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## The Adaptation of Export-Scale Urban Farmers Amid the COVID-19 Pandemic in Bandung Metropolitan

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## The Adaptation of Export-Scale Urban Farmers Amid the COVID-19 Pandemic in Bandung Metropolitan

### Abstract

These days, urban agriculture is more than a hobby. It has expanded into a local commercial business, even to an export scale. However, urban farmers who have commercialized their products must adapt to the COVID-19 pandemic situation, which has impacted many aspects of global life. This research used a mixed-method approach. We collected quantitative data from 107 respondents on the household commercialization index, income level, and education level of export-scale-urban farmers in the Bandung metropolitan area, West Java, Indonesia. We also used qualitative data to determine how farmers were adapting to difficult situations due to the COVID-19 pandemic. This information was gathered through in-depth interviews, observation, and documentation. The results showed that the urban farmers continued to prioritize commercial agriculture during the COVID-19 pandemic. The urban farmers must adapt to the COVID-19 pandemic in various ways, beginning with market access, agricultural management, and strengthening financial resources. There are some conditions where adaptation methods adopted by farmers are not environmentally friendly because the farmers are increasingly dependent on synthetic inputs and use cold storage on open land. Thus, the farmers' adaptation steps to maintain export-scale commercial farming activities in the situation of the COVID-19 pandemic also affect intensive agricultural practices that are not environmentally friendly.

### Keywords

urban agriculture, urban farmers, export, commercialization, COVID-19

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### Authors

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## The Adaptation of Export-Scale Urban Farmers Amid the COVID-19 Pandemic in Bandung Metropolitan

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These days, urban agriculture is more than a hobby. It has expanded into a local commercial business, even to an export scale. However, urban farmers who have commercialized their products must adapt to the COVID-19 pandemic situation, which has impacted many aspects of global life. This research used a mixed-method approach. We collected quantitative data from 107 respondents on the household commercialization index, income level, and education level of export-scale-urban farmers in the Bandung metropolitan area, West Java, Indonesia. We also used qualitative data to determine how farmers were adapting to difficult situations due to the COVID-19 pandemic. This information was gathered through in-depth interviews, observation, and documentation. The results showed that the urban farmers continued to prioritize commercial agriculture during the COVID-19 pandemic. The urban farmers must adapt to the COVID-19 pandemic in various ways, beginning with market access, agricultural management, and strengthening financial resources. There are some conditions where adaptation methods adopted by farmers are not environmentally friendly because the farmers are increasingly dependent on synthetic inputs and use cold storage on open land. Thus, the farmers' adaptation steps to maintain export-scale commercial farming activities in the situation of the COVID-19 pandemic also affect intensive agricultural practices that are not environmentally friendly.

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### Introduction

Nowadays, urban agriculture is a global phenomenon that has shifted away from subsistence agriculture toward commercial agriculture. This condition is prevalent in some countries, including those in Southeast Asia (Kem, 2017). Urban agriculture is defined as crop production in urban and suburban areas through community gardens (urban gardening), semi-commercial agriculture, and fully commercial agriculture (Hirsch et al., 2016). According to this perspective, urban agriculture is not limited to agricultural activities within the administrative boundaries of a city. Intensive agricultural activities in the suburbs are part of urban agricultural activities.

Urban agriculture encompasses all agricultural activities that take place within (intraurban) or on the outskirts (peri-urban) of an urban settlement or metropolis, either

independently or collectively, for household consumption or commercial purposes (Mougeot, 2005; Premat, 2005). Suburban agriculture (peri-urban agriculture) is also included in urban agriculture despite its proximity to rural areas. The “coverage” of urban agriculture tends to experience more dramatic changes over time (Mougeot, 2000). This is because of the process of peri urbanization, which is a spatial phenomenon that is continuing to develop in rapidly growing metropolitan areas (Budiyantini & Pratiwi, 2016). Peri-urbanization is the process by which rural areas adjacent to established cities become more urbanized in terms of physical, economic, and social characteristics (Webster, 2002). Thus, the peri-urban area is gaining importance as a new locus of economic activity, and rural-urban activities face intense competition (McGee, 2005).

Peri-urban areas reflect unique characteristics of mixed land use between the periphery and the countryside regarding urban functions' ecological, social, and economic dimensions (Budiyantini & Pratiwi, 2016). Additionally, peri-urban development is frequently associated with rapid social change, as small farming communities are quickly forced to adapt to urban or industrial lifestyles (Webster, 2002). Thus, urban agriculture can be defined according to Henk De Zeeuw (2004) definition, which states that all forms of urban agriculture are connected to urban ecological systems and can contribute significantly to urban environmental management systems classified as intra-urban and peri-urban agriculture.

Urban agricultural activities have the potential to generate economic output during their development. According to Mougeot (2000), urban agriculture is gaining economic viability due to market-oriented production (exports). This expansion of urban agriculture's objectives to business is indicated in several studies that have found that high-and-middle-income households engage in urban agriculture for commercial purposes, which has implications for urban employment (Bryceson, 1996; Tacoli, 1998). The existence of intensive urban agriculture demonstrates agriculture's commercialization. Commercialization of agriculture refers to a shift in agricultural characteristics in terms of output with an increase in market surplus and inputs with an increase in purchased inputs (Braun & Kennedy, 1994).

Agriculture has been classified into several market orientation scales as a result of these changes in characteristics. According to Pingali and Rosegrant, agricultural characteristics are classified into subsistence, semi-commercial, and commercial agriculture based on the scale of market orientation (Pingali & Rosegrant, 1995). The same references discussed commercial agriculture's characteristics regarding farmer objectives, input sources, product diversity, and household income sources (Pingali & Rosegrant, 1995). Farmers' primary objective in commercial agriculture is to maximize their profits. Traded inputs account for the largest portion of the input sources. Farmers purchase more inputs than they produce. The resulting product is more specialized in a single variety with economic value, whereas the source of household income is predominantly non-agricultural (Pingali & Rosegrant, 1995). Table 1 outlines the characteristics of a commercial farming system according to Pingali and Rosegrant (1995).

**Table 1**

*Characteristics of commercial systems from Pingali and Rosegrant (1995)*

<b>Level of Market Orientation</b>	<b>Farmers Objective</b>	<b>Sources of Inputs</b>	<b>Product Mix</b>	<b>Household Income Sources</b>
Commercial Systems	Profit Maximisation	Predominantly traded inputs	Highly specialised	Predominantly non-agricultural

Thus, the spread of urban agriculture, which extends to the export scale, is a product of the agricultural commercialization process when the internalization of economic functions

entered modern agricultural practices. Urban agriculture's economic function enables farmers to participate in a broader food commodity trading system. Agricultural activities are rationalized and transformed into economic enterprises with the goal of maximizing results (high profits), and farmers' subsistence needs no longer take precedence (Wolf, 1985). Commercialization of agriculture could provide benefits for urban farmers. Commercialization has long been regarded as a necessary component of enhancing food security, nutrition, and income (Jaleta et al., 2009).

However, the cyclical flow of urban agricultural commercialization faces external challenges from the impact of the COVID-19 pandemic. Currently, many countries are facing the COVID-19 pandemic, a global health crisis that is hurting the global economic sector (OECD, 2020). The COVID-19 pandemic has a direct impact on the food and agriculture sectors, as it disrupts the food supply chain to the consumer market, both domestically and internationally. This situation exists as a result of global export trade restrictions, which have resulted in a decline in the supply of global food exports (Espitia et al., 2020).

The majority of developed countries affected by the COVID-19 pandemic have strengthened inspections at their entry and exit gates for products in and out. This condition could be detrimental to farmers in Indonesia, as it would disrupt the shipping process, making it more arduous for farmers to sell their agricultural products (Sutrisna, 2020). Closure of transportation routes disrupts the supply chain for fresh food, particularly vegetables and fruit products, which have a relatively short shelf life and thus result in increased food waste and loss during shipment (FAO, 2020). Fruit shipments from Southeast Asia encountered congestion at the ports of Shanghai and Tianjin in April-May 2020, resulting in product damage and loss (FAO, 2020).

