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The portrait of the underground economy and tax evasion: Descriptive analysis from border region

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ABSTRACT

Underground economic activity is a phenomenon that requires special and continuous treatment. This phenomenon is counterproductive to local revenues and is related to corrupt practices and tax evasion. The research was conducted in Bengkayang Regency, West Kalimantan Province, Indonesia. The qualitative phenomenological method was carried out by interviewing underground economic actors such as liquor producers, "pangku" coffee shops, and street vendors. The findings indicate that corruption activities in the form of collecting bribes and offering bribes are carried out in cash without going through a legal transaction mechanism. The underground economy practices tax evasion, does business without a permit, pays substandard wages, and does not protect workers with insurance. The underground economic activity will contribute to an increase in the circulation of money in society, but do not take into account the regional economy. Such situations call for massive supervision of individuals and the introduction of pentahelix elements to form synergies between actors and to begin to integrate and develop digital structures in every financial activity using e-government systems.

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INTRODUCTION

National income is one of the benchmarks for the country's economic indicator. It is hoped that the correct calculation of national income will be able to contribute to the national economy and identify which sectors contribute to the development and which ones need to be strengthened sectors in order to support the social development. Underground economic practices are an important part of numerous countries, both developed and emerging. Economic operations are carried out both lawfully and unlawfully, the latter of which are not detected in the calculation of national income/GDP (Schneider & Hametner, 2014). During the 2001-2013 period, Indonesia's underground economic growth was 8.33% of GDP. As a result, there is a possible revenue deficit of 11,172.86 billion rupiahs, or around 1% of GDP, which covers market output of legitimate and illicit products and services that are exported or purchased illegally (Samuda, 2016).

Based on the findings of Feige (1990), the underground economy is classified into four groups: (i) the illegal economy: commercial activity that breaks laws such as the selling of stolen goods, slavery, smuggling, bribery, trafficking and drugs, (ii) the unreported economy: failure to disclose income to the tax authority concerned, (iii) an unrecorded economy: lack of statistical evidence on income for the

government and (iv) an informal economy: commercial actors that receive income without a business license, a job arrangement and a loan from an official financial institution (Azwar & Mulyawan, 2017). Measuring the level of the underground economy is not an easy assignment with a challenging level of precision. Optimal fiscal policy related to tax collection and administration needs to be more positive and pro-economic actors so that they can become registered business actors for contributing to GDP and being the target be the subsidies policy of the SME (Small Medium Enterprises) industry (Asaminew, 2010). Underground economic activity is an enterprise that produces revenue beyond the knowledge of the tax authority with a view to tax evasion, and involves the informal sector and the black market, which is commonly referred to as the illegal market.

The sluggishness of Indonesian SMEs is exacerbated by a range of social cognition errors. This social cognition is derived from cultural understanding shared in newspapers by the Indonesian government and citizens. There are perception-related shortcomings among market players, such as systemic philosophy, structuralism, and social learning. Due to the shortcomings of Indonesian SMEs, there is a need for collaborative research based on a philosophical approach to science. The low growth of SMEs in Indonesia is due to a lack of understanding among business players about how to build a business while considering social aspects such as salaries in compliance with government policy, employee health assurance, acceptable business practices and sufficient rewards for employees (Panjaitan et al., 2020).

Black markets were created as a result of overly rigid government controls and prohibitions on products entering the market. The unregulated market is illegal even with the lawful allocation of sales and market share. Production and distribution of products on the black market is illegal and violates state law. Illegal market descriptions are highly associated with informal sector activity such as small business units, self-employed employees, unregistered enterprises, low access to credit facilities, and position in border and peripheral regions (Faal, 2003).

Tax management policies frequently fail to be implemented due to many factors such as the civil servants' poor expertise in taxation, the indiscipline of business players, and mistrust of state agencies (Pravasanti, 2018). Fiscal policy commitment through moderate tax cuts and constant tight supervision will reduce the amount of underground economic activity and provide a boost for the regional economy, thus increasing regional government fiscal revenues (Orsi et al., 2014). The high level of tax pressures imposed on business players, the level of cash money supply, and unemployment add to increased tax evasion activity (Amoh & Adafula, 2019).

The approach of raising tax rates is intended to raise the amount of government revenue. However, this action will lead to future tax deviations and disincentive to the population in carrying out economic activities, thus enabling people to enter the underground economy (Azwar & Mulyawan, 2017). Increased underground economic growth will cause problems with poor fiscal decentralization policies and particularly growing regional economy in local level (Kanao et al., 2010). The general stereotype against performers in the underground economy is slum, filthy, disorderly, poor-ordered trade facility, unorganized business, unpleasant street vendors (Schneider, 2014). This characterizes the condition of the economy segment, namely the relatively limited size of operation, local resource reliance, time and location versatility and relatively simple accessibility (Tanzi & Fund, 2014; Wa Ode, 2015). Unfortunately, this underground economy continues to grow and becomes the choice of underground economic actors to survive. Such constraints as low employment opportunities and low quality of human resources encourage many people to engage in informal work.

There is a positive correlation between the degree of corruption and the actions of underground economic players, as shown by a limited circulation of money in a monetary point of view and the transaction value is not calculated by GDP. This can reduce state and local revenue accounts and show pseudo national economic activity. High levels of corruption diminish public confidence in government authorities, which can influence tax evasion and increase underground economic activity (Marè et al., 2020). The increasing activity of the underground economy in the form of bribery and criminal acts of corruption has worsened the image of law enforcement and the rule of law (Marliza Mohamed, 2012).

The complex bureaucratic pressure makes underground economic players choose alternate routes in all areas and seek security to keep their business going normally (Ouédraogo, 2017). To

foresee and control the issue of underground economic crime, the government must be prepared to take decisive action relating to underground economic operations by partnering with industrial organizations to engage in digital technology (An & Kim, 2018). By enhancing the micro and small enterprises to access the global economy, the amount of underground economic activity will be reduced (Hoang, 2020). The significance of an integrated framework between scientific disciplines, particularly law and crime, with an integrated approach to deal with the actions of underground economic actors and bribery behavior (Andreev et al., 2018).

To date, the activities of underground economic actors in Indonesia have not been clearly enforced and specified. It is important to address a continuous analysis in order to devise policies responding to the conditions of underground economic actors in each area of Indonesia. Some argue that the underground economy is a means of de-industrialization and social isolation, as shown by a decrease in social and individual freedoms, which leads to social inequality and poverty (Chotim et al., 2019).

Many studies on underground economic estimation have been carried out. The underground economy estimates from the consumption side show an estimated yield equivalent to 40% of GDP. This amount indicates the existence of tax evasion business practices or hidden dishonest business practices that do not generate a contribution to GDP (Nizar & Purnomo, 2011). Findings by Faal (2003) using a monetary approach clarified that the economy was underground in Guyana from 1964 to 2000, in which the tax burden could change the market for currency by introducing a major tax component. Measurement of the scale of the underground economy gives rise to demand for variable currency-M1 (monetary money) as a result of the implementation of Tanzi's standard model of demand for money (Samuda, 2016). Theoretically, the bank interest rate would have a negative effect on the demand for money, which means that if there is a decline in the amount of demand for money, the public chooses to save money in the form of a deposit (Kristianto, 2019). However, the condition is different if the society chooses to circulate money for commercial activities rather than save it in the form of investments with the bigger return of the benefits compared to that which are used for business, even though the interest rate of the deposit rises (Furuoka & Munir, 2014).

