Therefore, the top of mind of the consumers perceives hydroponic vegetables as having higher food safety levels." (R12)

Strengths - Customer Responsiveness

Product diversity, price level and customer satisfaction are tools to look at customer responsiveness (Narada et al., 2020). In terms of customer satisfaction, the respondents reported that customers are satisfied because of the freshness and the taste of the products.

"The buyers are happy with hydroponics crops; they know that this is a high-quality product. They reorder after trying it because the crops are fresh and tasty. We must increase productivity to help them obtain this product." (R11)

In terms of price, the respondents explained that the price is worth it because of the value they gained. Quality is the decisive driver for customer satisfaction, in which the higher the quality of the product, the higher the customer satisfaction will be.

"The customer sees more than just a cost when consuming the food, such as health, taste, safety and durability." (R11)

A healthy lifestyle recently increased significantly, particularly during the pandemic. Jabodetabek citizens are aware of the importance of maintaining a sound immune system. They are concerned about what they consume daily. The guarantee of eating hydroponics would be a good option for them. Respondents said the crops taste more robust, fresher and more delicious. Another point stated that the storing time of the product is more durable than conventional ones. According to the interview, hydroponics crops last one to two days longer than the traditional ones.

"Nowadays, people know what they should consume such as fresh and healthy food. Finally, they choose vegetable and hydroponics crops for sure." (R13)

The quality mindset of the customer defeats the high price. To conclude, various points create positive customer responsiveness that build the strength of the hydroponics production in Jabodetabek.

Weaknesses – Efficiency

In agriculture production, efficiency plays a pivotal role and is essential for farmers in improving their harvest. In this research, the efficiency term is related to resources. The efficiency of hydroponics production based in Jabodetabek is to what extent resources are obtained by hydroponics actors in the location. The easier farmers acquire the resources needed, the more efficient the process becomes.

One of the fundamental needs in agriculture production is seed. We found that the seed has a high germination level and can fit the local bio-physical condition, which is highly required. Our respondent stated that seed is the most challenging material compared to other vegetable production materials due to its availability in Jabodetabek.

"Seed supply is our problem. Normally we get the seed from an online shopping platform, but recently it is always sold out. We cannot buy the seeds that they need quickly in the local market due to limited seed stock. The seed demand, particularly vegetables, in Indonesia is high and tends to increase in the pandemic." (R18)

The vegetable seeds sale increased by 1000% in the marketplace (Andini, 2020). The high seed demand only for specific varieties is the reason why seed supply is sometimes tricky. Some customers' favorite varieties cannot be produced in Indonesia. Consequently, importing the seed can be a good solution despite a long time to import the seeds to Indonesia.

Hydroponics production has three crucial factors to optimize the plants' growth: water, temperature and lighting (Danang, 2017). Firstly, since hydroponics is a technique for growing plants or vegetables without soil but using mineral fertilizer solutions combined with water (Martin et al., 2019), the quality and quantity of water resources need to be considered. Hydroponics production needs the water's turbidity and acidity, with an optimal pH of 5.5 to 7 and the water temperature ranging from 25 to 27°C (Danang, 2017). The next factor is temperature and lighting. Plants can grow optimally at 20-26°C (Modu, 2020). Lighting needs to be divided into three categories such as light intensity, light quality (wavelength), and duration of exposure (length of day) in which hydroponics production requires soft quality with a period of at least 8 hours/ day (Modu, 2020).

The three factors have challenges in the implementation. In Bekasi, the respondent explained that the hydroponics implementation failed due to the quality of the water.

"Water is the most challenging. As we live in the northern part of Jakarta, it has brackish water with high salinity, pH is high, and the quality is bad." (R5)

Ichniarsyah et al. (2019) argued that water contains many electrolytes, which is typical for areas with municipal water. Some treatments have generally required the farmers, such as collecting and leaving the water in the tank for a week. The treatments are not always effective and may hinder the production process while water is continuously needed. Therefore, another water resource is urgently needed. From the study on hydroponics of Chinese cabbage by Lira et al.

(2015), we learned that brackish water could be an alternative for those with a restricted supply of freshwater, although it may impact the productivity of the vegetable.

As for temperature and lighting, our respondents stated that the temperature of Jabodetabek is not recommended, yet the weather is still suitable for some vegetables.

"The temperature is about 32-38°C, which is not friendly for hydroponics production. However, the weather is still suitable for certain vegetable varieties such as kangkong, Pak Choy and oriental vegetables." (R6).