Market disruptions put pressure on farmers in several countries who have entered into large-scale export trade in response to the uncertainty of international markets. As a result of the COVID-19 pandemic, the global food industry system has been exposed to such a situation (Altieri & Nicholls, 2020). Farmers face a significant decline in income due to numerous countries' lockdown policies, which have harmed farmers' access to markets (EIU, 2021). Meanwhile, farmers have already invested significant capital in expanding their production capacity to maintain their commodities' competitiveness in international trade. Because of the COVID-19 pandemic pressures, urban farmers who have experienced export-scale commercialization are trapped in the volatile international food market. To continue their production activities, export-scale urban farmers must search for ways to adapt to market conditions that have deteriorated due to the COVID-19 pandemic.

Therefore, this study attempts to answer research questions regarding how farmers adapt to maintain export-scale urban agricultural activities in the situation of the COVID-19 pandemic. Several researchers have researched such farmer adaptation (Anaïs, 2017; Regina, 2017; Suryana et al., 2016). Although many preceding studies have been conducted on farmer adaptation, there have not been many studies that discuss farmers' adaptation to survive in export-scale trading activities during the COVID-19 pandemic, particularly in the Bandung Metropolitan area of Indonesia.

The present study took place in the Bandung Metropolitan area, specifically in the upper Citarum river basin. Citarum is the longest river in West Java, providing irrigation for thousands of hectares of agricultural land, hydroelectric power, aquaculture resources, and drinking water for Bandung and Jakarta (Abdoellah et al., 2020). Citarum is also one of the world's most polluted rivers (Utami, 2019). The Citarum river is contaminated and degraded by industrial waste, agricultural waste, fishery waste, livestock waste, and domestic waste (Juniarti, 2020). Additionally, optimizing agricultural productivity in the upstream portion of the watershed may also result in a degradation of environmental quality. Therefore, this

research is critical because it is located in a river area with environmental degradation problems.

## Literature Review

### Export-Scale Urban Agriculture

Commercial urban agriculture is an agricultural system that is exclusively intended for trade and income generation to produce maximum returns for regular sales in the market with a sufficient rate of return so that profits can be reinvested to expand output, employment opportunities, and fixed assets (Mougeot, 2005). Many scholars have identified the emergence of commercial sub-type urban agriculture that has purely financial interests (De Bon et al., 2010; van Veenhuizen, 2006; Yi-Zhang & Zhan, 2000).

The phenomenon of commercial urban agriculture refers to the emergence of many successful entrepreneurs in urban agriculture who have attracted the interest of practitioners to adapt urban agriculture practices (Specht et al., 2016). Commercialization in urban agriculture is not a new phenomenon; several countries have transformed intensive urban agriculture and even its commodities to meet export markets, such as Cuba (Koont, 2011), Lebanon (Fournier, 2019), and South Africa (Danso et al., 2014). It is because commercialization in agriculture has become an important strategy to break out from the circle of poverty and increase the food security of farm households in low-income countries since the 1980s (Braun & Kennedy, 1994).

Commercialization is defined as a process, and changes in agricultural characteristics that occur on the output side resulting from an increase in market surplus may also occur on the input side as a result of an increase in purchased inputs (Braun & Kennedy, 1994). Commercialization at the household level can be considered one of the various output ratios related to the gross sales value (gross) of each crop divided by the total gross sales value of all crops produced (Braun & Kennedy, 1994; Govereh & Jayne, 1999; Jaleta et al., 2009; Strasberg et al., 1999). Commercialization is defined by increased output units, added value, and production for domestic and international markets (Hagos Belay et al., 2020).

Initiatives for commercialization promotes crop production for export (Sulle, 2016). Increased productivity is meaningless unless it is accompanied by market expansion (OECD, 2007). Thus, agricultural productivity has increased market access through domestic, regional, and international channels, serving as a critical growth strategy for poor households seeking sustainable livelihoods (OECD, 2007). The agricultural transformation agenda affects the shift away from small-scale agriculture (Sulle, 2016). Export crop orientation is a component of macroeconomic policy reform (Braun & Kennedy, 1994). From a historical perspective, the situation results from a global single market policy regulated by the World Trade Organization (WTO). Global trading is the result of implementing SAP (Structural Adjustment Program). Countries that received international loans in the 1980s were required to implement a Structural Adjustment Program that included provisions for agricultural liberalization and the elimination of government support for agriculture, such as subsidies and marketing (Hall, 2015).

There are some countries that have successfully achieved economic transformation through agriculture. Vietnam is the one of the prosperous countries in the world that has implemented economic reforms, known as *doi moi*, to complete the transition from a centralized to a market economy system. In 1990, agricultural privatization had a beneficial effect on poverty reduction in Vietnam (Linderhof et al., 2019). As a result, many developing countries have also adopted similar policies to boost food crop production for both export and domestic consumption (Braun & Kennedy, 1994).

## **The Impact of the COVID-19 Pandemic on Export Scale Agricultural Activities**

The COVID-19 pandemic has resulted in a tragedy of global health problems that also affect numerous including the agriculture and food sector. The pandemic's impact on agriculture and the food supply chain raises concerns about widespread food shortages and price increases (Altieri & Nicholls, 2020). Maintaining the stability of the international food supply chain has become a critical global priority during the COVID-19 pandemic.

There were at least two disruptions to global food trade activities because of the COVID-19 pandemic, both of which were related to supply issues so that export supplies would decline with a decrease in production. The second disruption occurred due to decreased demand because various retailers were forced to close, and retailers consequently ceased placing orders (Kerr, 2020). Another impediment was posed by travel restrictions, which affect transportation services that transport goods between countries.

Meanwhile, fresh vegetable and fruit products have limited resistance to spoilage, so they are prone to spoilage if delivery is delayed. Many countries have carried out higher customs controls on cargo ships carrying goods with unique risks, such as perishable foodstuffs (Erokhin & Gao, 2020). Additionally, closures and restrictions on operating hours affect numerous business sectors contributing to the upstream food supply chain, removing producers' primary market (FAO, 2020).

Thus, the potential losses incurred by export-scale farmers could become noteworthy if the COVID-19 pandemic situation in several countries did not improve. In that case, it can deteriorate food security, nutrition, and the livelihoods of farmers, fishers, and other communities involved in the food supply chain (OECD, 2020). Therefore, export markets do not generate the economic opportunities projected by exporters. Urban farmers engaged in economic cross-country trade on a large scale must make various adjustments to absorb all commodities and minimize potential losses.

Exporters, including producers, must be prepared to make various efforts to maintain profitable business operations. Many intensive agricultural enterprises in a variety of countries have increased efficiency by reducing agricultural labor costs due to community mobility restrictions (OECD, 2020). Additionally, some farmers choose to market their products through various channels, beginning with direct sales and progressing through intermediaries to build social networks. Many governments have implemented policies aimed at reducing inequality and reviving economic actors' commercial activities (Kerr, 2020).

## **The Adaptation of Urban Farmers Amid COVID-19 Pandemic**

The COVID-19 pandemic could cause collapses in farmers' commodities' demand and supply (Middendorf et al., 2021). To control the collapses caused by the COVID-19 pandemic, which could hinder access to global trade and lower commodity prices, farmers must adapt to the situation. Adaptation is an adjustment in the agricultural system to respond to actual stimuli or impulses through changes in practices, processes, and structures that produce impacts (Grothmann & Patt, 2003; Robert et al., 2016; Smit & Wandel, 2006). Adaptation in market orientation in the context of trade liberalization requires the search for added value for products (Jackson, 1996).

The product's added value is the proportion of the final price obtained from each intermediary or process in the supply chain to the consumer (Jackson, 1996). According to Kahan (2013), farmers must adapt to changing market conditions to survive in the market, and they also need to produce something that the market wants and something that can satisfy consumers. Further, Kahan (2013) stated that farmers need several ways to adapt related to the

three aspects, that is, the market, agricultural management, and finance. The following is the explanation of the crucial aspects of farmers' adaptation by Kahan (2013).