The research is aimed to estimate the underground economy in the border region. The research location was in Bengkayang Regency, West Kalimantan Province, Indonesia. This region borders the country of Malaysia, in particular the state of Sarawak on the island of Borneo. The underground economic potential in this region has been in the spotlight for a long time, implying opportunities for abuse of authority and corruption which affect regional growth.

RESEARCH METHOD

This study uses a qualitative phenomenological method, which is a technique to explain descriptions interpreted by an individual from his life experience holistically. This study observes the behavior of the underground economy business, the events experienced, and the responses or business processes. A triangulation method approach was used to collect evidence and data, which included in-depth interviews, participatory observations, and recordings in natural settings that were responsive to the respondent and research site.

The research was conducted in Bengkayang Regency, West Kalimantan Province. It is the outer region of the province which is directly adjacent to the Sarawak state of Malaysia. The underground economy player was interviewed to elaborate on their characteristics related to the type of business, business experience, and the kind of illegal activities, such as the practice of paying retribution/taxes, bribery, illegal levies, and extortion.

Respondents selection in this study is done based on the John W. Creswell approach, where the researcher chose respondents intentionally, and actively and thoroughly arranged respondents and places (documentation or visual material) to find more understanding and analysis of the problem being reviewed. The number of respondents in a heterogeneous group ranges from 3 to 15 people (Creswell, 2014). This study collected data from an unpublished respondent source. The selection of key respondents was done deliberately, related to the identification of locations and individuals/groups, including street vendors (legal and illegal), coffee shops, and liquor producers in Bengkayang market traditional. The survey selected eight key respondents (Table 1), including two coffee shops, two street vendors, two beer producers, and two wholesalers. They have shown an understanding of taxes as a

regional contribution. They generally pay illegal fees without valid evidence for the purpose of maintaining the cleanliness and security of the area.

Table 1. Respondents and Business Type

Name	Business Type
A1	Coffee Shop 1
A2	Coffee Shop 2
A3	Street Vendor 1
A4	Street Vendor 2
A5	Liquor producer 1
A6	Liquor producer 2
A7	Grocery Store 1
A8	Grocery Store 2

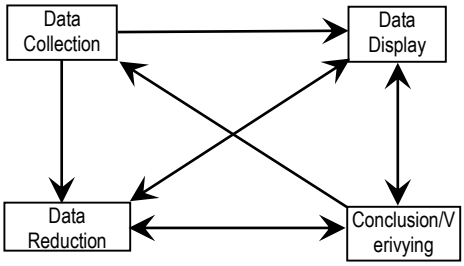

Figure 1. Analysis Method adapted from (Miles et al., 2014).

The data analysis method was carried out in a three-stage descriptive narrative, namely data reduction, data presentation and data verification to draw conclusions (Miles et al., 2014). The steps of the data processing can be seen in Figure 1.

RESULT AND DISCUSSION

Respondent Characteristics

The underground economy is an activity that is difficult to quantify. However, some knowledge that refers to the definition or characteristics of underground economic actors can be found in the Bengkayang area for the purpose of the study (Table 2).

Table 2 shows that business actors had an educational background profile of Junior High School (SMP) and Senior High School (SMA). Workers work more than eight hours per day. The wages received by workers were less than the regional minimum wage in the Bengkayang area. Economic actors did not include workers in welfare or social security programs. Indonesia's low ownership of work-accident insurance and social security is impacted by the informal workers' level of education or understanding. Overall, labor accident insurance ownership among unskilled workers underground economy sector is relatively low (Madya & Nurwahyuni, 2019).

Long and cumbersome bureaucracy and procedures make business players unwilling to apply for and register for business licenses for taxpayer ID (NPWP). This inefficient service is supposed to foster high levels of corruption and corruption along with weak institutional frameworks to assist underground economy improvement (Ouédraogo, 2017). Corruption cases must be taken care of with strict regulation, and make it standard for clean government performance in winning community trust (Berggren & Bjørnskov, 2020). Massive elimination of corruption must be done with a trustworthy government system and the anti-corruption committee (KPK) as an independent institution in prosecuting corruption cases (Samimi & Abedini, 2012).

Underground Economy Activities

The circumstances and practices of underground economic in relation to levies, unauthorized business licenses and taxes evasion are presented in Table 3.

Table 2. Respondent Characteristics of Underground Economy Activity

Properties	A1	A2	A3	A4	A5	A6	A7	A8
Education level	SMP	SMP	SMP	SMP	SMA	SMA	SMA	SMA
Wage level	<UMR	<UMR	<UMR	<UMR	<UMR	<UMR	<UMR	<UMR
Employee Social Security	No	No	No	No	No	No	No	No
Working day (hours)	>8	>8	>8	>8	>8	>8	>8	>8
NPWP (taxpayer ID)	No	No	No	No	No	No	No	No
Business license	No	No	No	No	No	No	No	No
Retribution	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business scale	Micro	Micro	Micro	Micro	Micro	Micro	Micro	Micro
Total Manpower (person)	<5	<5	<5	<5	<5	<5	<5	<5
Length of working (years)	>5	<5	>5	>5	<5	>5	<5	>5

SMP: Junior High School, SMA: Senior High School, UMR: minimum regional wage

Table 3. Data on Information Relating to Taxes and Licenses

	Retribution	Taxes/License
A1	There is no change in the payment of the garbage/cleaning services, the shop area is always filthy. Service is a formality.	There is no socialization on the issue of NPWP (taxpayer ID) and government business licenses, as well as the advantages of these taxes and the awareness of NPWP.
A2	Overlapping the payment of dues, certain economic actors are exempt from paying payments relative to all economic actors.	NPWP is found no required, as there is little benefit. However if the company is in violation of the legislation, the business is likely moving instead
A3	Support payments from officers as security money	NPWP is not so necessary and useful
A4	Food sector players are distinguished from coffee shops, with a 10% contribution from turnover.	NPWP is not so essential and useful
A5	The fees charged are voluntary donations, without pressure from the group involved, and the fees paid are meant for personal use, not for official purposes. Company typically allocate security services of between 200 and 300 thousand per person. The commitment is made every month where the security forces coming in are between two and three people.	NPWP and business licenses are not necessary because they believe that small companies are not taken into account. Posibly, business are side enterprises of officials and members of the board of directors.
A6	The advantage of paying security service, in the case of a raid is already given details from the unscrupulous.	Company licenses do not exist because they sound cumbersome and bureaucratic in the administration.
A7	Support payments from officers as security money	NPWP is not so essential and useful
A8	When there is a raid there is a notice from the apparatus, the payments will go to the Agency directly, not to the Agency.	NPWP is not so essential and useful

The underground economic activity begins with bribes by perpetrators, which are carried out in cash without going through a legal banking system. The transaction process can be carried out by providing fake receipts or intentionally eliminating evidence of recording interbank transactions. The transaction process is carried out by the team in charge of managing the field, after which the agreed bribe quota is distributed. Cash transactions can increase the supply of cash (Uslaner & Rothstein, 2016). Increased corruption will result in an increase in the circulation of money in society. Therefore, monitoring the circulation of individual money can be an option for extensive prevention of underground economic practices and tax evasion. The introduction of Penta helix elements is now possible to create synergies between stakeholders while starting to integrate and develop digitization structures in all financial activities using e-government payments and tax payment systems (Bhuiyan, 2011).

