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Technical Article

The impact of Covid-19 pandemic on *Aglaonema* farming income: a comparison between the height and the post trend

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Abstract

The expansion of the COVID-19 pandemic from 2019 to 2021 has weakened the performance of critical industries in Indonesia. *Aglaonema* as one of the ornamental plants had a surge in demand as part of the farming industry until its height in 2020. Currently, the response to the demand for ornamental plants has declined considerably. This study discussed the revenue and income of *Aglaonema* farming during two periods, at height and the post of the COVID-19 pandemic, and analyzed the distribution of inputs data as information related to the allocation of production. The respondents comprised 32 active farmers from the *Aglaonema* community (ASA) in Depok City, who produced 10 varieties of premium *Aglaonema*, namely *Super Pink, Suksom Jaipong, Khanza, Lotus Delight, Audrey, Tiara, Widuri, Adelia, Bidadari,* and *Pride of Sumatra*. The data was collected from June to November 2022 using the recall method to tabulate data in 2020 (the year of the height of COVID-19 pandemic) and 2022 (the year of the post COVID-19 pandemic). The R/C ratio was used as a profit indicator by considering the implicit and explicit costs. The findings revealed that *Aglaonema* farming in Depok City was highly profitable at the height of the COVID-19 pandemic, evidenced by an R/C ratio of 7.50. The R/C ratio has changed in 2022 value to 1.79, indicating a decline in farming profitability. Suppose the farmers pay the implicit costs in the current situation, the farming becomes less profitable as shown by the return value which is just slightly above the break-even point.

Keywords: *Aglaonema*, comparison, COVID-19, income, ornamental plants.

Resumo

O impacto da pandemia de Covid-19 na renda agrícola de uma propriedade de *Aglaonema*: comparação entre o ganho e pós-tendência

A expansão da pandemia de COVID-19 de 2019 a 2021 enfraqueceu o desempenho de indústrias críticas na Indonésia. *Aglaonema* como uma das plantas ornamentais teve um aumento na demanda e parte da indústria agrícola até seu auge em 2020. Atualmente, a resposta à demanda por plantas ornamentais diminuiu consideravelmente. Este estudo discutiu a receita e a renda da agricultura de *Aglaonema* durante dois períodos, no auge e pós-pandemia do COVID-19, e a distribuição analisada de dados de insumos como informações relacionadas à alocação da produção. Os entrevistados incluíram 32 agricultores ativos da comunidade *Aglaonema* (ASA) em Depok City, que produz 10 variedades de *Aglaonema* premium, ou seja, *Super Pink, Suksom Jaipong, Khanza, Lotus Delight, Audrey, Tiara, Widuri, Adelia, Bidadari* e *Pride of Sumatra*. Os dados foram coletados de junho a novembro de 2022 usando o método recordatório para tabular os dados em 2020 (o ano do auge da pandemia de COVID-19) e 2022 (o ano da pós-pandemia de COVID-19). A relação R/C foi utilizada como indicador de lucro considerando os custos implícitos e explícitos. As descobertas revelaram que o cultivo de *Aglaonema* em Depok City era altamente lucrativo no auge da pandemia de COVID-19, evidenciado por relação R/C de 7.50. A relação R/C mudou no valor de 2022 para 1.79, indicando queda na rentabilidade da lavoura. Supondo que os produtores paguem os custos implícitos na situação atual, as fazendas se tornam menos lucrativa, conforme mostrado pelo valor de retorno que está um pouco acima do ponto de equilíbrio.

Palavras-chave: *Aglaonema*, comparação, COVID-19, plantas ornamentais, renda.

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Introduction

The propagation of the COVID-19 virus has a global effect on communities, and it impacts not only health but also economic, social, environmental, and political aspects. Affected sectors include commerce, agriculture, fisheries, and other sectoral or non-sectoral investment sectors. Due to the COVID-19 pandemic, the industrial sector, which underpins the Indonesian economy, has also experienced instability, impacting agriculture, forestry, and fisheries to be the mainstay for other sectors. According to Central Statistics Agency (2020) statistics, agriculture, forestry, and fisheries were the third-largest contributors to the Gross Domestic Product (GDP) in 2019. Their combined contribution was 12.27%. Significantly, as many as 34.5 million persons of productive age are employed in this area.

Ornamental plants are horticultural subsector plants whose crown shape, leaves, color, scent, and flowers have aesthetic value. An expanding production trend in ornamental plant cultivation characterizes the development of ornamental plant agribusiness (Bulgari et al., 2021). The global demand for ornamental plants tends to increase by 3.9% annually (Gabellini and Scaramuzzi, 2022). Principal consumers of ornamental plants include the United States and Europe, which import them on average from Southeast Asia (Tag and Nangkar, 2018). *Aglaonema* from Southeast Asia is favored due to its relatively lower price and greater species diversity, including the hybrids (Khofifah et al., 2022). Indonesia, whose 27,500 ornamental plant species represent 10% of the world's total ornamental plant variety, might capitalize on this opportunity as a country with a rich biodiversity. Along with the growth of technology and social media, ornamental plant production has become more lucrative. Decoration, landscaping, parties, and other ceremonial activities have utilized ornamental plants.

