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Impact of Post-crisis Policy on Orange Agriculture in Banyuwangi, Indonesia

Azwar Annas[1], Ni'matur Rohmah[2]

[1,2]Agribusiness Study Program
Institut Teknologi dan Bisnis Muhammadiyah Banyuwangi
Banyuwangi, Indonesia
[1]Corresponding Author: Azwar Annas;azwar.ann@itbmb.ac.id

Abstract— The Covid-19 pandemic has adversely affected the economy of Indonesia in various sectors, including agriculture. Orange farming, which is a significant agricultural commodity in Banyuwangi Regency, has not been immune to this negative impact. To help recover the agricultural sector, the Banyuwangi Regency Government launched the Banyuwangi Rebound program in 2021. This research aims to analyze the economic condition of orange farming in Banyuwangi Regency after the Covid-19 pandemic and the implementation of the Banyuwangi Rebound program. The study involved 60 orange farmers and data was collected from 2018 to 2023. The analysis methods used in this research were ordinary least squares and Poisson pseudo maximum likelihood. The results of the analysis indicate that the Banyuwangi Rebound Program has had an adverse effect on the economic conditions of orange farming in Banyuwangi. This finding is contrary to the program's objective and hypothesis. It could be because the Banyuwangi Rebound program is not specific to orange farming and is only implemented by distributing subsidized fertilizer to a small number of farmers from all agricultural commodities.

Keywords—Agriculture Community; Agriculture Policy; Digitalization; Pandemic

I. INTRODUCTION

The world has been hit hard by the Covid-19 pandemic, and Indonesia is no exception. In 2020, Indonesia experienced a negative real GDP growth of minus 2.1 percent [1], indicating a significant decline in its economic conditions. Various sectors, such as the agricultural sector [2] [3], animal feed industry [4], and tourism [5], have been impacted by limited international trade. As a result, the prices and production of various commodities have fallen. Many activities, especially those outside the home, have been restricted [6] [7], causing a slow economic turnover. Orange fruit, which are widely consumed by the Indonesian people, have experienced a decline in trade during the pandemic. This condition lead Banyuwangi Regency, which is the highest-producing region for oranges in Indonesia [8], has also been affected by the restriction policy.

In late 2021, there was an increase in community activities and the number of domestic and foreign tourists after the implementation of relaxed social restrictions. This development has been positively impactful on the economy, and as a result, the Banyuwangi Regency Government has initiated a program to support it. The "Banyuwangi Rebound Program" is an effort by the government to address the health and economic challenges posed by the Covid-19 pandemic. One of the main focuses of the Banyuwangi Rebound Program is to increase the economy of agricultural sector. This program has been running since 2021 and an academic study is needed to determine the program's impact on society. Specifically, this research is aimed at studying the effect of the Banyuwangi Rebound Program on the economy of orange farming, which is a significant contributor to the economy of Banyuwangi Regency.

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According to recent data from the Ministry of Tourism and Creative Economy [9], tourism in Bali experience a significant increase of 400% from 2021 to 2022. The Ngurah Rai Airport has been identified as the primary entry point for foreign tourists, which is expected to have a positive impact on the local economy. This development has also been a boon to the orange farming industry in Banyuwangi since Banyuwangi is close to Bali. The Banyuwangi Regency Government who initiated the Banyuwangi Rebound Program could prioritize this development to increase the economy of the agricultural sector. That means orange farming is also one of the industries that receive the benefit of the development. It is essential to conduct academic research to assess the impact of this program, and the Banyuwangi Rebound Program must be thoroughly studied to determine its effectiveness in revitalizing the local economy, especially for orange farmers.

There have been limited studies conducted on the economic policies implemented by local governments to support small and medium-sized enterprises (SMEs) following the Covid-19 pandemic. According to some literature, government policies have primarily focused on health management, resulting in a considerable economic decline due to reduced consumption and insufficient government support [10]. This condition can exacerbate poverty and lead to more individuals becoming vulnerable to Covid-19 [11]. Governments in a number of countries are now beginning to address the economic situation stemming from lower production output through the use of monetary policy. However, this approach can result in inflation, which must be subsequently controlled through monetary policy further [10].

The Covid-19 pandemic has significantly impacted businesses, especially on small and medium-sized enterprises (SMEs) behaviour [12]. Many SMEs have acted irrationally, becoming more wasteful due to general panic in society. At the same time, they have become more concerned about each other. The pandemic has put immense pressure on SMEs, forcing them to innovate without any government assistance [13]. As a result, SMEs have started to be more creative in marketing, focusing on environmentally-friendly practices, and fostering collaborations between businesses (B2B) and customers (B2C) [13] [14].