Commodities entering the border are carried out via alternate routes at many locations in the forest connecting Malaysia with Indonesia. These goods might be in the form of drugs, craft splits (typical Dayak mats), motor cars and alcoholic drinks. This is done to avoid border or customs control. Although not backed by a centralized organizational framework, smugglers continue to operate successfully with the aid of ubiquitous contemporary communication technology, allowing them to connect rapidly and globally to share relevant information, leaving no trace. They work through a variety of relationships with people who are able to provide different services such as providers of local lodging and transportation, document forgers, corrupt authorities, transportation firms, and more. Many of these networks are ethnic (Içduygu & Toktas, 2002).

In order to ascertain the underground economy's contribution to the regional economy of the border area, this study conducted interviews with actors from the underground economy, including grocery stores, street sellers, coffee shops, and liquor producers, each of which was represented by two business actors. The interviews found that the majority of respondents said that the motive for beginning a business was to make money. As such, the community operated a grocery store, market stands, coffee shops, and liquor producers in order to make ends meet.

Research shows that the working hours imposed were not in accordance with applicable regulations. The underground economy business employed their workers more than eight hours a day. Respondents said that all grocery store owners, street vendors, coffee shops, and alcohol sellers did not have NPWP or social security for their employees. The respondents

put forward several reasons for not having NPWP and social security for their company, as explained below.

"*We receive very little information about NPWP and business licensing procedure. There is almost no correspondence between us as business communities and local government, and we don't understand the process [of acquiring NPWP].*" (Grocery store 1).

The next statement showed business actors did not feel the need to get NPWP.

"If information dissemination and mentorship continue on an ongoing basis, we as entrepreneurs will obey the laws as long as our business can expand in the future. Don't hamper tiny enterprises like us. At least provide us appropriate infrastructure and facilities." (Grocery store 2)

"For me, you know, [for] little businesses [like what] we operate, NPWP and business licenses are not that necessary. I think it is more vital to take care of medium and large enterprises. " (Coffee shop 1).

Another explanation why business actors did not wish to have an NPWP was the complex and long-standing bureaucracy. This was mentioned by the following business actor.

"*The lengthy procedure and poor service make us hesitant to take care [of it].*" (Coffee shop 2)

For business actors, the use of NPWP is an indicator that the business being run is officially operational. However, dissemination about the importance of NPWP for business actors was not carried out. Business actors claimed that it was hard to obtain NPWP and considered it unnecessary, which became their justification to run an underground economy business.

This study also confirmed the findings of Rothenberg (2016) who researched the informal economy sector in Indonesia. The market actors in the informal sector or the underground economy will live in an illegal position because they do not experience any loss due to the illegal status of their business. Fundamentally, the underground economy carried out by these local entrepreneurs will become a drain on the regional economy as well as on the national economy (Montenegro, 2010).

As acknowledged by research respondents, these underground economic traders paid a retribution fee to run their business, including environmental cleaning fees and security charges. Several respondents asserted that these payments were indirect contributions intended for thugs rather than authorized officials (Williams, 2015). Rothenberg et al. (2016) stated that uncontrolled business involvement in the underground economy can have a negative impact on tax revenues, market dynamics, and productivity. In term of economic contribution, according to research respondents, these dark economy traders were likely to be able to run their businesses. The underground economy according to Williams & Horodnic (2017) creates a situation that can harm regional growth, regional income, and the capacity for corruption within the apparatus. The more widespread the corruption in an area, the more underground economic actors appear there (Wiseman, 2015). The following findings confirmed this abuse of authority.

"*We have an insider to aid the process. We are ready to pay for the inducement if there is an issue so we are not too worried."* (Coffee shop 2)

"We paid the levy to the officials. If an unannounced inspection takes place, they would notify us to get ready." (Liquor producer 2).

"We don't dare to argue with them because they include the local security apparatus, so we just pay them so they don't take over. "(Liquor producer 1)

Qualitative research was performed to understand the role of the underground economy in the border area. The underground economy is all types of economic activity that are not registered and do not contribute to the account of a gross national/regional product or the regional economy, while their activities indicate that they are flowing and used for personal benefit (Strapuc & Hlaciuc, 2019). If we pay attention to the market situations of underground economic amid economic hardships created by the COVID-19 pandemic, it was indicated that those business actors can still thrive, while in other circumstances many large-scale and legitimate business actors have suffered deficits. This is stated in the following statement.

"*During the crisis, raw material costs go up while purchase price stays down*." (Street vendor 1).

"*I even sell, order and import alcohol from bordering areas, but no one has ever found out about it*. " (Coffee shop 2).

"*The wine production number varies according to the demand, with 2,000 to 3,000 kilos of wine sold at Rp25,000 a week*. " (Liquor producer 1).

This fact proves that underground business owners can run a company even during difficult times. Overall, the study results show that underground economy actors have the potential to support the economy of the region. This confirms the findings of research conducted by Rasbin (2013) that during the period 2001 to 2013, the underground economy accounted for 8.33% of Indonesia's GDP. The scope for tax losses is also very high, exceeding 1% of Indonesia's average quarterly GDP.

Research Implication

The respondents in the underground economy revealed that the majority of them were hesitant to apply for a company license and to get a taxpayer identification number (NPWP) because it was difficult and they believed their operations were constantly watched. Workers were not included in welfare or social security programs since they were considered as economic players. It is believed that the low degree of ownership of work accident insurance and social security in Indonesia is affected by the education or conditions of the informal employees. In general, the number of participants in occupational accident insurance is low among unskilled employees in the underground economy, especially those who work in hazardous conditions (Madya & Nurwahyuni, 2019).

Underground economic activity was carried out in cash transactions without going through the legal banking system. Hence, providing a payment and transaction processing digitization system is extremely helpful. This digitization system may connect various institutions such as tax agencies, commercial offices, community associations, police, and labor administration services. This integration may be in the form of creating big data with a robust server security system. Implementing big data processing may improve the life cycle of the collecting, processing and storing process. It can also provide links to support effective organization, improvement of data availability and processing speed, and reliable and secure data storage (Dobrolyubova et al., 2019).

It should be noted that the underground economy research encompasses the complexities of the relationships and the characteristics of the actors concerned, rules of engagement, values, and culture that govern an economy (Dermawan, 2010). Legitimation by politicians enables the underground economy to maintain tax evasion and unethical behavior. Political influence and corruption create a societal culture that renders repressive powers ineffective (Nurunnabi, 2019). The fields of public administration and sociology dominate the study of corruption. However, economists have conducted significant research on this topic. According to the Transparency International Agency, corruption is "the misuse of delegated authority for personal gain." While the damage caused by corruption has long been studied, there is no evidence of its effect on inflation. Between 1995 and 2015, the relationship between corruption and inflation was examined for twenty countries. The findings indicated that high levels of corruption raise inflation rates and that a unidirectional causal link exists between corruption and inflation in ten countries (Ozsahin & Ucler, 2017).