Aglaonema, an ornamental pot plant pioneer in Indonesia, has become an essential source of farmer revenue. The aesthetic desires that arose from hobbyists' to become a commercial enterprise. *Aglaonema* production has considerably grown and decreased (Khofifah et al., 2022). From 2015 to 2020, short-term volatility occurred, followed by a fall in output in January and June and an increase in production in September and December. The Price of *Aglaonema* tends to rise during those years. The phenomenon of the highest price of *Aglaonema* occurred at the end of 2020, at the height of the COVID-19 pandemic.

Aglaonema production frequently falls short of market requirements. It is relatively difficult to estimate the demand trend for ornamental plants, particularly concerning the desire for hobbyists and decoration service providers (Khofifah et al., 2022). Farmers must also carefully and efficiently handle their products. The term 'efficient' denotes that the utilization of these resources must yield outputs with fewer inputs.

Utilizing resources efficiently is typically the primary issue challenge in the *Aglaonema* business. A case study in ornamental farming demonstrated a failure that was caused by a limitation of land for cultivation, low labor productivity, a high incidence of disease attacks, and an inability to utilize inputs efficiently (Tiasmalomo et al., 2021). Farmers with low management abilities typically send the offer to the customer for varieties with excellent resistance, such as *Red Lipstick, Donacarmen,* and *Big Roy,* but provide very low prices. Farmers only handle high-end varieties (namely *Aglaonema* collections) if they have better experience and understanding of nursing management. This type of farmer also benefited from the high value of price during the rising of sales for those varieties.

Not much research has been conducted concerning the subject of farmer income for *Aglaonema*, whether in Indonesia or the rest of the world. The scarcity and diversity of *Aglaonema* which is only available in a few regions gain complexity for researchers to conduct the socio-economics study. Very few researchers consider its dependence on the level of the demand's trend, which would allow us to assess the further income disparate in two different periods of plant production.

This study examined a group of farmers who have capitalized on the dynamism of the *Aglaonema* trend to obtain high profits. The analysis of *Aglaonema* farming discussed the source of income data to measure whether the farming operation is profitable or detrimental and learning allocation data of manufacturing inputs in terms of quantity and expenditure. Analysis of *Aglaonema* farming was developed by presenting calculations at a single occurrence point, namely the COVID-19 pandemic. The accounting outcomes for these two events were subsequently explicitly analyzed and interpreted. This discussion focused on the performance and dynamic changes in *Aglaonema* farming in Depok City when the Covid-19 pandemic heightened in 2020 and diminished in 2022.

Material and Method

The study was carried out in Depok city-one of the ornamental plant source in major cities in Indonesia. This study's population consists of farmers who are members of a community called *Aglaonema* Nusantara Association (ASA) Depok City. The research objects to 10 (ten) superior types of *Aglaonema* that demonstrated a rising trend at the height of COVID-19 pandemic, including *Super Pink, Suksom Jaipong, Khanza, Lotus Delight, Audrey, Tiara, Widuri, Adelia, Bidadari,* and *Pride of Sumatra*. Figure 1 shows the two types of *Aglaonema* that are most wanted during the COVID-19 pandemic, namely *Suksom Jaipong* which generates high sales at relatively affordable prices, and *Lotus Delight* which promotes the highest prices due to its scarcity.

Figure 1. L: *Suksom Jaipong*, R: *Lotus Delight*

Primary data is the main source of data since no secondary data is provided for farming cost structure. The questionnaires were used to collect relevant information including farmers' backgrounds, farm performance, production variables, cost structure, and plant production. A detailed in-depth survey was conducted on 53 representative farms in the two biggest *Aglaonema* producers throughout the region (Sawangan and Bojongsari districts). A sample adjustment was performed, eliminating the observations for samples that did not cover all 10 varieties studied.

The primary data from farmers were collected and classified into 2 periods; 1) the trend of the high demand for *Aglaonema* which correspondence with the peak of the Covid-19 pandemic, accounted for December - the month of the highest extreme sales in 2020, and 2) the trend of decreasing demand for *Aglaonema* which correspondence with the post Covid-19 pandemic, accounted for June - the month of the lowest extreme sales in 2022.

The data selection criteria are based on in-depth interviews with the heads of farmers before the data collection. The main techniques employed in period classifications are based on the recall method where farmers were asked to recollect the data in each period. The data derived from the survey were processed in Microsoft Excel following farm business analysis developed by Soekartawi (2016). Secondary data was also used from various literature from books, scientific works, research reports, and data from the Central Statistics Agency (BPS), the Department of Food Crops, Horticulture and Plantation of Depok City, and else. It is utilized to enlarge the descriptive analysis to support the primary data.