- **Market:** Farmers must have the ability to use information technology to obtain information about the market. The utilization of information technology devices, such as mobile phones with an internet connection and other media provides new opportunities for exchanging information. Farmers need to take advantage of opportunities to strengthen capacity and find effective ways to gain market access (Kahan, 2013).
- **Farm Management:** Farm management is concerned with the capacity of farmers to manage agriculture. Farmers need knowledge and skills to manage competitive and profitable agriculture, including managing inputs, managing production, and gaining markets. It is a form of adjustment in order to be successful in market-oriented agriculture (Kahan, 2013).
- **Financial:** The threat of a financial crisis and a global recession due to the COVID-19 pandemic could reduce the availability of capital for farmers. It relates to financial access for operating the farm and investing in agricultural equipment, machinery, and others. Thus, access to capital has become an essential aspect, although many farmers find it difficult to get loans to expand their agricultural businesses. However, it is not just about capital access, but the skills of farmers to manage capital are also a crucial part of adapting to market-oriented agriculture (Kahan, 2013)

The COVID-19 pandemic has caused commercial-scale urban farmer actors to adapt to survive in the export trade. During the COVID-19 pandemic, farmers faced many consequences related to large-scale social restriction policies that affected changes in offers from international buyers and barriers to delivery of goods to other countries. Therefore, we want to know how high the level of commercialization of urban agriculture is and how farmers adapt from the market aspect, agricultural management to finance during the COVID-19 pandemic. This study aimed to discuss further whether the adaptation process of urban farmers contains practices that negatively impact the environment.

As mentioned in the previous discussion, urban agricultural activities in the Bandung Metropolitan area are located in the upper Citarum watershed area. The area has a metropolitan topography flanked by mountain slopes. This mountainous slope area is affected by commercial urban agricultural activities. Farmer actors have started clearing land on the slopes that should be a conservation zone. In addition, the use of pesticides and synthetic fertilizers in inappropriate doses to produce plants with long-lasting freshness can also adversely impact the environment. Therefore, we as researchers in the environmental field area are concerned with this research because the essence of urban agriculture should be prioritized in environmentally friendly production practices. It is because international institutions promote this activity as an alternative food network. However, urban farming that is already on a commercial scale must adapt to global market uncertainty due to the COVID-19 pandemic, which has the potential to bring urban farmer actors to production practices that are not environmentally friendly.



## **Materials and Methods**

### **Research Design**

The research took place from October to December 2020. We used an exploratory mixed-methods design. We collected quantitative data, analyzed the data, and then used the quantitative data collection results to underlie the stages of collecting qualitative data. The measurement of the commercialization index of urban farmers in the Bandung Metropolitan area was to determine how intensively urban agricultural production in the Bandung Metropolitan area was intended for sales. It would also prove that the subjects we were exploring further were the real urban farmers who had commercialized most of their products. We collected qualitative data to determine the stages of adaptation carried out by commercial urban farmers whose commercialization index was measured. This qualitative data collection effort was significant to provide a complete and comprehensive explanation regarding the adaptation methods of farmers during the COVID-19 pandemic so that it could be seen whether the adaptation method was contrary to environmental principles. The characteristics of farmers who were the subject of this research were farmers who had exported food products to other countries, including farmers who were members of farmer groups and had linked with buyers abroad or partners with companies that export products (exporters). In general, the type of social research in Indonesia is not yet strictly required to obtain a license from the ethics commission. However, the Indonesian government obliges the Indonesian government to administer research licensing procedures at the provincial, district, sub-district, village and group levels through the National and Political Unity Agency. Before conducting this research, we asked for a permit from the National Unity and Politics Agency, which is the place to apply for research involving human interaction permits. We completed the permit at the National and Political Unity Agency at the provincial level to the five regencies and cities in the Bandung Metropolitan area, where our research was located. After acquiring permission from the National and Political Unity Agency, we continued the ask for research permits at the sub-district, village, and farmer groups' organizations. We also informed informants that we are committed to keeping the privacy of all respondents and informants of this research. Therefore, we have confirmed that the parties involved in this research have given their consent knowingly and without being compelled to provide information.

### **Site Selection**

The present research was carried out in Bandung City, West Bandung Regency, Bandung Regency, Sumedang Regency, and Cimahi City, West Java Province, Indonesia. The five districts or cities are parts of the Bandung metropolitan area. Administratively, the Bandung metropolitan area has an area of 3313.08 km<sup>2</sup>. Some of the agricultural activities in the Bandung metropolitan area are included in urban agriculture. It is because the regencies and cities included in the Bandung metropolitan area have become an urban unit formed by the agglomeration of economic, social, and community activities based on West Java Provincial Regulation Number 12 of 2014. Based on the agricultural concept of Henk De Zeeuw (2004) and Mougeot (2000), agricultural activities in urban and suburban or peri-urban clusters are included in urban agriculture. The Bandung metropolitan area fulfils these requirements because this area can be identified in the cluster division. The Bandung metropolitan area comprises three clusters, i.e., urban, suburban, and rural clusters (Supriyatin et al., 2020).

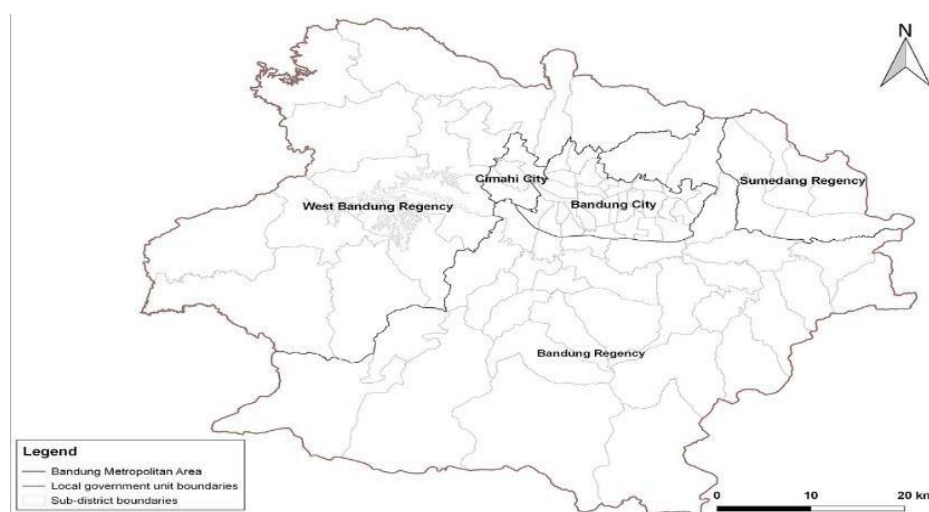
The cluster classification is based on an index of economic infrastructure availability, an index of social infrastructure availability, an index of educational infrastructure availability, the ratio of built-up land, the density of the road network, and population density (Supriyatin

et al., 2020). Bandung City and Cimahi are included in the Bandung metropolitan area's urban cluster. A peri-urbanization phenomenon occurs in this urban cluster, evidenced by population growth, socio-economic activity, and physical expansion of urban areas that transcend administrative boundaries (Budiyantini & Pratiwi, 2016). The suburbs are critical as a new center of economic activity, demonstrating fierce competition between rural and urban activities (McGee, 2005). This is because the increasing concentration of people, commodities, capital, and information in the city's core area results in the suburban areas immediately adjacent to the city's core gaining importance (McGee, 2005).

As a result, the peri-urban area has grown to become a new urban center (Budiyantini & Pratiwi, 2016). The result of research carried out by Budiyantini and Pratiwi (2016) supports this classification, stating that the Bandung metropolitan area has a peri-urban area divided into three clusters with distinct physical and socioeconomic characteristics: dominant urban clusters, semi-urban clusters, and potential urban clusters. This cluster includes parts of Bandung, West Bandung, and Sumedang Regencies. Cimenyan District (Bandung Regency), Lembang district (West Bandung Regency), and Jatinangor District (Sumedang) are just a few of them (Supriyatin et al., 2020). Thus, agriculture in the Bandung metropolitan area, which encompasses the areas mentioned above, is classified as urban agriculture. Researchers discovered that urban agriculture in the Bandung Metropolitan area expanded massively into export-oriented intensive urban agriculture during its development.