Although corruption and an ineffective judiciary will breach ethical standards and result in other negative consequences, they should not have to intensify social injustice. Additionally, while the judiciary's quality has a good connotation, it may indicate the polar opposite. However, we must stress that corruption and judicial accountability also have an effect on long-term development, which is why engaging in accountability and combating corruption would result in true success for the entire society. In general, these two considerations will also influence the quality of national balance data whether the rich gets away with corruption by diverting consumption to other countries or by engaging in unethical practices to conceal income and consumption from conventional measures. Furthermore, distributional reforms have no means of determining whether corruption and systemic transparency have an impact on social mobility levels. When considering policy proposals aimed at combating graft and enhancing judicial transparency, it is critical to exercise caution of unintended consequences on high distribution margins (Berggren & Bjørnskov, 2020).

The research findings show that underground economy business owners do not have permission from the tax authorities and reduce local government tax revenues. The reasons business actors do not register their businesses legally are because they do not have the expertise, do not trust, or do not want to deal with the complexity of legal arrangements by the tax authorities. Local governments should start collecting data and immediately implement programs to enable underground economic actors to run the economy legally and engage in official economic activities. This will have an impact on increasing local

tax revenues which will encourage regional economic growth. There should be socialization, assistance, and ongoing community preparedness about important information needed for sustainable regional growth (Ozsahin & Ucler, 2017). The enforced program needs to impose social sanctions in the form of annual reports on graft incidents and tax restitution. Enforcement of national policies is possible to build commitment and integrity of governance. There is a need for stricter regulations against perpetrators of corruption because corruption is contrary to human rights and contains a very significant political agenda.

CONCLUSION AND SUGGESTION

This study proves that business actors are reluctant to apply for and register business permits and taxpayer ID (NPWP) because of the complicated bureaucratic process. This is because they also lack knowledge and information about the needs and benefits of working legal businesses for the regional economy. The underground economy actors prefer to pay the penalty illegally because this situation for them is more adequately handled.

The performance of underground economic actors further shows violations of legal regulations, including tax evasion, providing wages below the regional minimum standards, not providing social assurance for workers, employing people beyond working hours, as well as paying illegal levies to certain people under the pretext of cleaning and security fees.

The underground economic situation must be addressed immediately by changing the perspective of economic actors so that their activities bring benefits to company growth and contribute to the regional economy. Quality government governance will provide feedback from tax payments, and assist the business world with facilities such as micro business loans, adequate infrastructure and facilities, and taxes based on the capacity of business actors.

This study suggests the implementation of an information technology-based financial system. A system that connects various institutions such as tax agencies, commercial offices, community associations, police and labor administration services. Implementing big data processing may improve the mechanism of the collecting, processing and storing process to prevent tax evasion and underground economic behavior.

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Consumer behavior to Thai fruit consumption during COVID-19 pandemic in Jakarta, Indonesia

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ABSTRACT

Indonesia imports fruits from around the world to serve people's demand. Thailand as one of the fruit exporters to Indonesia needs to further explore what influences the consumption of Thai Fruits in Indonesia. Moreover, currently the COVID-19 pandemic likely affects all sectors, including the agriculture sector. This study aims to analyze the relation between socioeconomic characteristics and consumer behavior, particularly the pandemic period, that affects the purchasing decision of Thai Fruits. Using a structured questionnaire, random sampling of 1,736 respondents who shop at 5 All Fresh Supermarket branches were interviewed. The data was analyzed using the chi square test and binary logistic regression. The results found that socioeconomic characteristics such as age, gender, education, occupation, and income had a relation with Thai Fruits purchasing decision. In term of product awareness for instance, quality and taste is the utmost concern for customers. However, during COVID-19 pandemic, the level of customers' consideration for quality and safety is clearly higher. Therefore, a different strategy is needed to convince consumers. The result also found that tasting experience influences purchasing decision significantly. To enhance international economic development, such agricultural products must respond to the customers' needs and mutual cooperation between trading countries.

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INTRODUCTION

Boasting one of the largest populations in the world, the demand for food and beverage products in Indonesia is very high (European Commission, 2017). Fortunately, Indonesia is an agro-based country with a tropical climate suitable for growing various horticultural crops including tropical fruits and vegetables. Therefore, horticulture products play an important role in economic development and propelling GDP growth (Firdaus & Gunawan, 2012). The current government issues the self-sufficiency policy, and highly supports the export of agricultural products particularly fruits such as mangosteen, banana, pineapple, salak, and mango. Many kinds of fruits are exported to various countries around the world including Thailand. However, Indonesia also imported fruits from many countries to serve the

needs of the consumers who are becoming more diversified (Minot et al., 2015).

Nowadays, modern markets likely sell more imported fruits than domestic fruits in terms of variety (Office of Agricultural Affairs, 2020). Indonesian horticultural commodities have to compete with imported ones, though it is more expensive, especially in big cities (Ministry of Commerce Thailand, 2019). The structural changes have been undergoing rapidly over recent decades (Reardon et al., 2015). Therefore, to secure domestic production and to control the imported fruit, the Indonesia government issued special regulations for horticulture product import.

In addition, the level of fruit and vegetable consumption in Indonesia varies widely in different provinces, with the highest level almost twice the lowest one. The average fruit and vegetable consumption in Indonesia is only 173 grams per capita per day, while the recommended dietary allowance (RDA) is 400 grams per capita per day. The low consumption of fruit in Indonesia has motivated the government to increase public awareness in consuming fruit. Previously the government had issued a Presidential Regulation about the national movement for nutrition improvement and tried to increase public awareness of fruit through GERMAS (Healthy Lifestyle Movement) (Syam et al., 2019).

As a result, Indonesian fruit consumption has a considerably increasing trend for many reasons including rising incomes and growing consumer confidence; growing awareness of healthy lifestyle products; and the shift of consumers towards modern retail stores (European Commission, 2017). However, one has their own consideration for buying each product, fruits in particular, such as the type of products, product quality, product design, product pricing, service, promotion, motivation, and location. Socioeconomic characteristics such as education, knowledge, age, sex, and income also influence fruit purchasing decision (Shipp et al., 2019; Bulsara & Trivedi, 2016).

Moreover, consumer behavior focused on how individuals make decisions to spend their available resources (time, money, effort) on consumption related items is also very important for purchasing decision. Consumer behavior includes where they buy it, how often they buy it, how often they use it, how they evaluate it after the purchase, and what is the impact of such evaluation on the future (Indriani, 2016). Previous research showed that income, occupation, education, and age affect a person's fruit consumption level. Drewnowski & Rehm (2015) found that fruit consumption is lower in lower-income neighborhoods. Díaz-Garcés et al. (2016) reported that in neighborhoods with a higher education level, there is an intention to increase their consumption of fruits. Furthermore, research from Hermina & Prihatini (2016) showed the lowest proportion of the population who consumed fruit are those who worked in the labor sector. Meanwhile, the population who consume the most fruit are people who work as employees with permanent status. The total consumption of fruit was found to be the least among children under five years old and the most is the elderly group.