Drawing from the aforementioned literature, a comprehensive review suggests that viable governmental strategies encompass financial backing, facilitation of SME innovation toward enhanced sustainability, and fostering collaborative initiatives to bolster resilience during periods of crisis. Further investigation of the Banyuwangi Rebound Program is warranted to ascertain its precise advantages for farmers.

II. METHODS

A. Research Location

This study was conducted in the Banyuwangi Regency, with a specific focus on Siamese orange commodities and Siamese orange farmers. This research aims to assess the specific effects of the Banyuwangi Rebound program on the orange farming in the Banyuwangi region. The study relied on primary data collected from orange farmers in Banyuwangi. Primary data was obtained through direct interviews, utilizing a questionnaire developed for this purpose. A sample size of 60 respondents was selected using a combination of purposive and snowball sampling methods. To be more precise, four villages of orange producers were chosen using purposive sampling, with 15 farmers selected from each village. Additionally, snowball sampling was used to recruit orange farmers from each specified village.

B. Analysis Methods

This study employs the Ordinary Least Square (OLS) estimation and Poisson Pseudo Maximum Likelihood (PPML) estimation techniques to evaluate the impacts of a country's policies using linear regression analysis [15]. The variables considered encompass references from various sources, notably business income [16], agricultural land area [17], selling price, production cost, access to digital technology, participation in the Banyuwangi Rebound program, and involvement in the local farming community. Additionally, this research had incorporated additional variables such as education level and experience in orange farming. The equation for the OLS estimation is depicted as follows in Eq 1.

$$\ln I_t = \beta_0 + \beta_1 \ln W_t + \beta_2 \ln P_t + \beta_3 \ln C_t + \beta_4 \ln Exp_t + \beta_5 \ln Ed + \beta_6 Dig_t + \beta_7 Reb_t + \beta_8 Kom_t + \varepsilon_t \quad (1)$$

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This study will utilize the natural logarithm in OLS estimation to mitigate heteroscedasticity arising from significant variations in variable values. However, the presence of zero values in the data can pose issues when applying the natural logarithm. To mitigate this, a value of one will be added to any zero values encountered. Ensuring result accuracy, this research will cross-validate the outcomes derived from OLS estimation with those obtained through Poisson Pseudo Maximum Likelihood (PPML) estimation. PPML is a prevalent technique in linear regression analysis, particularly when handling datasets containing zero values, as it effectively incorporates these entries. Moreover, PPML finds common use in policy analysis research, particularly when dealing with binary data, due to its ability to handle such scenarios adeptly. The equation for PPML estimation is outlined in Eq 2.

$$I_t = exp\{\beta_0 + \beta_1 \ln W_t + \beta_2 \ln P_t + \beta_3 \ln C_t + \beta_4 \ln Exp_t + \beta_5 \ln Ed + \beta_6 Dig_t + \beta_7 Reb_t + \beta_8 Com_t\}.\varepsilon_t \quad (2)$$

The dependent variable, denoted as I_t, represents the income generated by orange farmers during year t. The set of independent variables includes W_t, signifying the cultivated land area by orange farmers in period t; P_t, indicating the selling price attained by orange farmers in period t; and C_t, representing the production cost incurred in orange farming during period t. Additionally, Exp_t reflects the duration of experience in orange farming during period t, while Ed signifies the consistent level of education among orange farmers across periods. Moreover, there are binary variables: Reb_t, a binary indicator for access to the Banyuwangi Rebound program; Dig_t, representing access to digital tools or products; and Com_t, indicating access to farming communities. The hypothesis posited in this research contends that all analyzed independent variables will exhibit a significant positive correlation with the dependent variable.

III. Results and Discussions

A. Data and Farmers Conditions

The study encompassed 60 farmers from four distinct villages in the Banyuwangi area, recognized as a center for orange farming. A combined approach of purposive and snowball sampling was employed for data collection, involving 15 farmers from each of the four villages. The data was gathered over a span of six years, from 2018 to 2023, accumulating a total of 360 observations for analysis. The collected data revealed that the majority of respondents engaged in orange farming were small-scale farmers with land areas spanning less than one hectare, as depicted in Figure 1. Notably, throughout the research period, a substantial portion of Banyuwangi's orange farming activities remained in the initial planting stages, resulting in diverse data due to the absence of income records. The typical pattern in orange farming involves a minimum of two years wherein costs are incurred without corresponding income during the initial planting phase. Additionally, the research unveiled instances where land was temporarily utilized to cultivate commodities other than oranges between 2018 and 2023.