In terms of lighting, the respondent said that the factor is challenging.

"Lighting is typically obtained from sunlight. Jabodetabek has good sunlight intensity for hydroponics systems, although the duration is often less than 8 hours. Hydroponic vegetable production in the city is often overshadowed by surrounding buildings or trees, unless located on the rooftops." (R23)

All in all, hydroponics production needs expensive capital due to the high initial fixed cost of the systems and additional treatments such as the LED lights, water treatment, nutrition reservoir and supporting material (planting medium, hydroponics rack and other equipment).

Weaknesses – Innovation

Farmers should know how much knowledge, in this case about hydroponics production, they have before created a certain innovation. In the interview, the respondents explained their understanding about all hydroponics processes. Hydroponics production needs more attention than conventional practices, and people thought they need to be competent to run the hydroponics enterprise. Most of our respondents learned hydroponics by self-taught and attained some additional insights from their colleagues and self-practice afterwards.

"I have not understood this production, I do not have the background about this." (R5)

According to Siskayanti et al. (2020), hydroponics training is unsuccessful because the participants do not comprehend the systems yet. Prasetya et al. (2020) emphasized that the recent increase in people's interest in a hydroponics system is not aligned with their understanding. The respondents see that hydroponics systems are complex, particularly in nutrient and pest management. Besides, they also lacked marketing knowledge, which is also necessary.

In terms of innovation, this research emphasizes that the variety of planted vegetables, product development, and design of the system are necessary. The common vegetable grown in hydroponics systems is leafy vegetables such as kangkong, Pak Choi, and spinach. Several potential vegetable varieties, such as kale and Japanese spinach, are challenging to be found in Indonesia. According to the interview, the respondent stated that they lack innovation.

"People complain about the lack of varieties. The demand for those varieties is relatively high. As explained in the efficiency topic, the farmers encounter limited seed stock of imported and local varieties. It caused farmers to only produce limited vegetable varieties." (R6).

One of the reasons why innovation is lacking is because of product development. The respondent expressed that product awareness is still loved.

"The awareness of product development in hydroponics sectors remains low. The farmers tend to sell their raw produce as it is more doable. On some occasions, the hydroponics yield has been transformed into smoothies and snacks, but it has not been well-executed." (R6)

How farmers designed their farms leads to working effectiveness and efficiency. Most hydroponics farms in Jabodetabek are uncovered or unautomated farms that are too sensitive to external factors such as changeable weather, pests, or even human error. A farmer forgets to turn off their water machine in a specific illustration, causing the overfull water tank and then flooded farm. Unergonomic farm design also makes it worse. For instance, the farmer who has a hydroponics farm outside the greenhouse puts their water tank too high that they cannot control the water when it overflows. The plants are then too watered and will be damaged.

Opportunities - Politic

In terms of political topics, this research sees the extent to which the governmental (national, provincial and regional level) and non-governmental institutions support entrepreneurs based on hydroponics production. In Jabodetabek, the respondent said that the environment is quite supportive.

"We have good support from the government, but we need to make some effort. Indeed, there is no specific subsidies or financial support for urban farming/ hydroponics production ventures. Nevertheless, the support for the small or medium enterprises (SMEs) and entrepreneurs are there, in which hydroponics production could be included. The state minister for Cooperatives, Small and Medium Enterprises of Indonesia gives capital support to SME actors. We should submit a proposal and join the selection. The common issue is about information. Some citizens are not well-informed." (R6)

The local governments have several programs to support urban farming potential. For instance, Bekasi's government plans to create Bekasi as a production center and pilot for hydroponics production in West Java. Bekasi and other cities possibly have potential in agritourism through hydroponics and organic training. As urban agriculture occupies approximately 21% of Jakarta's total green space area (Chandra et al., 2019), the city considers the percentage as green space. The regional government supports hydroponics development towards extension and competition programs to achieve their visions of development. When the government gives more support, it communicates clearly and ensures the information for farmers, this can be an excellent trend for entrepreneurship in hydroponics production.

Respondents also said that the support system is not only from the government, but also from non-governmental institutions.

"Some NGOs encourage hydroponics entrepreneurs by giving extension, community engagement and product development. We also got training from some universities. The lecturer and students work on several societies' programs on agriculture, particularly in helping communities get more value in agriculture production, including training and extension on the hydroponics process." (R25)

Hydroponics is a good approach for communities' engagement, particularly for women in urban areas (Suharjuddin et al., 2020). Moreover, the respondent said that private companies also take part to support them.