Currently, Indonesia and most countries are being imposed by the COVID-19 pandemic (Corona Virus 19). The Indonesian government assumed that the consumption demand for healthy foods including fruit is probably increasing at the household level. Believing that good nutrition and healthy lifestyle factors give a positive impact on immune function, promoting biological and physiological systems and processes that enable humans to resist infection (Lanham-New et al., 2020; Safitri & Harun, 2021).

Until now, there has been no specific research on the influence of Indonesian socioeconomic characteristics and consumer behavior on the purchasing decision of Thai Fruits particularly during the COVID-19 pandemic. This study aims to analyze the relationship between socioeconomic characteristics and consumer behavior variables that affect the purchasing decision of Thai Fruits in Indonesia. This study will be useful to set up strategic plans and relevant measures to efficiently increase trading promotion. In a hard situation affected by the COVID-19 pandemic, every country needs to survive and thrive out of it. Therefore, it is very advantageous in this pandemic situation to forge further collaboration that can build a better future for agriculture and economic resiliency and sustainability between Indonesia and Thailand (Royal Thai Embassy, Jakarta).

RESEARCH METHOD

This study was conducted in All Fresh Supermarket branches (3 branches in Jakarta and 2 in border provinces) from July to August 2020. All Fresh Supermarket was chosen as a research location because this supermarket is a modern retail store that

sells both local and imported fruits, including Thai Fruits. Branch selection was carried out to obtain a sample distribution that could represent samples of both Jakarta and the border provinces, as well as large and small branches.

The data were obtained from a random sampling of 1,736 respondents who shopped at supermarkets through face-to-face interviews using a structured questionnaire. However, people below 18 years of age were excluded because they are assumed to have no purchasing power. Total samples from the Jakarta branches were 1,005 (57.89%) and from border provinces were 731 samples (42.11%).

The questionnaire was divided into two sections. In the first section, the respondents were asked about their socioeconomic characteristics (e.g., age, gender, the distance between residence and supermarket, education, occupation, and income). These socioeconomic variables were then hypothesized to influence purchasing decision. The second section contained questions on the consumer behavior such as tasting Thai Fruits experience, Thai Fruits preference, purchasing Thai Fruits experience, and consuming processed Thai Fruits experience (Table 1). These data were analyzed using the chi-square test to find the relationship between socioeconomic variables and consumer behavior.

Binary Logistic Regression was applied to analyze the socioeconomic variables and consumer behavior variables (X_n) that affected the Thai Fruits purchasing decision (Y). Binary logistic regression seeks to identify whether a relationship exists between a dependent variable (Y) associated with the occurrence or not of an event (dichotomous type) and one or more categorical or continuous independent variables (Díaz-Pérez et al., 2019). In addition, the value of 2 log-likelihood, Cox & Snell R^2, and Nagelkerke R^2 verify how well a model with a given set of parameters can explain an observed data set (van Opheusden et al., 2020) and how much the independent variable is able to explain and influence the dependent variable. If the Nagelkerke R^2 value is getting closer to 1, the relationship between the dependent and independent variables is getting stronger. Whereas if the value is getting closer to 0, it means that the relationship between the dependent and independent variables is getting weaker (Aridi & Agustina, 2019).

RESULT AND DISCUSSION

Respondent Characteristics

In this study, the respondent characteristics include gender, the distance between residence and supermarket, education level, occupation, and monthly income. The samples characteristics are presented in Table 2.

Table 2 shows that the proportion of female was much higher than male. This is likely because women are predominantly responsible for purchasing food in Indonesia. Suripatty & Tantoly (2019) pointed out that 74% of respondents who buy fruit in Ambon, Maluku province, Indonesia are women. Generally, women play a major role in household food management, including food production, food procurement, food processing, and food quality (Purwanto et al., 2016).

Table 1. Research Variables

No	Variable	Unit
1	Age (X_1)	Year
2	Gender (X_2)	Male (0), Female (1)
3	Community type (X_3)	Rural (0), City (1)
4	Residence Distance (X_4)	<1 km (1), 1-2 km. (2), 3-5 km. (3), 6-10 km. (4), >10 km. (5)
5	Education (X_5)	Not studying (1), elementary school (2), junior high school (3), senior high school (4), above senior high school (5).
6	Occupation (X_6)	Employee (1), Student / Unemployed / Independent Entrepreneur / Business Owner / Civil Servant / Housewife / Retirement / Others (0)
7	Income (X_7)	<3 million rupiahs (1), 3 million-5 million rupiahs (2), 5 million-10 million rupiahs (3), 10 million-20 million rupiahs (4), >20 million rupiahs (5).
8	Have you tasted Thai Fruits? (X_8)	Never (0), Ever (1)
9	Do you like Thai Fruits? (X_9)	Dislike (0), Like (1)
10	Do you know if there is processed Thai Fruits? (X_{10})	Unknown (0), Know (1)

Table 2. Socioeconomic Characteristics of Respondent

Variable	Percentage	Variable	Percentage
	%		%
Gender		Occupation	
Male	36.1	Student	2.4
Female	63.9	Unemployed	1.7
Distance of Residence		Employee	39.9
<1 km	10.2	Entrepreneur	12.8
1-2 km	19.6	Businessmen	4.6
2-5 km	31.6	Government Employees	9.3
5-10 km	21.4	Housewife	21.1
>10 km	17.1	Retired	4.3
Education Level		Other	3.9
Uneducated	0.3	Monthly Income (rupiah)	
Primary School	0.9	<3 million rupiahs	11.2
Junior High School	3.1	3 million-5 million rupiahs	16.3
Senior High School	17.4	5 million-10 million rupiahs	25.1
Higher education	78.3	10 million-20 million rupiahs	22.7
		>20 million rupiahs	24.7

The average age of the samples was 43 years old. A large proportion of respondents went shopping near their own residences, which was approximately 2-5 km. About 78.3% of respondents attained higher education, which is above the average of Indonesians' education level. According to Indonesian Statistics (2020), the education level of the Indonesian population is dominated by senior high school level because since 2015 the Indonesian government has made a 12-year Compulsory Education Program or equivalent to the Senior High School level. Previous research shows that people with a high education level tend to shop in modern markets because they have a high-quality products (Dewi et al., 2017). In addition, people prefer shopping in modern markets because of the good quality of fruit, tidier fruit packaging and convenience in shopping (Trisna, 2017).

The average income level of employees in Indonesia depends on the level of education. For education levels above senior high school, the average income is above 4.2 million rupiahs per month (Indonesian Statistics, 2020). Whereas, the minimum wage for DKI Jakarta workers in 2020 is 4.2 million per month (USD 304). The result shows that the large proportion of respondents' income was in the range of 5-10 million per month (USD 350-700) as company employees. On average, respondents' income was above the standard income of residents in Jakarta. Although products in supermarkets have higher prices than those in traditional markets, supermarkets provide more convenience for customers. As a result, people with higher income prefer shopping in supermarkets than in traditional markets. This is in line with the research by Dwicahyani & Muttaqin (2019) and Vermila (2016), which stated that the modern market is dominated by people with incomes more than 5 million rupiahs per month.