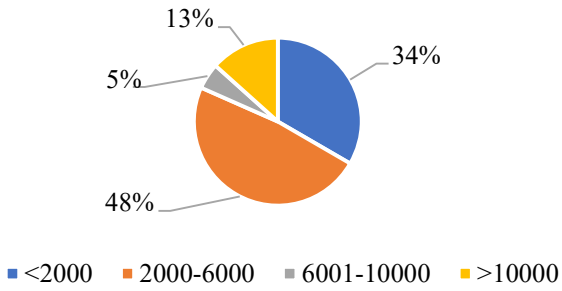

Fig. 1. Orange farmland of corresponding farmers

Based on the area of land cultivated by orange farmers, the income and costs incurred will be different. It is not always the case that wider cultivation will provide higher income or incur higher production costs. According to the research data, a majority of farmers, accounting for 40% of the total observations, earn less than IDR 20 million per year. The next significant income bracket,

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comprising 21% of the total observations, falls within the range of IDR 20 million to IDR 40 million per year. This income level is typically achieved when the orange fruit harvest begins, usually starting from the third year after planting. On the other hand, production costs in orange farming commence right from the planting phase. A substantial proportion of orange farmers, approximately 60%, incur relatively low costs, specifically less than IDR 10 million per year. The distribution of several data variables is detailed in Table 1.

Table 1. The percentage of farmers data variables

No.	Income (IDR/year)	Percentage
1	< 20 million	40%
2	20 million – 40 million	21%
3	40 million – 60 million	10%
4	60 million – 80 million	6%
5	80 million – 100 million	8%
6	> 100 million	14%
	Production cost (IDR/year)	
1	< 10 million	60%
2	10 million – 30 million	26%
3	30 million – 50 million	6%
4	> 50 million	8%
	Education level	
1	Elementary school	13%
2	Middle school	47%
3	High school	32%
4	College	8%
	Orange farming experience	
1	1-5 year	37%
2	6-10 year	25%
3	11-15 year	12%
4	> 15 year	25%

The agricultural community in Banyuwangi has undergone significant development, yet there isn't a specific community for orange farmers. Instead, agricultural communities generally encompass members from various agricultural commodities. Joining such communities offers benefits like sharing agricultural knowledge between members and access to fertilizer subsidies. Government-provided fertilizer subsidies are typically channeled through agricultural communities due to the community membership possessing clearer data regarding targeted farmers. Among the total data gathered, 68% of orange farmers are part of these agricultural communities.

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Contrarily, in the contemporary era, digital technology has seen substantial advancement in Indonesia. However, the reception among orange farmers in Banyuwangi appears lukewarm. Research data indicates that the majority of farmers, constituting 68%, refrain from utilizing digital products such as cellphones and the internet to enhance their practices in orange farming. This condition may be attributed since the major orange farmers in the data are from older-generation who might be less inclined or resistant to adopting or learning about digital technology.

The data utilized for the Banyuwangi Rebound Program in this research is represented through dummy variables. These dummies were assigned a value of zero for the period between 2018 and 2020, while assuming a value of one for the period spanning from 2021 to 2023. The primary aim of this research is to ascertain the influence of the Banyuwangi Rebound program on the economic landscape of orange farming in the region. This objective will be pursued using two statistical estimation methods: the Ordinary Least Square (OLS) estimator and the Poisson Pseudo Maximum Likelihood (PPML) estimator. These two methods are frequently employed for comparative analyses to discern insights derived from different analytical approaches.

B. Ordinary Least Square Estimation

The research applied panel data analysis to assess the impact of the Banyuwangi Rebound Program policy. Two estimation methods, namely OLS and PPML, were utilized. The outcomes of the OLS estimation are presented in Table 2. These results confirm the hypothesis, indicating a positive and statistically significant relationship between the independent variables land area (W_t), selling price of orange commodities (P_t), and production cost variables (C_t) to dependent variable, income (I_t). The findings suggest that an increase in the orange farming land area leads to higher income for farmers. Regarding the selling price of oranges, the analysis reveals a substantial effect, a one-point increase in the selling price multiply to 3.58 points rise in income for orange farmers, ceteris paribus. Notably, the impact of orange prices appears to be considerably substantial, nearly four times greater. Furthermore, higher production costs are associated with increased income for orange farmers, as indicated by the analysis results.