Data Analysis

This study's data were descriptively and quantitatively analyzed. Age, background, farming experience, occupation, *et cetera.,* are discovered by descriptive analysis. The quantitative analysis of *Aglaonema* farming included costs, revenues, and profits. A month-mean average has been calculated in the average land area since large calculations are not required. The currency used in the research area is the Indonesian rupiah (IDR). However, it has been adjusted into the U.S. dollar, as the world's dominant reserve currency, to make this article more comprehensible. The values are converted based on the Bank Indonesia foreign exchange rate on 24 February 2023, which is IDR15,186 per US$.

Revenue is calculated using the following formula by Soekartawi (2016):

$$TR = \sum_{i=1}^{n} Y.Py$$

Description: TR = Total Revenue (US$); Y = Quantity of sales (US$); Py = Price per variety (US$/pot)

Farming costs are calculated using the following formula: TC = FC + VC

Description: TC = Total Cost (US$); FC = Fixed Costs (including the amount of explicit and implicit fixed costs) (US$); VC = Variable costs (including the amount of explicit and implicit variable costs) (US$)

The Total Cost (TC) is the amount of all production inputs costs, including fertilizers, insecticides, planting media, labor, depreciation, *et cetera*. The requirement is accomplished by multiplying the number of uses by its price, whereas the analysis focuses on certain variables. Certain variables, like labor and depreciation, were analyzed first using a specific formula obtained from Suratiyah (2006). The labor is measured in man-day units before being multiplied by the prevailing wages in the study area.

$$Man - day = \frac{\sum_{i=1}^{n} L.Wh.Wd}{8}$$

Description: L = Labor (the variable for man is 1 and woman is 0.8); Wh = Working Hours (hour); Wd = Working Days (day)

The calculation of depreciation of equipment and buildings uses the straight-line depreciation model. The yearly value is then converted into a month.

$$D = \frac{(C - RV)}{UL}$$

Description: D = Depreciation per annum (US$); C = Cost of an asset (US$); RV = Residual Value (US$); UL = Useful Life (year)

The total value of revenue will be divided by the total cost of farming to achieve the revenue-to-cost ratio, abbreviated as R/C. The R/C ratio is utilized as a benchmark for farming profits based on three criteria (Soekartawi, 2016). These three criteria serve as justifications for analyzing study data: R/C > 1 indicates that farming is profitable; R/C = 1 indicates the farm is at the break-even point; R/C < 1 indicates that farming is unprofitable

Overview of Research Locations and Objects

Depok City has a strategic location to cultivate *Aglaonema* due to the adjacency to the market and consumers. Furthermore, this city provides suitable agronomic conditions for *Aglaonema* by temperatures of 23 – 25 °C, humidity levels of 85% - 90%, wind speeds of 0-20 km per hour, and rainfall of 1,106 mm to 4,579 mm/ year. It brings purposeful benefits that have a direct impact on plant growth.

The *Aglaonema* Nusantara Association (ASA) Depok is responsible for *Aglaonema* farming in Depok City. ASA comprises *Aglaonema* cultivators from numerous backgrounds, including farmers, employees, sellers, and community households. This organization is divided into three levels: Central, Provincial, and City. This organization is spread throughout major cities around Indonesia, including Depok, Jakarta, and Yogyakarta.

ASA was created in response to the changes in the value of *Aglaonema* sales during the Covid-19 pandemic. Farmers required an organization as a place for exchanging ideas and affiliating with others due to the sharp rise in demand. Furthermore, this organization is anticipated to reduce fraud, theft, and counterfeiting of *Aglaonema*. The ASA aims to develop, promote, and improve the regeneration of farmers. This organization comprises some departments such as marketing, research and development, law, and public relations.

Results and Discussion

Characteristics of Respondents

The respondents of the study were classified based on age, education levels, farming experience, number of dependents, number of lands, and status of land ownership. Following is an explanation of the characteristics of the respondents.

Farmer Age

The Central Statistics Agency determines the productive age of the labor, which ranges from 15 to 64 years. This period was crucial in agriculture since it affects physical strength at labor and cognitive abilities, particularly in adopting new technologies. The Minister for National Development Planning (2022) categorizes age into 7 groups that called child (less than 15 years old), young (15-24 years old), early working (25-34 years old), middle age (35-44 years old), pre-retirement (45-54 years old), retirement (55-64 years old), and elderly (more than 64 years old). Farmers who grow *Aglaonema* are mostly classified as 'young' age and 'early working' age. The labor in the 'young' group provides a technological acceptability edge, as seen by their expertise in promoting *Aglaonema* through social media. Younger laborers are not only more creative and innovative than their elders but also gain more power in any sales transactions. This supports other research which found that *Aglaonema* production is mainly in the hands of youth which gain more effective marketing channels (Zarliani et al., 2021).