### Figure 1

*Location of Bandung Metropolitan, West Java, Indonesia (Organisation for Economic Co-operation and Development, 2016)*



## Quantitative Data Collection

### *Sampling and Data Collection*

The sampling method used was accidental sampling, a purposeful sampling of an interesting population because it is available at certain times and in certain places (Rozalia, 2007). We used accidental sampling as we did not have a sampling frame of all the farmers' members and partners. It was because the farmer group was unwilling to provide the data because of the internal privacy of the farmer group institution. We only found the total number of farmer group members. Based on these data, the population of this study referred to the data of the export-scale urban farmer group that had collected 360 people. The population consisting of 360 export farmers were members of export farmer groups spread throughout the Bandung

metropolitan area. Three export farmer groups in the Bandung metropolitan area were willing to participate in this group. To determine the sample size ( $n$ ), the following Slovin formula was used (Tejada & Punzalan, 2012).

$$n = N / (1 + N e^2)$$

Description:

$n$  = sample size (respondents)

$N$  = population size

$e$  = raw numerance distribution value (1.96) in realibility 0.95

Based on the above formula, we acquired a sample size of 107 farmers on an export scale in urban agriculture. The quantitative data collection method in this study was performed with a questionnaire. We used questionnaires to survey urban farmers regarding the commercialization of their households. The questionnaires included demographic questions (respondent identities, education, household size, number of crops sold, number of crops consumed, income from products sold, and the gross value of all products). The questionnaires were open-ended questions. The questions in the questionnaires contain the formula used to measure commercialization based on Govereh and Jayne (1999) and Strasberg et al. (1999). The method of distributing the questionnaires was by proportionally dividing them into three export-scale urban farmer groups. Our total respondents were 107 people; when divided into three groups, each export-scale urban farmer group had 36 respondents. Thus, the total number of questionnaires during data collection was 108 questionnaires. However, one respondent's data was incomplete and not eligible, so we deleted it in this study. Therefore, we continued to distribute the questionnaires to 107 respondents as the previous sample calculation. We collected data through questionnaires by visiting the respondents directly at their respective home addresses in the afternoon and evening. We already have a sampling frame of respondents containing their respective home addresses. Sometimes, we also visited the respondent when they are doing activities in their urban garden when we do not meet the respondent at their house.

### **Quantitative Data Analysis**

We used the household commercialization index to calculate the commercialization of urban agriculture in the respondent's household. The commercialization index of the respondent's household was calculated using a formulation by Govereh and Jayne (1999) and Strasberg et al. (1999). Using the following calculation formula, the gross sales value in year J was divided by the gross value of all plants produced in year J and subsequently multiplied by 100. The result of the calculation is expressed as a percentage (%).

The commercialization value ranges from 0 to 100. A value of 0 shows that the production is only for its own needs (total subsistence), while a value of 100 means that the production is for commercial purposes (high commercial level). Subsequently, we used descriptive statistical analysis to analyze survey data on household characteristics related to farmers' income and education.

## Qualitative Data Collection

### *Informants Determination and Data Collection*

We determined informants based on the purposeful sampling method. For taking informants purposively, we had determined specific criteria for actors who were suitable to be informants. Informants in this study were actors who had a role and position in export-scale urban agriculture activities in the Bandung metropolitan area. The total informants in this study were 27 people. The 27 informants comprised 12 export-scale urban agriculture farmers, two informants from the Department of Food Crops and Horticulture of West Java Province, two informants from the Department of Food Security of West Java Province, one informant from the Department of Industry and Trade of West Java Province, two informants from the Department of Agriculture in Bandung Regency, two informants from the Department of Agriculture and Forestry of West Bandung Regency, two informants from the Department of Food and Agriculture of Bandung City, two informants from packing house officer, and two informants from exporters in different business institutions. Qualitative data collection method used in this study include observation, in-depth interviews, and documentation.

- **Observation:** We observed how farmers managed inputs, production methods, and marketing methods carried out by urban farmers. During the observations, we implemented proper health protocols according to government regulations of the Republic of Indonesia to prevent the spread of the COVID-19 virus. We frequently performed the observation when farmers were in their gardens from 07.00 AM to 11.30 AM. We observed how they planned to determine inputs and carried out cultivation to the harvest process. Therefore, we continuously carried out this observation process for more than one month. We also observed the warehouse and packing house to record post-harvest processing and export-scale commodity delivery processes.
- **In-depth interviews:** In-depth interviews were executed with informants who knew the conditions and practices of urban agriculture commercialization in the Bandung metropolitan area. Before conducting in-depth interviews, we have made preparations to build personal closeness and trust with the informants. We were committed to maintaining the confidentiality of identity data from informants. It was because information on production practices was sensitive and crucial information that could affect the sustainability of their livelihoods. Therefore, this in-depth interview was conducted after we succeeded in establishing social ties with the informants. We built social bonds by visiting the garden's location, inviting farmers to chat with light topics, and sometimes also helping with their activities in the garden. This process took about 2-3 weeks. Interviews with informants were conducted to obtain information on the adaptation of urban farmers, which includes: market access, farm management, and strengthening financial resources.
- **Documentation:** We collected data by accumulating photo documents and video recordings during data collection and recording the voices of informants. We carried out this documentation activity in conjunction with collecting observation data and in-depth interviews. We also did

documentation by taking pictures, recording videos, and writing notes during the observation and in-depth interviews. The documentation of data collection has gone through the process of consent and approval by the informant.

### **Qualitative Data Analysis**

We carried out data analysis consisting of several processes. We referred to data analysis procedures based on Creswell and Creswell (2017). According to Creswell and Creswell (2017), the data analysis process has several preparations for analyzing, understanding, representing data, and interpreting data meaning. In the first step, we organized and prepared all data from interview transcripts, field notes, and results from the documentation. Then, we studied all the data and reflected on its overall meaning, and wrote notes on the results of studying the data. In the next stage, we started by doing a detailed analysis using coding by segmenting the data and labelling the categories according to the farmer adaptation concept based on Kahan (2013), including market access, agricultural management, and strengthening financial resources. After that, we carried out describing the setting of places, events, and categories. The subsequent step was to represent the data in a descriptive narrative and make an interpretation of the meaning of the data that we did in the discussion session. We discussed and analyzed the adaptation process of farmers by referring to the literature of experts who have previously reviewed related to the operationalization of global agricultural systems. We used data source triangulation technique and method triangulation to ensure data validity. We triangulated data sources by cross-checking the answers from in-depth interviews with each informant. We also used triangulation techniques for data collection methods through observations, in-depth interviews and documentation to ensure the correctness of the data obtained from all data collection methods used.

## **Results**

### **The Characteristics of Export-Scale Urban Farmers in Bandung Metropolitan**

Export-scale urban farmers in the Bandung metropolitan area are defined as those whose products are used to meet the needs of export markets to other countries, which includes farmers who belong to farmer groups, farmers who deal directly with foreign buyers, and farmers who become partners with institutions or companies that distribute export products (exporters). The average farmer owns approximately 0.25-3 hectares of land. The export-scale urban farmers have the main production orientation to commercialize most of their products. The commercialization index of export scale urban farmer households in the Bandung metropolitan area of 107 households was 97.58%. Thus, the commercialization index of urban farmer households on an export scale showed a very high number during the COVID-19 pandemic.

Our data showed that the urban farmers continue to allocate substantial agricultural products to meet market demand because export opportunities were not entirely closed during the COVID-19 pandemic. The Indonesian government has not implemented strict international trade restrictions. Before the COVID-19 pandemic, the Indonesian government made various efforts to balance the trade between export and import transaction values. Therefore, export-scale urban agriculture was encouraged to be developed in various regions in Indonesia, including the Bandung metropolitan area. The stimulant given by the government was to help farmers gain market access to cross-country buyers. Buyers in destination countries such as Singapore and Hong Kong were still sending a list of product requests to farmer associations.

Thus, the delivery of agricultural products from the Bandung metropolitan area is still ongoing even though the delivery process experienced problems due to large-scale social restrictions.