Table 2. OLS estimation results

ln I_t	Estimate	Std. Error
ln W_t	0,552**	0,268
ln P_t	3,579**	1,801
ln C_t	0,351**	0,138
ln Exp_t	0,640	0,443
ln Ed	0,100	1,571
Dig_t	0,524	0,914
Reb_t	-0,934	0,837
Com_t	1,234	0,868
Constant	-32,916**	15,757
Observations	360	
R2	0,364	
Adjusted R2	0,349	
Residual Standard Error	6,991 (df = 351)	
F Statistic	25,087*** (df = 8; 351)	
Note:	*p < 0,1; **p < 0,05; ***p < 0,01	

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The analysis outcomes for variables experience (Exp_t), education (Ed), digitalization (Dig_t), Banyuwangi Rebound program (Reb_t), and access to farming communities (Com_t) did not exhibit statistically significant results. Specifically, the variable representing the Banyuwangi Rebound Program (Reb_t) demonstrated a negative coefficient of -0.934. This implies that the Banyuwangi Rebound Program potentially plays a counterproductive role in the development of the orange farming economy, as it seemingly correlates with a decrease in income for orange farmers. However, it's important to note that this particular figure lacks statistical significance. This finding runs contrary to both the intended objectives of the Banyuwangi Rebound Program and the hypothesis that government policies should positively impact the economic welfare of orange farmers.

C. Poisson Pseudo Maximum Likelihood Estimation

The dissimilarities between the analysis outcomes using the PPML (Poisson Pseudo Maximum Likelihood) estimator and the OLS (Ordinary Least Square) estimator can be attributed to the PPML's capability to address the presence of heteroscedasticity [18]. The results of the analysis using the PPML estimator can be seen in Table 3. In the results obtained from the PPML estimator, consistent patterns emerge, echoing the OLS estimation findings for variables such as land area (W_t), selling price (P_t), and production costs (C_t), indicating a positive and statistically significant relationship with income (I_t). However, the distinctive aspect between the two estimation methods lies in the magnitude of influence these variables exert on the dependent variable. Notably, the PPML estimator yields larger coefficients for the land area (W_t) and selling price (P_t) variables compared to the OLS estimation. Specifically, the coefficient for the land area (W_t) suggests that a one-unit improvement in land area can increase income (I_t) by 1.53 units. The impact of the selling price (P_t) variable is substantial, with a coefficient of 6.63, signifying a nearly 700% positive influence on the income variable (I_t), ceteris paribus. In contrast, the variable representing production costs (C_t) exhibits a smaller impact magnitude compared to the results derived from the OLS estimation in the PPML estimator's findings.

Table 3. PPML estimation results

I_t	Estimate	Std. Error
ln W_t	1,535***	0,147
ln P_t	6,626***	0,637
ln C_t	0,104**	0,047
ln Exp_t	1,158***	0,215
ln Ed	1,820**	0,878
Dig_t	-2,569***	0,480
Reb_t	-0,169***	0,048
Com_t	-1,478***	0,320
Constant	-59,929***	5,575
Observations	360	
Residual Standard Error	1481000 (df = 351)	
F Statistic	25,087*** (df = 8; 351)	
Note:	* p < 0,1; ** p < 0,05; *** p < 0,01	

The PPML estimation analysis presents divergent findings compared to OLS estimation concerning the variables Exp_t (experience) and Ed (education). These variables demonstrate a notable and statistically significant impact on income (I_t) with a positive relationship in the estimation results using the PPML method. In particular, the estimation results for the (Exp_t) variable

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display a considerably high figure, signifying that an increase in a farmer's experience in orange farming correlates with higher income (I_t). The coefficient for (Exp_t) stands at 1.16, implying that each additional year of experience among orange farmers results in a 1.16 fold increase in income. Similarly, the coefficient for the education variable (Ed) surpasses the impact magnitude of (Exp_t). This suggests that for each higher level of education attained by a farmer, their income can potentially rise by a factor of 1.82. In essence, higher education levels among farmers appear to yield a more substantial positive impact on income compared to the influence of increased experience in orange farming.