Education Level

Education level affects the mental state, attitude, and behavior of farmers. Cultivation knowledge is part of the natural sciences gained during schooling. The greater the level of education, the better their knowledge and critical thinking ability. According to the findings, no farmer had a low level of education. The percentage of farmers with a Senior High School diploma is 68.75%; while the remainder has a higher level of education. This elaborates the similar studies stating that floricultural producers are well-educated (Muhammad-Lawal et al., 2012; Tiasmalomo et al., 2021). This also distinguishes the character of farming in *Aglaonema* fields from non-floriculture commodities, whose farmers typically come from a low education level.

Occupation

Farming is considered the be the main job if it can provide most of a farmer's daily needs. *Aglaonema* cultivation can be relied upon as the main job for some farmers (60%). This refutes other studies which stated that cultivating ornamental plants is a non-primary job, besides engaging in traditional activities (Spier et al., 2020). Few respondents privately view this farming only as a pastime

and a side business. The average size of these farmers' plots of land was 197 m^2, yet their cultivation experience was relatively fair (an average of 7 years working on *Aglaonema*).

Farming Experience

Aglaonema is not the first commodity that farmers cultivate, indeed they have prior expertise in producing a wide range of ornamental plants. The experience in farming also affects the level of success in agriculture, as seen by its output results. Farmers that have long experience in growing *Aglaonema* typically possess a high level of knowledge, experience, and skills for addressing any farming issues. There are three categories of farming experience, i.e: less experienced (less than 5 years), moderately experienced (5 to 10 years), and experienced (more than 10 years). According to the survey data, most farmers got moderate experience, with an average number of 9 years in plant farming and about 7 years of experience in specialty growing *Aglaonema*. The findings support others who state ornamental farming is held by the mid-experienced farmer (Muhammad-Lawal et al., 2012).

Number of Dependent Family Members

The word 'dependent family' represents the large number of family members who still live in the same house with the patriarch. There are two categories of family based on their composition, i.e a big family and a small family. Regarding the cost structure of farming, numerous family members can be profitable because they can be employed as unpaid labor called Family labor (TKDK).

According to data, *Aglaonema* farmers in Depok City are classified as a big family where most households have 4 to 5 family members. The total number of dependents in the family, including parents and children, was determined. Typically, the family patriarch solicits assistance from family members to care for the existing *Aglaonema* plants. In addition, family members were regarded to be better and more conscientious when it comes to obeying the instructions of the patriarch. The finding is supported by other research that also highlighted a relatively high family labor availability in ornamental farming (Spier et al., 2020).

Land area

Land area is one of the essential aspects of growing *Aglaonema*. The wider the managed land area, the greater the potential for producing results and the opportunity to create more significant revenue. *Aglaonema* was cultivated utilizing pots arranged in a greenhouse. The land area referred to in this study was the production house's size. The land area of *Aglaonema* farmers was highly varied, ranging from 10 m^2 to 1,200 m^2, with an average of 197.53 m^2.

The land area category is divided into three groups: small farms (0 – 0.5 ha), medium farms (0.5 – 2.0 ha), and large farms (more than 2.0 ha). Farmers grow *Aglaonema* in a small farming area, which is less than 0.5 ha. This is in line with other research showing that ornamental plant farmers are commonly categorized as small-scale producers (Spier et al., 2020). However, growing *Aglaonema* does not require a large size of land like other commodities (such as crops and plantations). Because of its high adaptability in all regions, *Aglaonema* may suitable be a business product in urban areas since its consumers mostly come from middle-high income levels.

Land Ownership Status

There are two types of land ownership: private ownership and rental. Land ownership is tied to a farmer's income, affecting costs, revenues, and incomes. Farmers with land rental status have a lower income than farmers with owned status (Pasaribu and Istriningsih, 2020). The existence of payment obligations has increased farming expenses, hence decreasing the potential revenue. The land rental status is commonly given to large-scale commodity farming, like crops or plantations. *Aglaonema* cultivation in Depok City was performed by farmers who owned privately the land.

Cost Analysis

Cost analysis is performed on all components that reduce the value of farm income. Cost is divided into fixed cost and variable cost. The nominal value of fixed costs is the same for each production cycle and is unaffected by production volume, like depreciation and tax expenses. Variable costs are frequently referred to as an expense that changes in proportion to how much a farm produces. Seeds, fertilizers, insecticides, and labor are examples of variable costs. The cost analysis of farming is presented in Table 1.

Table 1. Cost Structure in Growing *Aglaonema* in Average Farm Size in a Month

Component	The Height of Pandemic (US$)	Post Pandemic (US$)	Percentage to total cost at Height of Pandemic (%)	Percentage to the total cost at Post Pandemic (%)
Explicit Fixed Costs				
Land tax	3.45	3.45	0.15	0.20
Seeds	1,382.85	897.75	58.54	52.49
Planting media	131.17	67.71	5.55	3.96
External labor	22.85	22.85	0.97	1.34
Pots and ingredients	86.20	16.08	3.65	0.94
Fertilizer	9.56	8.00	0.40	0.47
Pesticide	5.77	4.80	0.24	0.28
Total Explicit Cost	1,641.85	1,020.64	69.50	59.68
Implicit Fixed Cost				
Depreciation	507.18	507.18	21.47	29.65
Implicit Variable Costs				
Seeds (vegetative propagation)	137.19	106.46	5.81	6.22
Family labor	76.13	76.13	3.22	4.45
Total Implicit Cost	720.50	689.77	30.50	40.32
Total Explicit Cost and Implicit Cost	2,362.35	1,710.43	100.00	100.00

Source: Primary Data (processed), 2022.