Consumer Behavior

Consumer behavior focuses on how individuals decide to spend their available resources on consumption-related items (Indriani, 2016). Consumer behavior discussed in this paper includes tasting Thai Fruits experience, Thai Fruits preference, purchasing Thai Fruits experience and consuming processed Thai Fruits experience. The result shows that more than 80% of respondents have already tried Thai Fruits. This is likely that Thai Fruits has an interesting visual appearance, uniform shape, bigger size than local fruit, clean appearance, and attractive color. Fruit quality can be categorized into external quality (shape, size, color, and defects) and internal quality (flavor, texture, nutrition, and safety). Yani (2014) stated that imported fruit has a good look, texture, color and relatively large size that can attract buyers. Currently, many imported fruits are sold in supermarkets, even in traditional markets because of the high demand. Since the government policy on FDI (Free Domestic Trade) in 1998, many supermarkets in Indonesia have sold imported fruit (Yosini, 2011).

The results show that about 82.31% of respondents liked Thai Fruits because of its good taste and quality. Thailand focuses on making food, including fruit, that has a good taste and good quality

(Harmayani et al., 2019). In Thailand, aspects such as taste, texture, color, and use of ingredients with medicinal benefits and good flavor are vital in culinary traditions. The outward appearance and freshness of fruit are some of the attributes that highly influence decisions at the time of purchase (Yosini, 2011; Massaglia et al., 2019). Generally, the imported fruits have a good appearance and the consumers have the perception that appearance is related to good quality (Widyadana et al., 2013). The kinds of Thai Fruits available in Indonesia are Durian, Mango, Longan, Rose Apple, Lychee, and Sweet Tamarind. Almost a half of the respondents liked Durian (45.34%), then longan (21.76%) and mango (17.35%). Durian is the most popular seasonal fruit in Indonesia and Thailand (Cornelia et al., 2015; Yuniastuti et al., 2018). The economy of Thailand is majorly based on the exporting of durian to other related countries, including Indonesia (Sittisom et al., 2020).

Most of the sample groups had prior experience of purchasing Thai Fruits, about 80.58%. The top three of Thai Fruits most bought were durian (43.53%), longan (23.65%), and mango (15.93%) which occupied more than 80% of purchasing. More than 70% of respondents bought Thai Fruits ranging from every 1-2 weeks to 1-2 months. If consumers are satisfied with a product that has been tried, they will buy the product more often (Bayu et al., 2020). Igir et al. (2018) stated that product quality is one of the most important factors in a purchasing decision. The same reason for fruit, quality dominantly affects consumers' willingness to buy (Wei et al., 2018).

The primary reason why respondents did not buy Thai Fruits was that they were not easily found in the market. One of the reasons why Thai Fruits is currently not easy to find is because there are restrictions on importing several types of fresh Thai Fruits, one of which is Fresh Durian and Mango. The demand for imported fruit is always increasing in Indonesia, which identifies that the community prefers importing fruit than local fruit (Sari, 2018). Indonesia's import policy is often complained by trading partner countries, in terms of clarity and repealing of import policy (Zubaedah et al., 2015). Indonesia needs an appropriate trade strategy to compete internationally, including by increasing domestic fruit production (Lubis, 2018) along with improving quality and taste.

The second reason why respondents did not buy Thai Fruits was because of the expensive price. The good quality and the shipping costs of imported fruit make the price of Thai Fruits higher than local fruit. The higher the quality, the price of the fruit will be increased (Wei et al., 2018). Higher prices likely indicate greater guarantees of overall quality (Massaglia et al., 2019). As such, the seller must provide a price and quality that is comparable and in accordance with market demand. Though imported fruit has a higher price than local food, the unique color, usability and freshness of imported fruit make customers want to buy it (Yosini, 2011).

About 74% of respondents knew that there are processed Thai Fruits, not only fresh ones. The preferred type of processed Thai Fruits were Mango (25.82%), Durian (22.69%), and Longan (22.30%). Thai Mango became the main exported fruit of Thailand in 2011 (Tiwong et al., 2012). Thai Mango fast-food drinks are very popular among Indonesians (Christian, 2018).

Based on the results above regarding consumer behavior, most Indonesians have tried and liked Thai Fruits because of its good taste and quality. However, some cannot find Thai Fruits in the market. The reason is due to the non-tariff barrier policy by the Indonesian government including the prohibition of certain types of fruit, the quota system, and others in order to protect domestic producers (Sari et al., 2014). Indonesia tries to boost the export value and reduce the import value. Product access is administered by a large set of regulations and requirements which must be met by the exporter (UNCTAD, 2018). This can increase trade costs and pressure small exporters (Virginia & Novianti, 2020). Therefore, the governments of Indonesia and Thailand are expected to make fair and profitable policies to increase economic and sustainable agriculture development in both countries.

COVID-19 pandemic makes people more concerned about a healthy lifestyle and consuming more fruit and vegetables. This study identifies what Indonesian people consider when purchasing Thai Fruits, including taste, quality and safety, price, selling place, and packaging. Overall, the large proportion of respondents (50%) considered quality and safety aspects at high to very high (52%), whereas taste and reasonable price were about 20% and 11% respectively. It means, most of the respondents consider the quality and safety aspects with a high level of attention. The majority of respondents show a willingness to pay more to reduce food safety risks in this pandemic (Meixner & Katt, 2020; Petrescu et al.,

2019). It should be noted that reasonable prices are considered only 11% at a moderate level (46.51%).

Relations between Socioeconomic Characteristics and Consumer Behavior

The chi-square test and t-test from the SPSS software program were applied to examine whether there was a relationship between the socioeconomic characteristics variable and consumer behavior. The results are presented in Table 3, Table 4, and Table 5.

Table 3. Socioeconomic Characteristics and Experience to Taste Thai Fruits

Variable	Ever	Never
	..... %	
Education Level		
Uneducated	0.2	0.7
Primary School	0.9	1.0
Junior High School	2.8	4.7
Senior High School	15.8	25.0
Higher Education	80.3	68.6
Significant level	0.000**	
Occupation		
Student	1.5	6.8
Unemployed	1.5	2.7
Employee	39.6	41.2
Entrepreneur	13.2	10.8
Businessmen	4.9	2.7
Government Employees	9.2	10.1
Housewife	21.5	19.3
Retired	4.7	2.4
Other	3.8	4.1
Significant level	0.000**	
Monthly Income		
<3 million rupiahs	9.4	19.9
3-5 million rupiahs	15.4	20.6
5-10 million rupiahs	25.3	24.3
10-20 million rupiahs	23.2	20.3
>20 million rupiahs	27.6	14.9
Significant level	0.000**	
Age		
Average	44.0	38.1
Significant level	0.000**	

** and *denote significance at p 0.01 and 0.05

Table 3 and Table 5 shows that socioeconomic variables (age, education, occupation, and income) had a relation with experience to taste and purchase Thai Fruits. Meanwhile, gender had a relation with the Thai Fruits preference besides age, education, occupation, and income (Table 4). Unlike other consumer behavior, education and income had no relation with tasting processed Thai fruits experience but had a relation with gender, occupation, and age.