Based on Figure 2, the average agricultural commercialization index for male and female farmer households was 97.35% and 98.57%, respectively. This data showed that the commercialization of female farmer households was higher than male farmer households. We found that urban women farmers who held positions as heads of households rely on agriculture as their primary livelihood. Generating economic value to fulfill the needs of family members and taking care of housework were two equally important interests. The agricultural sector was the primary source of income with time flexibility, so women farmers who owned private land could manage their working hours on the farm. They could still control the household, such as taking care of their children, parents, and other household chores. Such condition was indicated by the following statement from our 10<sup>th</sup> informant, who was a female urban farmer:

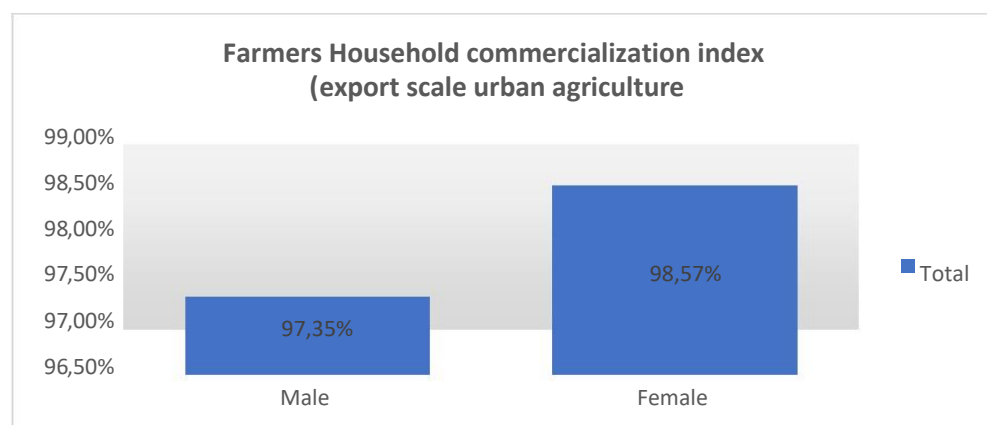
After cooking and cleaning the house, I went to work in my garden. My husband has passed away, so I have to maintain the garden alone. However, I was managing the garden more flexible so I could come home anytime.

Therefore, women as heads of households could become productive household actors who allocated time to commercially oriented agricultural activities. In this case, we found that women who owned land resources became independent agricultural producers. Meanwhile, women farmers who did not own land typically work on other people's agricultural land and receive profit-sharing from the commercialization of their harvested commodities. Most of the time, women farmers were aware of their position as laborers and agree to profit-sharing to improve their household economic welfare. It was accordance with the statement of the 3<sup>rd</sup> informant below:

Everyday, I went to work at 07.00 am, waiting to be picked up by a truck provided by the land owner to transport workers (farmers) whose homes were far from the land. In this region, a woman like me (middle age) could do a job maintaining other people's land. At harvest time, the harvested products were distributed to the landowner and other workers. The harvested products could be sold and stored to meet household consumption. My family's economy had benefited greatly from this job.

### Figure 2

*Export Scale Urban Agriculture Household Commercialization Index in Bandung Metropolitan (Primary Data Processing, 2020)*

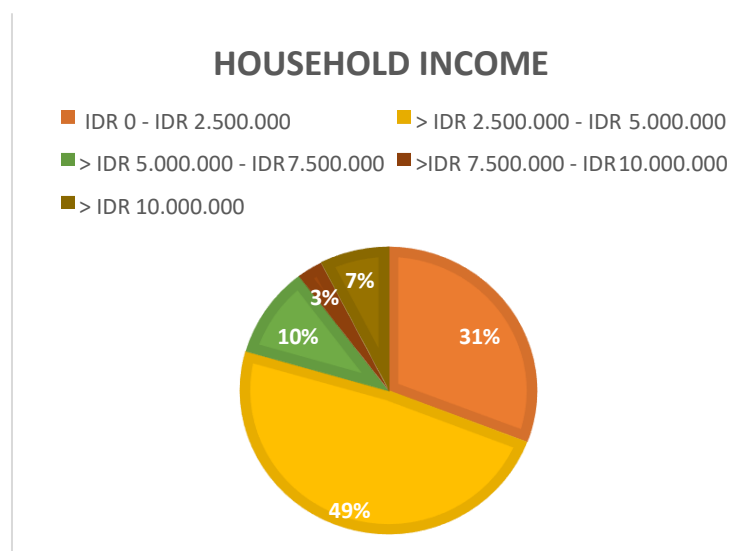


The high trend of commercialization was also because lands in the peri-urban of the Bandung metropolitan area were applied to growing commercial commodities without being set aside to meet the food needs of family members. Our informants stated that selling their crops could maximize the income earned by households. Meanwhile, the farmers fulfilled household food needs by purchasing food from local markets. The farmers had a perception that they could buy various basic needs and diversify their food with their income. Thus, it was perceived that high income could also strengthen the food security of the farmer's households. Such a situation was shown by the following statement by our 8<sup>th</sup> informant, who was an urban farmer:

If the selling price (or yield) increased again, the income would automatically increase, so we could use it to buy food such as beef, chicken, and eggs. We do not have (produce) those foodstuffs. So, our increasing income will affect the many types of food we can buy, actually.

The COVID-19 pandemic has also caused the urban farmers to earn the highest income during crisis conditions. We calculated that 49% or 52 respondents have household income from export-scale urban agriculture of > IDR 2,500,000-5,000,000/month.<sup>1</sup> 10% or 11 respondents have household income from export-scale urban agriculture between > IDR 5,000,000 - IDR 7,500,000. There were 3% or three respondents who have household income from export scale urban agriculture between > IDR 7,500,000 - IDR 10,000,000, and there were 7% or eight respondents who have a monthly household income of more than IDR 10,000,000. This amount is still above the minimum wage value of West Java Province in 2021, which was IDR 1,810,351/month. Meanwhile, the export-scale urban farmers with household income from urban agriculture of less than 2,500,000 were 31% or 33 people. Thus, most of the export-scale urban farmers in the Bandung metropolitan area during the COVID-19 pandemic did not face the economic turmoil that triggered the vulnerability of the agricultural income they earned because most of them gained income above the provincial minimum wage in the year when the survey was conducted.

**Figure 3**  
*Household Income (Primary Data Processing, 2020)*



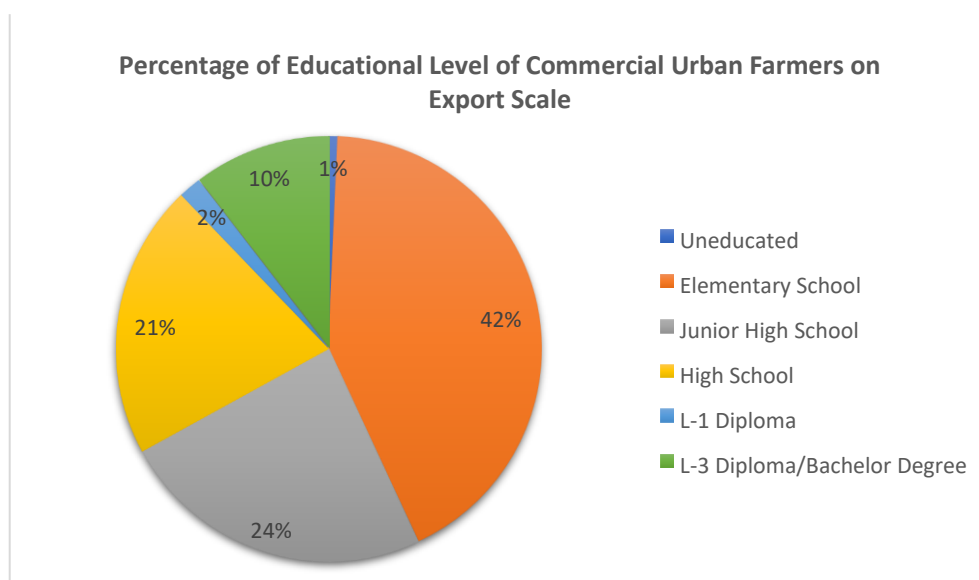
According to the educational level, the education level of export-scale urban farmers showed that 57% of export-scale commercial urban farmers had a primary education

<sup>1</sup> IDR = Indonesian Rupiah

background. Meanwhile, 21% of export-scale commercial urban farmers had a junior high school education, and 14% of urban farmers had a high school education. It depicted that the educational level of commercial-scale urban farmers in the Bandung metropolitan area was still relatively low.

#### Figure 4

*Percentage of Educational Level of Commercial Urban Farmers on Export Scale (Primary Data Processing, 2020)*



However, the export-scale urban farmers' household commercialization index did not show a significant percentage difference between farmers with a bachelor's degree, diploma, senior high school, junior high school, elementary school, or uneducated. If classified based on the last education level, the household commercialization index was still above the average of 96%.