The results obtained from the PPML estimation reveal a surprising outcome concerning three binary variables: digitalization (Dig_t), the Banyuwangi Rebound Program (Reb_t), and access to the orange commodity farming community (Com_t). Contrary to the initial hypothesis that proposed a positive relationship, these variables exhibit a significant negative influence on farmer income (I_t). This implies that the involvement of digitalization, the Banyuwangi Rebound government program, and participation in the farming community has resulted in a decrease in farmer income. The coefficient for the (Dig_t) variable, notably -2.569, represents a substantial negative impact on farmers' income. The interpretation of this figure suggests that digitalization could potentially reduce farmer income by up to 92% ($(e^{-2,569} - 1) \times 100\%$), ceteris paribus. This result contrasts with established theories and prior research that indicates digital technology could support economic development. Despite the common use of digital tools, their function might not significantly altering farmers' income. It's possible that digital tools aren't effectively used for the needs of orange farmers. These tools might not assist in expanding market reach or enhancing farming skills, which could typically be obtained through online learning platforms. Instead, the primary function of digital tools for farmers seems to be limited to ease access to price information from local commodity collectors, especially given that most farmers operate on a small production scale.

The Banyuwangi Rebound Program, designed by the government to revive the economy post-Covid-19, aims to enhance various sectors, including agriculture. However, the results from the PPML estimation analysis show the variable Reb_t has a negative coefficient of -0.169 to the orange farmer income (I_t). The program potentially decreases the income of orange farmers by approximately 15% ($(e^{-0,169} - 1) \times 100\%$). This contradicts with the program's objective of uplifting the agricultural sector's economy. This discrepancy in outcomes could stem from a lack of alignment between the program's objectives and the available data. The available data predominantly reflects information regarding farmer income and the implementation of the Banyuwangi Rebound Program. It appears that the program's impact on farmers might be minimal, largely limited to the provision of fertilizer subsidies without specific allocation for orange farming but rather distributed among farmers engaged in various agricultural commodities. This lack of specialized allocation or targeted benefits for orange farming might explain the absence of significant positive effects on the income of orange farmers despite the program's broader economic objectives.

The variable representing access to the orange farmer community (Com_t) also demonstrates a negative impact on orange farmer income, evident from its coefficient of -1.478. This implies that involvement in the orange farming community could potentially decrease farmer income by as much as 77% ($(e^{-1,478} - 1) \times 100\%$). This outcome contrasts with the hypotheses and established theories in prior research, suggesting that the farming community might not directly contribute to augmenting farmer income. It's plausible that the farming community, as reflected in the data, primarily serves as a platform for information dissemination without directly translating into tangible income enhancements for farmers. This discrepancy might arise due to the limited role of the farming community in directly facilitating income-generating activities or economic opportunities for orange farmers, as indicated by the available data.

IV. Conclussions and Recommendations

A. Conclussions

Most analyzed variables align with the hypothesis and theoretical frameworks. Notably, variables such as land area, selling price of orange fruit, and production costs exhibit a positive relationship with farmer income. An expanded land area dedicated to cultivation corresponds to increased income among orange farmers. Moreover, the selling price of oranges demonstrates a remarkably substantial impact on farmer income, with a potential 3 to 6-fold increase in income corresponding to higher selling prices, ceteris paribus. The education level and farming experience variables display a positive relationship with increased income

for orange farmers. These findings imply that higher education levels and more extensive experience in orange farming contribute positively to enhancing farmer income in this context.

The research yielded contrasting results in the variables related to the Banyuwangi Rebound program, digitalization, and access to farming communities. These variables display a negative relationship, contrary to the initial hypothesis, suggesting that their presence might lead to a reduction in farmer income. This contradicts the intended objectives, particularly for the Banyuwangi Rebound Program, which is envisioned to elevate farmers' income. Such unexpected outcomes might stem from inadequate data representation or program design, notably as the Banyuwangi Rebound program's impact on farmers' income appears to be indirect, primarily through the channel of fertilizer subsidies.

B. Recommendations

The research primarily focuses on examining the impact of the Banyuwangi Rebound program, and the results indicate a negative effect on farmer income. This adverse impact might stem from the indirect nature of the program, primarily providing subsidies solely for fertilizers. Notably, these fertilizer subsidies aren't exclusive to orange farmers but extend to all agricultural practitioners. Moreover, the data suggests that only a small proportion of farmers access these subsidies, while the majority of orange farmers use non-subsidized fertilizers. To potentially enhance its impact on farmer income, the Banyuwangi Rebound program could extend its scope beyond fertilizer subsidies. Expanding the program to include broader market access for orange farmers could significantly amplify its positive influence on farmer income. By facilitating increased market opportunities, the program could create a more direct and impactful effect on the income of orange farmers.

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