In general, tasting and purchasing Thai Fruits was likely done more by older people. When someone gets older, the awareness to adopt a healthy lifestyle will possibly be higher. They will consume more fruit and try various kinds of fruits. However, Nurdin & Damayanti (2017) argued that the purchase of imported fruit is dominated by the productive age about 24-32 years old. Effendi et al. (2019) found the purchase of imported fruit is dominated by women of productive age, namely 20-40 years. However, environmental conditions and socioeconomic characteristics may influence in different countries. This result also shows that people with higher education levels were more likely to taste and purchase Thai Fruits. Widyadana et al. (2013) found that purchasers' attitude toward imported fruit was influenced by education level. Higher education level has the intention to increase their consumption of fruits (Díaz-Garcés et al., 2016).

Table 4. Socioeconomic Characteristics and Thai Fruits Preference

Variable	Like	Dislike
	..... %	
Gender		
Male	25.0	41.4
Female	65.0	58.6
Significant level	0.035*	
Education Level		
Uneducated	0.1	1.0
Primary School	0.9	1.0
Junior High School	2.8	4.6
Senior High School	15.9	24.4
Higher Education	80.3	69.1
Significant level	0.000**	
Occupation		
Student	1.5	6.5
Unemployed	1.5	2.6
Employee	39.5	41.7
Entrepreneur	13.4	10.1
Businessmen	5.0	2.6
Government Employees	9.1	10.4
Housewife	21.4	19.9
Retired	4.8	2.3
Other	3.8	3.9
Significant level	0.000**	
Monthly Income		
<3 million rupiahs	9.4	19.5
3-5 million rupiahs	15.3	21.2
5-10 million rupiahs	25.2	24.8
10-20 million rupiahs	23.3	19.9
>20 million rupiahs	26.8	14.7
Significant level	0.000**	
Age		
Average	44.0	38.3
Significant level	0.000**	

** and *denote significance at p 0.01 and 0.05

More than 75% of respondents with income more than 5 million rupiahs per month (350 USD/month) have tried and purchased Thai Fruits. The higher the

family income is, the higher the level of fruit consumption. Drewnowski & Rehm (2015) also stated that fruit consumption is lower in lower-income neighborhoods. High-income consumers are more concerned about the quality attributes than low- and middle-income consumers (Widyadana et al., 2013). About 40% of respondents who worked as employees in the business sectors have also tried and bought Thai Fruits. Employees are considered to be able to meet nutritious food needs because they probably have a steady income and are affordable. Suripatty & Tantoly (2019) argued that most of the fruits are purchased by government employees who have stable incomes. Meanwhile, people who are low in consuming fruits are those who worked in the labor intensive sector (Hermina & Prihatini, 2016).

Table 5. Socioeconomic Characteristics and Experience to Purchase Thai Fruits

Variable	Ever	Never
	..... %	
Education Level		
Uneducated	0.1	0.9
Primary School	0.9	0.9
Junior High School	2.6	5.0
Senior High School	15.8	24.0
Higher Education	80.5	69.1
Significant level	0.000**	
Occupation		
Student	1.4	6.5
Unemployed	1.5	2.7
Employee	39.4	41.8
Entrepreneur	13.4	10.1
Businessmen	4.8	3.6
Government Employees	9.2	9.8
Housewife	21.7	18.7
Retired	4.8	2.4
Other	3.7	4.5
Significant level	0.000**	
Monthly Income		
<3 million rupiahs	9.5	18.4
3-5 million rupiahs	15.1	21.4
5-10 million rupiahs	25.2	24.9
10-20 million rupiahs	23.3	20.2
>20 million rupiahs	26.9	15.1
Significant level	0.000**	
Age		
Average	44.1	38.5
Significant level	0.000**	

** and *denote significance at p 0.01 and 0.05

The study also found that distance between residence and supermarket, and in different areas (Jakarta and border provinces) did not affect the consumer behavior. This is likely that the imported fruit has been distributed and spread to various cities in Indonesia (Nurchayati & Hikmah, 2014). Therefore, people living in both Jakarta and the border provinces each had around 50% of them trying Thai Fruits, purchasing Thai Fruits, consuming processed Thai Fruits, and liking Thai Fruits. The high level of consumption of fruit production is followed by an imbalance in the amount of local fruit production, thus importing fruits from abroad is one of the Indonesian government policies (Lubis, 2018).

The result also shows that there was a relationship between consuming processed Thai Fruits experience and Thai Fruits preference with age, gender, and occupation. Massaglia et al. (2019) demonstrated that besides age, the average annual income also influences consumer preference and behavior. In general, older people knew more about Thai Fruits, so they consumed more fresh or processed Thai Fruits compared to younger people who might not know yet about the processed Thai Fruits. Massaglia et al. (2019) stated that consumer choices are greatly influenced by age, where the majority of fruit consumers aged more than 55 years old. Female significantly tend to eat more Thai Fruits than male. More than 65% of respondents who liked Thai Fruits were female because they have a higher chance of trying fresh and processed Thai Fruits in supermarkets. Seguin et al. (2016) and Vabø & Hansen (2014) reported that females eat approximately half a serving more of fruits and vegetables per day than males. Meanwhile, the population who liked and had tasted processed Thai Fruits were residents working as employees with permanent status. The price of processed Thai Fruits was rather high, but the company employees could afford to buy it.

Thai Fruits preference is also related to education level and income. More than 80% of respondents who liked Thai Fruits had higher education background. The higher education level affects their mindset and views of a product, and the type of food they choose (Vabø & Hansen, 2014). Likewise, Nurdin & Damayanti (2017) stated that nearly 50% of respondents who choose import fruits have a high level of education. Respondents with a higher education level tended to choose fruits that have many benefits for their health. Higher education lets consumers to have a high desire to try various product options that benefit them (Trisna, 2017).

The result shows that more than 70% of respondents with income more than 5 million per month (>350 USD/month) liked Thai Fruits and had

tasted processed Thai Fruits. It corresponds with Yosini (2011) who found that consumers who buy imported fruit generally have income more than 4 million rupiahs per month. Meanwhile, people with low income cannot afford Thai Fruits because of high prices. Huang et al. (2016) pointed that fruit price and income level are particularly influential on fruit purchases, even more so than educational level, emphasizing the importance of budget when making fruit purchases. Considering a broader product category in Massaglia et al. (2019) research, the price of fruit will affect one's preferences.

Socioeconomic Characteristics and Consumer Behavior that Affects the Purchasing Decision of Thai Fruits

The estimate effect of socioeconomic variables and consumer behavior on purchasing decision is presented in Table 6.

Table 6. Estimate Socioeconomic Variables Affecting Thai Fruits Purchasing Decision

Variable	Coefficient	p-value
Constant	-1.598	0.004
Age (X_1)	0.030	0.000**
Gender (X_2)	0.263	0.046*
Community type (X_3)	-0.161	0.503
Residence Distance (X_4)	0.011	0.835
Education (X_5)	0.179	0.095
Occupation (X_6)	0.001	0.996
Income (X_7)	0.196	0.000**

** and * denote significance at p 0.01 and 0.05

Table 6 shows that the socioeconomic variables of gender, income, and age significantly influenced the decision to buy Thai Fruits. Women tend to buy Thai Fruits more than men. Women likely have a major role in household food management and food procurement (Purwanto et al., 2016). This is in line with Seguin et al. (2016) who reported that women also consume significantly more fruit than men.