#### Figure 5

*Household Commercialization Index Based on Educational Level of Urban Farmers on Export Scale (Primary Data Processing, 2020)*

Formal Education	Household Commercialization Index	Total Farmers
Uneducated	96,75%	2
Elementary School	97,30%	61
Junior High School	96,95%	23
High School	99,23%	15
L-1 Diploma	96,57%	1
L-3 Diploma/Bachelor Degree	99,47%	5
<b>Total</b>	<b>97,58%</b>	<b>107</b>

Despite any educational background, export-scale urban farmers in the Bandung metropolitan area had a high orientation toward selling their crops rather than providing a considerable proportion for consumption or distribution to their neighbors, especially during the COVID-19 pandemic. One reason why the farmers did it was that they had already signed



contracts with exporters or farmer associations that accommodated their products. Based on the interviews with the administrators of the farmer associations, they have set the minimum rules for product deposits with their partners. To boost the market's demand, the urban farmers typically applied a monoculture system to intensify their agricultural yield.

The contract was mandatory, and if the farmers violated the agreed rules, they could be penalized. Therefore, farmers did not reduce the allocation of products to the exporters or the associations. Other statements from farmer partners stated that they could be subject to penalties when they could not meet the minimum product deposit standards, as well as the following statement from our 2<sup>nd</sup> informant, as an urban farmer, regarding the penalties:

If we did not send our products, we would be penalized. Once, I did not send only one day because there were no products. I was called by the manager (exporter), and he said to me, "you knew that this system was not a joke."

Penalties could be imposed in various forms, from reprimands to contract termination by exporters/associations to the partner farmers. This also became a reason why the urban farmers decided to stay on the commercial route. The implementation of minimum standards for product deposits reflected urban farmers were in a powerless position. The existence of sanctions imposed on farmers was a form of farmers' restraint on their production space. Farmers were not given the freedom to determine the allocation of these commodities. So, the farmers were forced to use their land for the production of cash crops. They could not make allowances for the land area to grow crops used to provide household food. Meanwhile, their food needs were entirely dependent on local market supplies. Therefore, during the COVID-19 pandemic, the farmers were faced with household food vulnerability and the risk of export market uncertainty that affected cross-border trade lines.

### **The Adaptation of Urban Farmers Amid COVID-19 Pandemic**

Nowadays, export-scale urban farmers face pressure from market uncertainty because of the COVID-19 pandemic. The COVID-19 pandemic has influenced various global trade policies (Kerr, 2020). The situation has led to many changes that pose challenges for export-scale urban farmers in the Bandung metropolitan area. Urban farmers must make adjustments to maintain the commercialization of their commodities and survive in the circle of export activity. There were several ways of adapting to export-scale urban farmers in the Bandung metropolitan area, which we classified into aspects of market-oriented agricultural adaptation according to Kahan (2013).

#### ***Market Access***

Farmers have several ways to gain market access. Farmers need access to new alternative markets and access to information on selling prices in various market channels. The following were some of the strategies that commercial scale urban farmers in Bandung Metropolitan gain market access, based on the qualitative data we had gathered.

**New Market Alternative Access.** Before the COVID-19 pandemic, some export-scale urban farmers in the Bandung metropolitan area received market access assistance from the local government. Informants of urban farmers and exporters stated that the government helped market access to cross-border buyers through exhibitions of agricultural products. Export-scale urban farmers in the Bandung metropolitan area responded to the government's encouragement by participating in an agricultural commodity exhibition event. Some informants stated they

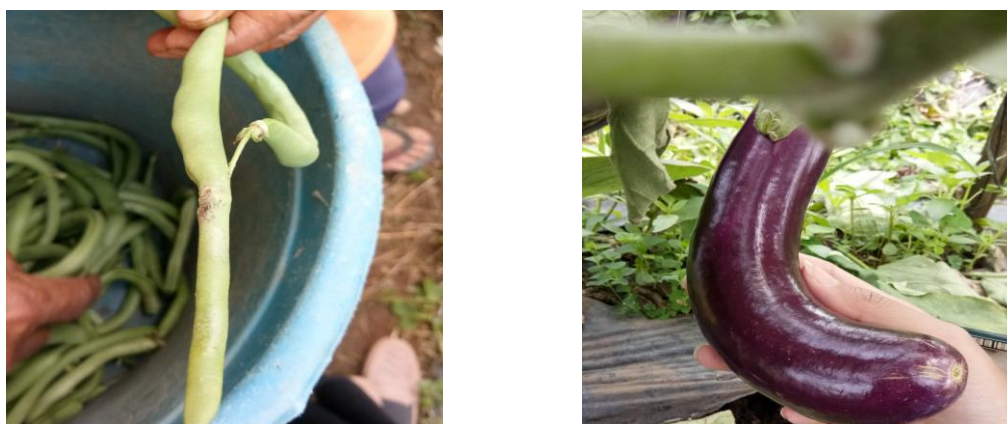
attended a special commodity exhibition managed by the government because there were opportunities for farmers to network with international buyers. Besides, the government also held training for farmer group leaders through the Agricultural Extension and Human Resources Development Agency. That is indicated by the following statement from our 30<sup>th</sup> informant as staff representative of the Agricultural Extension and Human Resources Development Agency:

We knew international buyers from their participation in international exhibitions in Jakarta. The exhibitions were facilitated by the Indonesian Ministry of Agriculture and the Indonesian Ministry of Trade. We also participated in online exhibitions during the pandemic to contact buyers.

Unfortunately, during the COVID-19 pandemic, the exhibition events were not intensively carried out because of domestic and foreign travel restrictions. Therefore, export-scale urban farmers perceived that they had to find ways to gain new market access. Export-scale urban farmers took a persuasive approach to exporters to sort their products in the shipping process. However, not all farmers' products would be sorted because of the strict quality standards for buyers' products in the destination country. The farmer's products would be sorted and classified into at least three grades, i.e., Grade A, B, and C. For Grade A products, they were normally accepted into the export market. However, there were some strict categories that should be fulfilled by a product to be classified as Grade A. For example, green beans (*Phaseolus vulgaris*) commodity could be classified as Grade A standard if the products had a specification of 13.5 cm long with full green color, smooth texture, straight shape (not bent), and fresh. For commodities categorized in Grades B and C, the farmers had to find local markets so that they would not suffer from losses.

### Picture 1

Sample of Grade C Products



The search for the market during such harsh times was not only the responsibility of the individual or farmer's household level. Farmers' associations have also been searching for alternative markets. Farmers' associations decided to establish a network with modern retailers. They built cooperation with supermarkets in the Bandung metropolitan area and DKI Jakarta areas. Even before the COVID-19 pandemic, several export-scale urban farmer associations collaborated with modern retailers to supply certain commodities. Nowadays, they are trying harder to acquire the trust of modern retail managers to supply the types of commodities that were initially intended for export. That condition was in accordance with the following statement mentioned by our 19<sup>th</sup> informant, as an urban farmer and exporter partner:

There were also limitations for depositing products; the main one was the absorption of products for exports, the second was the absorption of products to the modern market, and the rest was the absorption of products to the local market. If we discussed traditional markets, they were full of risks; although we were still inseparable from traditional markets, we directed our production to modern markets rather than conventional markets.

One of the cases of the market shift was the trading of paprika (*Capsicum annum L.*). In the Bandung metropolitan area, some associations had shifted the export market for paprika to the modern retail market. Besides modern retail, another local target market was traditional markets, even though mainly traditional markets had also been affected by the COVID-19 pandemic.

The policy to restrict community activities in public spaces led to a visitor reduction in local markets. Therefore, farmers' associations did not have high expectations for the absorption of local market commodities because of lower selling prices than modern retail and exports. That was in accordance with the following statement by our 13<sup>th</sup> informant, who was an urban farmer's association manager: "We would lose if we entered the local market with the current conditions that were full of uncertainty with low prices and low purchasing power."

During the COVID-19 pandemic, an association of export-scale urban farmers attempted to use social media to sell their products online. The farmers' association implemented a digital marketing strategy by building a website for buying and selling vegetables to serve commodity shipments in West Java and DKI Jakarta. It encouraged the urban farmers expected that such a vegetable trading website could become a new market channel to sell their products.