"Some private companies help us towards their Corporate Social Responsibility (CSR) program. One example, we got support from private companies to develop our hydroponics farm and impact our communities towards entrepreneurship based on hydroponics production." (R25)

Opportunities - Social

The social topic focuses on competitiveness and to what extent farmers can help the community. Typically, every hydroponics farmer always worries about competition within their venture as it will minimize their value. This study shows that the hydroponics farmers in Jabodetabek have a sound support system.

The respondent explained that the culture of working together as a sense of belonging, called gotong-royong in Bahasa, is firmly embedded in the entrepreneurship activities in Jabodetabek.

"I do not see any competitors so far because we belong to each other. We support each other. The environment makes it convenient to do this business. We try to help each other in meeting the hydroponics demand. We organize a variety planting schedule for those living in the same area to have different varieties in one growing period of 2-3 months. It can help us to diversify the varieties planted." (R11)

The gotong-royong concept influences the knowledge transfer process. The respondent said that knowledge transfer among farmers is the strength of the business environment.

"In this business, those having more experience than others are willing to share their insights. The beginners in this sector are then not afraid to get learning sources or even tackle problems. The sense of belonging helps them be more comfortable with certain practices, limit competition and collaborate." (R1)

Since hydroponics interest has increased recently, collaborating, or creating a partnership with many actors is possible. Some institutions become more resourceful, particularly in potential spaces for the hydroponics process. The respondent said that hydroponics production has a good influence on society.

"Hydroponics can help society to not only provide healthy food but also decrease air pollution. We can help people to breathe fresh air." (R2)

Other evidence also shows a positive impact. The program's success in the military community can prove that hydroponics production can be suitable for promoting environmental and food self-sufficiency issues (Irawan, 2019). A positive trend of hydroponics production in cities can generate more green space in the cities. Secondly, hydroponics yield is known as a fresh and healthy product. The existence of hydroponics production around the cities will help society to obtain healthy food. Indrawati et al. (2019) pointed out that urban society, particularly in West Java or Jakarta, tends to consume and is addicted to unhealthy processed food. One of the reasons is that finding fresh and healthy food is challenging. Hydroponics in the cities can be an answer to a healthy urban lifestyle.

Opportunities - Technology

In terms of technological factors, this research considers changes in technology usage that could help hydroponics production. Technological change is a crucial driver, and it can create great opportunities for the agriculture sector. Many options of applicable technologies have already

existed. The automatic system has existed in Indonesia, especially in Jabodetabek. According to Prasetya *et al.* (2020), an automated system for hydroponics production is wanted by many people, particularly in Jabodetabek, who lack knowledge of the system. Recently, respondents argued that the automated hydroponics system has become an opportunity to improve hydroponics production in the areas.

"We need automatic control. If we can control our hydroponics automatically, then we will need less effort, especially for water and some important treatment such as pH and temperature. Automatic control can be a good opportunity for us." (P11)

In addition, the respondent stated that the internet of things (IoT) and digitalization can be great opportunities.

"The Internet helps our communication with the customers. We can sell our product easily." (P8)

IoT is helpful, especially in marketing the product. The existence of communication and shopping platforms will help the farmers to sell their products. Communication platforms such as WhatsApp, Instagram and Facebook have massively expanded in Indonesia. It is helpful for the producer to communicate with customers directly. According to Voutier (2020), the most effective agriculture apps allow users to communicate with each other.

The other opportunities are about digital marketing. The respondent argued that digital technology is an opportunity to improve their hydroponics entrepreneurship process.

"We hope that we can improve digital technology. I heard that some of our friends started using digital technology. They utilize their handphone to control some indicators such as pH, temperature, and lighting. Also, I want to market my products on a digital marketing platform. Shopee, Happy Fresh and Go Food are common platforms for fulfilling citizens' needs. Shopee and Gojek have specific features to shop for daily necessities such as fresh vegetables from the closest source. Similarly, digitalization helps farmers get more information and training." (R8).

Opportunities – Legal

The respondent explained that legalization is a good opportunity for the business.