Variable cost forms based on production capacity, productivity, crop variety, and farmer technology. Both fixed costs and variable costs can be classified more as explicit and implicit costs. Explicit cost refers to the component which is purchased in cash; whereas, the implicit cost is any cost that has already occurred without payment but is reported as a separate expense. The components of *Aglaonema* farming in Table 1 are described as follows:

Land tax

The farmer is exempt from paying land taxes since he owns his land privately. The tax value is a kind of explicit cost and is computed under Tax Object Sales Value (NJOP). The NJOP is determined by comparing the costs of similar objects or new acquisition values. The value deemed by the state to be the property tax base. Farmers have to pay an annual land tax of US$ 41.45 per year for an average farm size (197 m^2), in other words, the tax expense per month is US$ 3.45.

Seeds

There are two strategies to receive seeds from *Aglaonema* farmers in the city of Depok: by vegetative propagation (cutting of basal shoots and separating from its mother plant) or purchasing them. Seeds obtained through purchase are categorized as an explicit cost since farmers pay directly for them, while vegetative propagation seeds are factored into the implicit cost. During the height of the pandemic, the total cost of seeds purchased was US$ 1,520.04. The difference was quite significant between post pandemic and the height of pandemic, to wit US$ 515.83. At the height of the COVID-19 pandemic, there was a shortage of seeds due to high demand from new hobbyists, which drove up the cost of *Aglaonema* seeds. The finding suggests farmers improve their knowledge of micropropagation since it is way better to produce the *Aglaonema* seed in a short time (Zahara and Win, 2020) so that farmers do not struggle for the seeds supply.

Planting Media

Aglaonema has a fair vitality, which refers to the capacity to live or grow in any media. The optimal growing media for *Aglaonema* are often formulated from a blend of such raw materials which contains high porosity. Farmers

can purchase pre-mixed planting media or compose the ingredients on their own. Farmers in this study utilize a mixed planting material. The growing medium consists of toasted husks, cocopeat, and fern roots. The planting media is included in the explicit cost since farmers purchase all growing media components monthly. At the height of the pandemic, the total buy value was US$131.17, however, after the pandemic, the purchase value of growth media declined since the purchase of seeds also decreased.

Labor

The labor employed in *Aglaonema* farming consists of Family labor and External labor. Family labor refers to the family members who help with any activities in farming but do not have significant wages. External labor is compensated based on the prevalent pay in the research region. Labor duties include preparing seeds, manufacturing planting media, planting or transplanting (repotting), applying fertilizers, vitamins, and pesticides, maintaining the greenhouses, packing and delivering plants to customers. The cost of labor is gained by multiplying the absolute number of man-days with a certain amount of wages.

The labor structure for growing *Aglaonema* differs from the labor structure for other horticultural products. The cost of external labor is generally more expensive than family labor for other farming types; however, the opposite happens for *Aglaonema* farming. The characteristic of growing *Aglaonema* is comparable to the types of growing flower plants, such as *Chrysanthemum* farming (Selfiana, 2020) and other ornamental plants like Orchid Jasmin or Anthurium (Supiani and Sinaini, 2020). Family members are considered more tender in caring activities and flexible in working hours.

The unit of labor is measured by man-day (HOK). HOK is a unit used to calculate labor costs; its value for men is 1 and 0.8 for women. The labor is compensated on a daily and monthly basis. The wages paid per day to employees range between US$ 3.29 and US$ 9.88, depending on the activity of their employment. Table 2 represents the labor utilization for *Aglaonema* cultivation in Depok City.

Table 2. Labor allocation in average farm size in a month

Component	The height of COVID-19 Pandemic				Post COVID-19 Pandemic			
	Man-day		Wage Expense (US$)		Man-day		Wage Expense (US$)	
	External Workers	Family Workers	External Workers	Family Workers	External Workers	Family Workers	External Workers	Family Workers
Preparing Seed	1.5	0.7	12.13	5.66	1.4	0.6	10.87	4.98
Composing planting Media	1.3	0.3	12.08	3.13	1.2	0.3	11.00	2.78
Planting	1.6	0.6	12.49	4.69	1.4	0.5	11.00	3.92
Fertilizing	0.7	0.1	4.40	0.94	0.7	0.1	4.40	0.94
Applying pesticides	0.5	0.1	3.44	0.72	0.5	0.1	3.44	0.61
Taking care of the greenhouse	1.0	0.2	3.09	0.67	1.0	0.2	3.02	0.67
Packaging	2.9	0.8	21.96	6.72	2.4	0.7	6.54	5.43
Delivery	2.1	0.1	6.54	0.32	2.1	0.1	4.98	0.32
Total	11.6	2.9	76.13	22.85	10.7	2.6	55.25	19.65

Source: Primary Data, (processed) 2022.