**Selling Price Information.** Export-scale urban farmers needed to notice the latest updates on commodity prices in various market networks to acquire market channel opportunities that could provide relatively high selling prices compared to other market channels. In addition, market channels to export-scale urban farmer associations still provide opportunities for farmers to bargain prices. Partner farmers could lobby the association manager to reach an agreement on the selling price.

Meanwhile, information on the selling price of exported commodities was an agreement between exporters and international buyers. Partner farmers did not easily access it. The information becomes a secret of the association, and not all members get the information. Therefore, partner farmers often tried to obtain updated selling price information through an online portal that provided commodity price information published by the government's official website. Meanwhile, several urban farmer informants (5<sup>th</sup>, 6<sup>th</sup>, and 7<sup>th</sup> informants) stated that they searched for information on commodity prices by visiting modern shopping centers, as expressed in the following statement:

We compared prices with supermarkets; we saw the selling price on the barcode posted by the supermarket. So, we knew whether the commodity price we plant was going up or down to determine the market before the harvest.

The urban farmers observed the selling prices of the commodities by looking at the labels of similar products to those they planted. So, they could compare the prices of these commodities between retail market channels and export channels. If they found a reasonably high price gap where agricultural products distributed for the export market tended to have low prices, partner farmers would negotiate persuasively with the association or exporter

management. However, several exporters in the Bandung metropolitan area had complete control over selling prices and did not allow farmers to negotiate selling prices. Usually, these large exporters stipulated these regulations in cooperation contracts with partner farmers. They update their selling price list and send it to partner farmers every week.

Thus, the urban farmers actually have little control over the prices of the commodities that have been planted. The farmers' attachment to global markets carries risks related to price uncertainty because the relative price of a commodity has been controlled by the global food regime (Winders et al., 2015). Therefore, there is no price guarantee for the planted commodity (Grossman, 1998). The process of commercialization of agriculture can cause price fluctuations due to the abundance of agricultural production. The condition causes the amount of product supply to be more tremendous than the demand.

### ***Farm Management***

To maintain the continuity of market-oriented agriculture, farmers have to adjust the management of agricultural aspects. In this study, we found several adaptations by the farmers in agricultural management during the COVID-19 pandemic, such as changing the orientation of more durable export commodities, changing input interventions, and improving agricultural facilities and infrastructure.

**Changing the Orientation of Durable Export Commodities.** During the COVID-19 pandemic, export-scale urban farmers had been trying to change the orientation of the types of commodities they produce. It was due to change in demand for commodities from international buyers. This change occurred when the government-imposed restrictions on product shipments through flight restrictions, so commodity shipments were disrupted. In the end, the buyer only ordered products that could last a long time and had high physical quality within the delivery period.

Before the COVID-19 pandemic, export-scale urban farmers in West Bandung Regency planted paprika (*Capsicum annum L.*) as the main crop for export. However, during the COVID-19 pandemic, some exporters in the Bandung Metropolitan Regency no longer received a demand for paprika from buyers in the destination country. Several urban farmer associations had been looking for local market opportunities to sell the paprika they had already produced since the beginning of the pandemic. Some urban farmers also shifted the orientation of the commodities they produced. It was indicated by the 12<sup>th</sup> informant, as farmer and exporter, by the following statement:

We exported non-perishable products such as green beans and sweet potatoes. If we sent products (export), we also should calculate the cost. We served commodity shipments with pre-orders which were quite a lot, for instance, 1-2 tons at a time for Cilembu sweet potatoes. So, we always anticipate the loss.

Some commodities that were currently becoming the focus of farmers for export were green beans (*Phaseolus vulgaris*) and sweet potatoes (*Ipomoea batatas*). These two commodities have a high resistance to decay. Therefore, currently, the primary agricultural export commodities in the Bandung Metropolitan area were green beans and sweet potatoes. For the commodity of green beans, the highest producer of green beans of the five regions included in the Bandung Metropolitan area was Bandung Regency, which reached 14,447 tons in 2019. The second highest production of green beans was in West Bandung Regency West, which reached 5,830 tons in 2019. Therefore, it was not surprising that the export value of green beans commodities in the Bandung Metropolitan area was quite significant during the

COVID-19 pandemic, which was IDR 7,556,765,331 from early March to early November 2020 with a total weight shipped of 184,402 kilograms. Meanwhile, the export value of sweet potatoes in the same period in the Bandung Metropolitan area reached IDR 508,014,764 with a total weight of sweet potatoes of 28,130 kilograms.

Changing commodity orientation has also been carried out by planting other alternative commodities. Many of the export-scale urban farmers applied intensive agriculture, but they did not focus on one type of commodity for export. They implemented an intercropping system on their land to not strictly apply monoculture, but there were still some other varieties being grown. They also used synthetic mulches to support their intercropping system. According to our informants, this would be more efficient than changing the cropping system on their land to polyculture (planting many varieties) using conventional methods that require time, effort, and capital to maintain. That condition was indicated by the following statement mentioned by our 16<sup>th</sup> informant as a manager of the urban farmer group association:

We could survive from a small land, but in what way did we produced our products? We could survive with intercropping; we had trouble with monoculture because most farmers did not have large land, so we had been trying to maximize land with intercropping.

However, the intercropping system was not intended to grow vegetables to meet household food needs, but as a safety net when facing falling prices for major commodities in the export market.

**Changing Input Intervention.** Besides replacing the type of commodities with more durable commodities, the export-scale urban farmers also make changes to input interventions. Some urban farmers decided to buy superior genetically engineered seeds produced by seed companies. Some farmers also intervened with higher synthetic pesticides than before the pandemic. This phenomenon could be viewed from the intensity of synthetic pesticides that were more often used. Based on the interviews with the 14<sup>th</sup> informant as an urban woman farmer, she routinely sprayed pesticides every two days on green beans (*Phaseolus vulgaris*) in a 1-hectare area. She intervened in the crop more intensely during the pandemic to prevent their products from spoiling.

In order to keep produce fresh and non-perishable, our fields required synthetic input interventions with higher doses than usual. Usually, we sprayed pesticides twice a week, but now, we spray pesticides every two days and add 50 kilograms of fertilizer.

There was a case where export-scale urban farmer associations openly imposed regulations on the use of certain pesticide brands on their members and partner farmers. The doctrine of using certain types of pesticides took place in social forums held by farmer associations. Therefore, regular meetings between members and associate partners were held every month to maintain compliance with the instructions. Meanwhile, the impact of the use of synthetic agrochemicals on the environment was not critically realized by many farmers. The use of synthetic agrochemicals that did not follow the doses used can disrupt the basic soil structure, agroecosystem function, and soil biota diversity (Wittfogel, 2008). The urban farmers perceived efforts to survive in the harsh conditions amid the COVID-19 pandemic through changes in inputs as the primary mechanism to maintain both sustainable production and market networks.

**Agricultural Facilities and Infrastructure Improvement.** The urban farmers have been considering the use of more diverse agricultural facilities and infrastructure amid the pandemic of COVID-19. Export-scale urban farmers in the Bandung metropolitan area have utilized technological innovations to achieve maximum productivity. Some farmers used mulches to plant green beans to help maintain soil temperature stability and water efficiency.

**Picture 2**

*New mulch (left) and damaged mulch (right)*



However, mulch is an expensive resource. Farmers needed at least 12 rolls of mulch for one hectare of land. The price for one roll of the best quality mulch ranged from IDR 700,000 to 1,000,000. To use mulch, export-scale urban farmers had to pay for the raw materials and the laborers, in accordance with the statement of the 8<sup>th</sup> informant below:

To produce products of export quality, we had to provide many production facilities and equipment. One of the most important was mulch. We used mulch to increase the yield, and it was also possible to plant alternative crops. If you bought good quality mulch, it could last for 2 years. But the price was a bit expensive, around 700,000-1,000,000/roll. I also needed workers to lay the mulch, it costed more.

The export-scale urban farmers also used cold storage facilities to store their products, so the products were resistant to rotting. Based on our observation, the export-scale urban farmers typically installed cold storage near their land, while other farmers chose to sign a cooperation contract to rent cold storage facilities belonging to the Agricultural Extension Center. However, renting cold storage also required money. Therefore, high enough capital was needed by the export-scale urban farmers to deal with the COVID-19 pandemic situation. It could be concluded that the export-scale urban farmers who could survive to carry out export production amid the COVID-19 pandemic were actors with high economic capital support.