"We need legalization for the permit process... a couple months ago, I got an allowance because I have the legal permit and my local government helped me with that." (R17)

For further explanation, a citizen needs to apply for a business permit to start as an entrepreneur in Indonesia, namely SIUP, but it depends on the entrepreneur's assets. A sort of SIUP, SIUP Mikro is suitable for entrepreneurship based on hydroponics production. This type of SIUP mainly targets business actors with less than IDR 50 million capital and net assets, excluding land and building assets. The government has SIUP registration to be easier for the actor. The local government is willing to help the actors, making them more aware that legal entrepreneurship has more benefits, such as easy access to government support and trusted labels to support product marketing. Table 8 shows to what extent the law can give opportunities to hydroponics production in Jabodetabek.

Threats – Economic

Society often labels hydroponics yield as an expensive product. Its initial investment and production cost create a

higher price than the conventional one. Those who know the quality of hydroponics products said the price is worth it. However, the respondent reported that many people are still unwilling to pay for vegetables at a high price, making the hydroponics seem not profitable.

"The price of hydroponics is higher than the conventional vegetable. We need to introduce to people that they are different in terms of quality. People sometimes do not care about the quality. They still lack knowledge on that." (R25)

In this case, quantity talks more than quality. At the same price, buying a traditional product is more beneficial for them than the hydroponics one due to the plenty of vegetable quantity acquired. In terms of demand, the respondent said that the demand is unstable.

"Demand has been quite challenging recently. During the pandemic, we sell to direct customers, but they cannot be expected. The product demand in Jabodetabek remains unstable. We tend to sell the produce at a lower price on special occasions than the hydroponics product price should be. The high demand used to come from restaurants, cafes and hotels, but those places were closed because of the pandemic." (R3)

As demand decreases, selling hydroponics vegetables at a high price looks impossible. For farmers, it is better to earn an acceptable price if they still get paid and are not bankrupt. It shows how selling prices can be a threat to hydroponics production. Regarding income, respondents argue that hydroponics entrepreneurship gives promising income.

"I got adequate income every day for this business. The definition of adequate income is enough for daily consumed food and some primary expenses. I do not know about other farmers, but I guess it depends on their farming areas and how much time they spend in the business. Some only see this business as a side income source." (R11)

Entrepreneurship based on hydroponics production may be impossible to be the primary income for those living in Jabodetabek. Based on the interview, this study shows that the income-earning from selling hydroponics remains lower than the cities' minimum regional wage. Nevertheless, some terms should be highlighted. First, the amount of income depends on the production area or the number of hydroponics holes that farmers have. The farmers' hydroponics system is not yet proper. Second, so far, hydroponics actors started with their hobby. They see growing plants in the hydroponics system as enjoyable and productive for their leisure time. They also consider hydroponics as profitable as a side job. Third, hydroponics nowadays tends to be related to food security in which actors focus more on filling food requirements than profit. Therefore, some significant steps are needed to consider hydroponics entrepreneurship to become the primary source of income. Table 9 explains how the economy can threaten hydroponics production in Jabodetabek.

Threats – Environment

Indonesia has two seasons, dry and rainy. The dry season will help the farmers to get more lighting, however, the temperature will be too high. In contrast, the respondent stated that the rainy season leads to proper temperatures but insufficient light duration.

"Rainy season will be more challenging because our customers will decrease. We need to deal with disease or pests. Also, we will have lower light duration." (R11)

Pests are commonly found in hydroponics production in Jabodetabek, such as spider mites, aphids, thrips and whitefly. The farmers have not had good knowledge of pest management yet.

CONCLUSION

The study shows that hydroponics entrepreneurship shows evidence of sustainable income in urban areas. The study also indicates that hydroponics farmers in Jabodetabek have strength in quality and customer responsiveness. The quality of hydroponics production in the area is recognized as decent quality. That is why customer response is also positive. However, we must deal with efficiency and innovation to enhance our strength. The efficiency and innovation remain low, influencing the hydroponics process and customer satisfaction. Additionally, hydroponics seems to have potential if we can catch up with opportunities such as the usage of technology, approach to a political movement, social network, and legal process. On the other hand, there are economic and environmental threats for the hydroponics growers to be aware of. Henceforth, the founded aspects can be categorized into two points: helpful and challenging. The practical point is about the strength and opportunities to help hydroponics farmers execute hydroponics production as their source of income. As for the harmful point, they are an aspect that hydroponics growers should overcome to improve their entrepreneurship.

From this research, the researcher sees that two interesting topics can be future research. First, it is about the motivation of hydroponics entrepreneurs in the areas after the pandemic. Second, regarding economics as a threat, future research can focus on to what extent economic conditions change after the pandemic affects hydroponics entrepreneurship.

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