Table 2 reveals that packaging activities are the most time-consuming. Farmers must ensure that their product is not harmed in the way to customers; thus, packaging activities are critical. Applying fertilizers or vitamins requires the least amount of time. This demonstrates that this plant does not require much nutrition levels. Pesticides are only used for prevention since specific illnesses that target *Aglaonema* are challenging to treat and can only be avoided.

Fertilizer/vitamins

It is essential to ensure that plants obtain enough sufficient nutrition to grow optimally. *Dekastar* and *osmocot* are the brands of fertilizers used by farmers. Since both fertilizers are kind of slow-release types, nutrients are gradually delivered into the growth media. This fertilizer is applied once every six months. There is a slight price difference between purchasing fertilizers at the height of the COVID-19 pandemic and post COVID-19 pandemic.

At the height of the pandemic, the cost of fertilizer procurement is higher than post pandemics, deliberately US$ 9.56 and US$ 8.00. The slight difference between the two periods was caused by the relatively stable price and low intensity of fertilizer usage. Under the conditions of the COVID-19 pandemic, the acceleration of plant sales significantly reduces the expenses of this activity.

Pest and disease control

Control of plant disease organisms (OPT) in *Aglaonema* is also essential since the disturbance of organisms affects the plant's growth. Disturbances that usually occur are not only diseases and pest attacks, but also physiological disorders. The spread of bacterial stem rot caused by the bacteria *Erwinia carotovora* was controlled by spraying a fungicide containing Propineb 70% WP. Mealybugs were eliminated using insecticide containing Profenofos 500 g L^{-1} at a dose of 0.7 ml per liter of water. The cost of disease control during peak season was still affordable, even more, the high turnover of product stock causes the cost of pesticides to be reduced. At the peak of the COVID-19 pandemic, the cost of applying pesticides was US$ 5.77, a bit higher than in the post-pandemic which was US$ 4.80.

Depreciation

Depreciation is the diminution in the utility or value of assets and is categorized as a non-cash expense. Depreciation is calculated for production facilities such as watering cans, machines, greenhouses, and buildings; except land. Land investment has no depreciation since its value rises yearly (Pasaribu and Istriningsih, 2020). Depreciation is classified as a fixed cost with a value of US$ 507.18 for both time usage.

Pots and packing materials

Pot is a variable expense whose amount varies depending on the amount of output. Direct purchases by customers have caused the consumption of packaging materials to be minimized. Cardboard boxes were only arranged for indirect purchases. Long-distance delivery required additional protection to protect the leaves during shipping. At the height of the pandemic, the price of pots and packaging materials was higher than its need in post COVID-19 pandemic. Farmers spent US$ 86.20 for materials at the height of the pandemic and US$ 16.08 in post-pandemic period.

Revenue Analysis

Farming revenue is the total sale of the ten *Aglaonema* varieties. The amount of sold quantity and prices varied at the period of height and post COVID-19 pandemic. Note that the high value occurred at the peak of the Covid 19 pandemic and not at the beginning of the pandemic, as other studies have found it has ever decreased revenue at the beginning of the pandemic (Anacleto et al., 2021). The following figure demonstrates the revenue for each variety. The farmers' revenue during the height of the COVID-19 pandemic was six times greater than those after the pandemic, as illustrated in Figure 2. During the height of the pandemic, the farmers earned US$ 12,317.90 in a month. It was much more than they earned during post pandemic which only reached US$ 1,828.01 in a month. This was followed by differences in sales volume and plant pricing. *Aglaonema* cultivation is so widespread during the pandemic, along with the growth of mental health awareness and time availability to care the plants (Afrianto and Diannita, 2022). Because of the rose in price, hobbyists were encouraged to care for and sell these plants.