### ***Strengthening Financial Resources***

The urban farmers needed efforts to stabilize their financial conditions amid the COVID-19 pandemic. Financial risk could occur in two channels. The first channel came from global recession risk and the financial crisis because of single market instability, while the second channel came from the risk of losses from policy changes related to trade restrictions. Fortunately, most of the informants were aware of the risk. Within the scope of the association, they had drawn up strategic steps to obtain new financial sources. They aimed to find new

financial sources to anticipate the termination of financial assistance and business credit cooperation from various partners who had previously served as a support system for associations before the COVID-19 pandemic. On the other hand, the urban farmers had additional needs for commodity storage, such as cold storage and packaging warehouses for product storage while waiting for an open shipment. Therefore, seeking access to financial resources was one of the priorities of urban farmers to maintain their urban agriculture business. As stated by the farmer who became the 24<sup>th</sup> informant of this study:

There should be a financial strategy for sustainable production because we needed large amounts of funds for cultivation, paying workers, and maintaining production equipment. Farmers should also be smart in managing their finances in the midst of a storm of economic uncertainty. So, it was very important to seek financial access.

At the association level, they had been seeking financial capital by building partnerships with various parties. One of the parties who were trying to collaborate was banking institutions. Based on our observation when we lived at the farmer association basecamp, the farmer association was busy with a joint socialization event with an Indonesian state-owned enterprise in the banking sector. This event aimed to invite banks to collaborate on social responsibility programs with export-scale urban farmer associations. Based on Law Number 19 (Law on State-Owned Enterprises, No. 19., 2003) concerning the Indonesian state-owned enterprises, the allowance for profits fosters small businesses or cooperatives and fosters the community around Indonesian state-owned enterprises. These regulations caused the banking sector to provide coaching and strengthen financial capital support for business actors. According to the 15<sup>th</sup> informant statement as one of the farmers who were association administrators:

Farmer associations were getting assistance (funding) from one of the state-owned enterprises. The program was called "Corporate Social Responsibility." So financially, we were not too short of operational funds. They (state-owned enterprises) also often came here to give us training. The training ranged from technical assistance to production to marketing training for farmers' products to the marketplace.

We also found that the farmer associations could receive financial support by collaborating with start-up companies that were oriented toward financing capital for farmers. The collaboration was mutually agreed upon in November 2020 after the COVID-19 pandemic exposed Indonesia. This was indicated by the following statement by the 13<sup>th</sup> informant as manager of the urban farmer association:

Currently, we had to cooperate with start-up companies that collected investors' capital outside the region—the start-ups who offered cooperation with us. We agreed that this collaboration was helpful for us because our farmers often lack capital, while the input costs were continually rising.

Start-up companies could become a medium that connected people who were interested in becoming investors with those who provided capital loans for farmers to increase the scale of planting or cultivation. Export-scale urban farmers typically did not apply for cooperation with start-up companies, but start-up companies made the offer to farmer associations. Because of the COVID-19 pandemic, farmers had decided to accept the offer of cooperation.

## Discussion

We observed that export-scale urban farmers in the Bandung Metropolitan area adapted to the hard situations due to the COVID-19 pandemic in various ways. The adaptation strategies focus on market access, agricultural management, and financial resource strengthening. These adaptation strategies aimed to cope with market uncertainty and maintain a share of the export trade. As a result, export-scale-urban farmers in this study retained a high commercial orientation during the COVID-19 pandemic. The success of the adaptation strategies by the urban farmers was also demonstrated by the 97.58% commercialization index of export-scale urban farmer households in the Bandung metropolitan area.

However, the adaptation process undertaken by the urban farmers within the capitalist circle may conflict with the principle of environmental protection. For example, the use of synthetic chemical fertilizers that affect the soil, atmosphere, water sources, and pesticides that cause the death of pollinators is a manifestation of agricultural capitalism by treating nature as a commodity (Giraldo, 2019). Giraldo's statement has relevance to what we found. The results of our research showed that increasing the use of fertilizers and pesticides (with higher doses than the recommended dose) was one of the adaptation steps implemented by the export-scale urban farmers. In reality, farmers sprayed pesticides regularly every two days on green beans (*Phaseolus vulgaris*) in each 1-hectare area. Spraying pesticides (*Curacron* and *Antracol*) for green beans is ideally carried out once a week or 4-5 days during the pest season (Amin, 2014). Changes in these input with high doses can have environmental consequences (Dodd, 2011).

There are considerable discussions about urban environments that they are being unsuitable for agricultural activities and that urban agriculture could contribute to environmental degradation, although some experts have advanced fundamental arguments in favor of urban agriculture. Lands in cities are unsuitable for agricultural activities because they are contaminated by various pollutants such as toxic hydrocarbons and pathogens (Hallett et al., 2016). Pollution of the soil, water, and air can bring a negative impact on crop production, worker safety, and consumer safety (Hallett et al., 2016). Based on the political ecology approach, multinational capital power influences the decision-making made by farmers (Carr, 2015). For a long time, several countries have integrated agricultural systems into the global economy, and supranational forces influence many countries such as transnational capital, international financial institutions, and agreements with international trade institutions (Grossman, 1998). The phenomenon brings farmers into the physiocratic doctrine to understand that there will be no surplus of labor in agriculture and no livelihood for nonagricultural workers without an agricultural surplus (Burkett, 2006). Overall, there is no surplus value in the economy (Burkett, 2006). Physiocrats refer to land as the primary source of growth and economic value (Hornborg, 2015). This phenomenon in the context of farmers in Bandung Metropolitan could be traced to the intensive use of land with mulch in Bandung Metropolitan, which was in the upstream of the watershed. On the one hand, the use of mulch improved water efficiency for cultivation, but also lowers the space available for the development of conservation crops on sloping terrain.

Farmers' adaptation efforts should not be limited to surviving in the export market. The existence of the COVID-19 pandemic should be able to alter farmers' adaptation strategies, placing a greater emphasis on aspects such as meeting food needs and providing adequate family nutrition. Additionally, health issues related to the COVID-19 pandemic should improve awareness of farmers to practice environmentally friendly agricultural practices and increase the quality of healthy food products, given that the COVID-19 crisis has exacerbated long-standing global food system problems (EIU, 2021). As a result, this pandemic raises concerns about food insecurity among countries and international organizations (Sidharta, 2020). According to some experts, urban agriculture may be a solution to the socio-economic



impact of the COVID-19 pandemic, as the concept of urban agriculture can produce between 15% and 20% of global production. Thus, urban agriculture should be devoted to food production to play a significant role in ensuring food security during the COVID-19 crisis (Lal, 2020).

The adaptation of export-scale urban farmers should be harmonized with the internalization of the sustainable urban agriculture agenda through collaboration from various stakeholders. Collaboration between the government, farmers, and the private sector in realizing sustainable urban agriculture must create a mechanism of apparent authority between the three actors. The government has to act as the facilitator who provides facilities for mentoring and allocating funds. The government should play an active role in providing feedback to farmers who have implemented environmentally friendly production activities and provide strict sanctions and supervision if actors carry out intensive agricultural activities that significantly damage the surrounding ecosystem.

The government also needs to provide empowerment policies for farmers, so they have full role and control over the operationalization of sustainable urban agriculture. Farmers should be given the sovereignty to manage the land and have market access. Businesses or the private sector also have a central role in supporting sustainable urban agriculture projects, including assisting agricultural producers with corporate social responsibility (CSR) mechanisms and supporting the implementation of research to improve environmental management knowledge for their partner farmers.

Our study's focus was still limited to researching the types of adaptation practices carried out by export-scale urban farmers during the COVID-19 pandemic. However, exploration of the environmental damage caused by these adaptation practices requires further studies. In addition, we had not explicitly examined the aspect of the network of actors in the management of urban agricultural resources. The network of actors in resource management is one of the critical discussions in the perspective of political ecology to determine the distribution of power between actors that cause environmental degradation. Therefore, we recommend further research related to analyzing the network of actors in the management of urban agricultural resources and measuring the environmental impact of adaptation practices that are not environmentally friendly. We suggest measuring pesticide residues from vegetables and fruit produced by farmers, irrigation water pollution due to contamination from synthetic inputs, and research on land degradation from agricultural, horticultural city activities that expand to slope topographic areas in the Bandung metropolitan area.

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