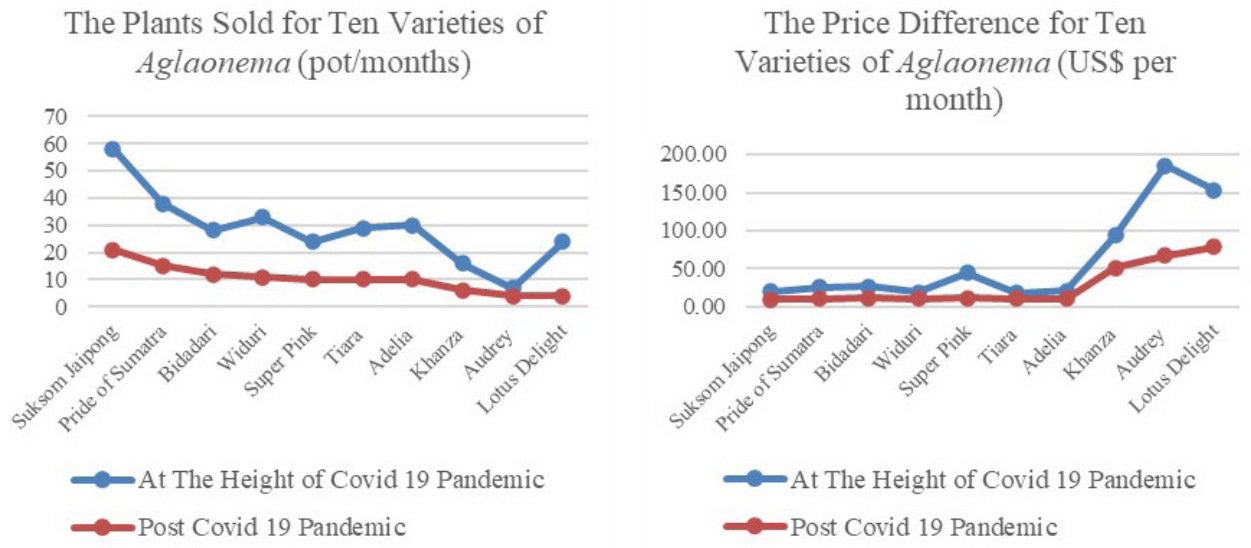

Figure 2. The Output Difference for Selling during the Height of Covid 19 and Post Covid 19 Pandemic, L: sold product (pot) for each variety, R: price difference for each variety

Figure 2 also displays sales trends for each *Aglaonema* variety. *Suksom Jaipong* was the most popular variety. It had affordable prices and vibrant hues. The sales were fairly constant throughout the year. Small quantities of specialty items such as *Khanza, Audrey, and Lotus Delight* were marketed. *Lotus Delight* was the most popular of the three sorts at the height of the COVID-19 pandemic. This variety sold 24 pots per month despite being sold at an exceptional price. Their behavior and preferences affect consumers' propensity to purchase. According to the findings of Olewnicki et al. (2019) customers with low incomes prefer to acquire ornamental plants variety at more affordable costs; on the other hand, consumers with high incomes prefer to purchase ornamental plants of the collection or specialty type, despite its fantastic price.

The Covid-19 pandemic has stimulated consumer interest in various ornamental plant varieties, which cause an increase in total sales volume. Gabellini and Scaramuzzi, (2022) explained that the influencing factors could be 1) consumers' willingness to buy luxury products, under the assurance of quality and scarcity values, 2) consumers' awareness of the socio-ecological benefits and emotional therapy of ornamental plants (Bulgari et al., 2021), 3) consumers' optimistic assessment of the development of local ornamental plants, and 4) consumers' access to social media and online sales platforms have made it easier to purchase ornamental plants (Anacleto et al., 2021). Due to the lack of outdoor activities, the allocation of household expenditure during the pandemic Covid-19 tended to be low. Under these conditions, the saving of households became substantial. It is evident from Olewnicki et al., (2019) that when household expenditures increase, purchasers prefer to acquire less essential things, including ornamental plants.

Aglaonema has an elastic demand for consumer income, which indicates the number of plants demanded was directly proportional to the increase in customer income (Afrianto and Diannita, 2022; Olewnicki et al., 2019). At the beginning of 2022, outdoor activities, such as work and school resumed back to normal. The necessity for food, clothing, communication, and transportation has reduced household urges to buy other less necessary products, including ornamental plants. It noted that ornamental plants require cultivators' care and attention (Afrianto and Diannita, 2022). The lack of time allocated for caring for plants has caused consumers to limit their purchases, either for personal collection or for resale use.

Income Analysis

Farm income is the amount earned from a farming business which shows the difference between revenue and cost. Income is divided into two categories explicit income and implicit income. Explicit incomes refer to income generated after actual payments, while implicit incomes are generated from both actual payments and non-cash expenses. The income from explicit cost was US$ 10,676.05 at the height of the pandemic Covid-19, and US$ 810.54 during post pandemic Covid-19, collected from a land area of 197 m^2. It is supported by another research stating that the potential income of *Aglaonema* farming is enormous (Zarliani et al., 2021).

R/C Ratio

The R/C ratio formula is used to justify farm profits. The R/C ratio is the ratio between revenue and production costs. The R/C ratio is divided into two categories: the R/C ratio on explicit cost and the R/C ratio on the total cost. The R/C ratio on explicit costs attempts to identify the relationship between revenue and explicit costs. This one shows the real condition of how growing *Aglaonema* in Depok city could generate profits. Because the implicit costs are disregarded from its ratio, the discounted cost is more significant than the R/C ratio of the total costs.

The R/C ratio for explicit cost was higher at the height of COVID-19 pandemic, compared to post COVID-19 pandemic. This result is in line with another research stating that the ornamental plant business is feasible throughout the Covid 19 pandemic (Munajat and Sari, 2021). This demonstrates that growing *Aglaonema* during the height of the COVID-19 pandemic was significantly more profitable than the conditions afterward. Every US$ of the explicit cost incurred for *Aglaonema* cultivation yielded US$ 7.50 in return. However, the return farmers gained nowadays was only US$ 1.79 for every dollar expended. This number describes the real-time cost-receipt structure of *Aglaonema* farmers in Depok City, given that the R/C ratio of explicit cost did not calculate the non-cash expenses. Table 3 demonstrates the income of *Aglaonema* farming**.**

Table 3. *Aglaonema* farming income in depok city in average farm size in a month

Component	Height of the COVID-19 pandemic (US$)	Post COVID-19 pandemic (US$)
Total Revenue	12,317.90	1,828.01
Explicit Cost	1,641.85	1,020.64
Implicit Cost	720.50	689.77
Total cost	2,362.35	1,710.43
R/C on explicit cost	7.50	1.79
R/C on the total cost	5.21	1.07

Source: Primary Data, (processed) 2022.

Table 3 shows a big difference in farming revenue at the height of the COVID-19 and post-pandemic, respectively US$ 12,317 to US$ 1,828. The high value of revenue compared to costs causes the R/C ratio to be immense. At the height of COVID-19 pandemic, the R/C ratio for total costs was 5.21, and during the post pandemic period, it was 1.07. The R/C percentage in both periods was less than the R/C ratio on explicit cost. The R/C ratio on total costs has been adjusted to consider implicit cost, consequently increasing the cost of expenditures for production factors and decreasing the ratio of revenues to expenses. This ratio analysis is used to demonstrate the benefit of *Aglaonema* farming if the farmers or investors are willing to pay for all production factors.

Based on this analysis, it can be inferred that *Aglaonema* farming in Depok City is profitable. Even though the profit value has decreased nowadays, farmers are advised to wait for the trends to leverage profits. *Aglaonema* farmers in Depok might increase their product range by expanding their sales through online outlets. Direct visits to flower shops still dominated ornamental plant sales; thus, online sales would be a viable marketing option (Bulgari, 2021; Paiva et al., 2020). The community of Depok *Aglaonema* Nusantara Association (ASA) is recommended to organize the use of this online technology. Farmers need to strengthen their links with other farmers, producers, and distributors to improve their innovative capabilities (Orozco et al., 2021), hence the community of ASA Depok will be very beneficial to help farmers. Furthermore, government support is also required to provide special business zones so that farming will be able to increase the opportunity to grow (Tiasmalomo et al., 2021).

This study also discovered that *Aglaonema* is ideal to cultivate in urban areas. *Aglaonema* has reasonable commercial worth as well as long-term ecological benefits. This industry attracts many middle- to upper-class customers, most of whom live in cities. Customers are willing to pay extra money since this beautiful plant is classified as a specialty good, which implies that the rarer the variety introduced, the more desired and the higher the selling price is (Gabellini and Scaramuzzi, 2022). Environmental sustainability is also significant because this plant affects physical and mental health benefits, particularly in urban regions plagued by numerous pollution disturbances (Olewnicki et al., 2019). Another advantage of *Aglaonema's* business is its relatively quick stock turnover, which is especially important in expanding stage. Khofifah et al., (2022), on the other hand, believe that the changing prices of ornamental plants have a negligible effect on the producer market, implying that these plants will be available throughout the year despite their variable output. This viewpoint is shared by Darras (2020), Olewnicki et al., (2019), and Paiva et al., 2020 who believe that increased interest in ornamental plants will occur in spurts throughout the decline.

Conclusions

The fluctuating revenue of *Aglaonema* farming is dictated by a trend that indicates an increase in production during the height of the COVID-19 pandemic in 2020 and vice versa at post Covid-19 since 2022. Although there were considerable disparities in both periods, *Aglaonema* farming activities in Depok city were profitable. The R/C ratio analysis reveals that *Aglaonema* farming during the height of the COVID-19 pandemic produced significant profits, both in terms of explicit costs and total costs. At the height of the COVID-19 pandemic, the R/C ratio reached 7.50, suggesting that the revenue value was seven times greater than the break-even point. As the COVID-19 pandemic subsided, sales value declined, and farming became less profitable.

The changes in revenue resulted from the increase in price and number of sales for the ten varieties studied. There were only slight changes in some production factors in both periods. The cost structure with the highest expense is the seed, which increases significantly following the trends. This study finds some distinction between the characteristics of *Aglaonema* farming and other commodities. First, the characteristics of labor composition, where the employment of family labor was higher than those of external labor. Second, the attributes of using caring facilities, pesticides, and low fertilizers imply that this commodity had a relatively quick turnover, good adaptability, and durability, thereby supporting farmers in reducing costs. This study revealed that growing *Aglaonema* in the urban area is worth to be developed, according to its high economic value, extensive stock turnover, and low land use.

Author Contribution

LIH: developing the idea and survey design, interpreting data results, and writing the manuscript; **FAM:** organizing questionnaires application, data curation, and manuscript writing; **SS:** conducting investigation and editing the manuscript.

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