Meanwhile, older people tend to have a greater experience of trying Thai Fruits. Youngsters may not be aware of the importance of consuming fruits that are beneficial to their physiques and prevent diseases when they are no longer productive (Trisna, 2017). Ordun (2015) argued that generation Y has certain criteria in trying and choosing fruit because they are most up to date with today's developments. Generation Y is more concerned about the freshness, quality and safety of the fresh fruits than generation X (Gindi et al., 2016).

People with high incomes tend to be able to buy diverse and nutritious foods for their health. Arifin et al. (2018) verified that higher incomes and better knowledge tend to make consumers demand healthier and more diversified food. Moreover, the Indonesian middle-class spending on fresh fruits and vegetables has increased in recent years due to the campaign of the Indonesian government for healthy lifestyles and nutritional benefits of Fresh Fruit and Vegetables (FFV) (Slamet & Nakayasu, 2017).

The estimate effect of socioeconomic variables and consumer behavior on purchasing decision is presented in Table 7.

Table 7. Estimate Socioeconomic and Consumer Behavior Variables Affecting Thai Fruits Purchasing Decision

Variable	Coefficient	p-value
Constant	- 8.502	0.000**
Age (X_1)	0.014	0.316
Gender (X_2)	0.101	0.769
Community type (X_3)	- 0.273	0.705
Residence Distance (X_4)	0.174	0.199
Education (X_5)	0.236	0.370
Occupation (X_6)	0.012	0.897
Income (X_7)	0.079	0.586
Have you tasted Thai Fruits? (X_8)	5.665	0.000**
Do you like Thai Fruits? (X_9)	3.381	0.000**
Do you know if there is processed Thai Fruits? (X_{10})	0.965	0.004**

** and *denote significance at p 0.01 and 0.05

The consumer behavior variables (X8, X9, and X10) significantly influenced decision-making to buy Thai Fruits, while socioeconomic characteristics did not. Indeed, tasting Thai Fruits experience (X8) show the greatest influence, followed by the preference of Thai Fruits (X9), and awareness of processed Thai Fruits products (X10). This implies that tasting and satisfaction with product quality encourage consumers to buy the product. Such promotion type as booth table that provides a free fruit taste for instance, can increase consumer interest, and make them curious enough to buy the products (Halim & Radianto, 2016; Aji et al., 2018). Yosini (2011) pointed out that 59% of respondents chose to buy imported fruit because they saw other people buying the fruit from promoted events.

This research also considers two groups of respondent residence regions in the estimation. The Jakarta region verified the following analytical values: -2 Log Likelihood = 210.300, Cox Step & Snell R2 = 0.538 and Nagelkerke R2 = 0.860. Whereas, the

respondents residing in Jakarta outer region shows analytical values: -2 Log Likelihood = 133.879, Cox Step & Snell R2 = 0.553 and Nagelkerke R2 = 0.881. It is proved that consumer behavior variables are able to explain the purchasing decision by 86-88%, while the remaining is possibly explained by other variables outside the model. Other factors outside the model that affect purchasing decision can be culture, social, psychological, motivation, and others (Trisna, 2017; Suripatty & Tantoly, 2019). Fruit providers need to clearly understand how all these aspects can influence purchasing decision, as well as plan and develop products in reaching consumers.

Research Implication

The International Labour Organization (2020) stated that as the COVID-19 outbreak continues to spread throughout the world, it is important to address the existing and possible impacts on the agricultural sector from both food supply and demand perspectives. The result is emphasized again with the respondents' suggestion for Thai Fruits trade in Indonesia during COVID-19 pandemic. A majority of respondents (48%) suggested an increase in quality and safety, followed by price reduction (16.4%) and the addition of fruit types (14.1%). Most people are very aware of the quality and variety of food they consume. Since the more nutrients the food contains, the better it will increase their immunity to fight the COVID-19 virus. Lanham-New et al. (2020) and Safitri & Harun (2021) stated that good nutrition and lifestyle factors have a positive impact on immune function that enables humans to resist infection during this pandemic, one of which is by eating fruits and vegetables. However, logistics should be paid more attention to, so that food is not contaminated, especially for shipping between countries (World Health Organization Indonesia, 2020).

During COVID-19 pandemic, many people are growing more concerned in choosing fruit especially in terms of safety and quality, and are more aware in terms of nutritional content, price, purchase location, and packaging (Meixner & Katt, 2020). The right information allows the farmer or seller to produce goods that respond to the real needs of the buyer. Sellers can develop marketing strategies, for example, the promotion of free fruit to get a real experience, to increase consumer interest and attract potential customers (Yuliantoro et al., 2019) to buy the products offered (Aji et al., 2018).

The exchange of information and knowledge and the improvement of human resource capabilities are key factors. The government should encourage the parties to cooperate in initiating the exchange of information and technical support for farming. New cultural practice technology for fruit cultivation, such as planting systems, breeding new cultivars, pruning treatments (Sritontip et al., 2020) including harvesting, and packaging logistics for fruit products, should be given top research priority. Good Agricultural Practice (GAP) for fruit products should be applied and met the international or equivalent standard. Such standard must be emphasized particularly by concerned government agencies to ensure safety, quality, and the environmental sustainability of agriculture (Suwanmaneepong et al., 2016). In this case, social aspects among stakeholders are crucial. Effective communication and community participation among local officials, farmers, and private companies is needed to enhance commodity competitiveness and benefits (Puspitaningrum & Gayatri, 2019; Permadhi & Dianpratiwi, 2019).

Indonesia and Thailand governments can cooperate to set mutual strategies for sustainable agriculture development. For instance, implementing a program to increase farmer capital and skills for increasing productivity and income. Both countries can also exchange information and knowledge related to the production of certain fruits to improve the capabilities of human resources as stated in the Joint Agriculture Working Group (JAWG) (Boy, 2017). Nurhayati (2018) stated that agricultural cooperation is more focused on technical cooperation through exchanges of technical experts and researchers. In addition, the government can make technological innovations and improve trade strategies. Agricultural products have a high opportunity to be sold in the domestic and export markets. Such sectors as organic fertilizer, agriculture equipment and machinery can also be developed.

CONCLUSION AND SUGGESTION

It is unsure when COVID-19 pandemic will be absolutely controlled throughout the world. However, the imported fruit sector has a positive trend in Indonesia. Fruit products must be safe and clean from infection and contamination. Raising awareness of healthy lifestyle products and shifting of consumers to

modern retail stores will be key factors for an increasing of fruit consumptions in Indonesia.

Socioeconomic variables such as age, education, occupation, and income have a relation with experience of tasting and purchasing Thai Fruits. People who are more than 40 years old, higher education, being employee, income more than 5 million rupiahs per month, show more significant experience. In addition, consumer behavior variables, especially tasting experience, significantly influence the decision to buy Thai Fruits. However, consumer behavior likely differs according to time and space. Therefore, further research in other cities and in the post-pandemic period are needed to draw more general conclusions.

The government agencies of Indonesia and Thailand should carry out various cooperation in agriculture sector, particularly in enhancing technological innovations (grow more from less) and increasing farmers' skills. These various efforts are expected to increase national food security and improve welfare of farmers. Indonesian and Thai governments can well cooperate to establish regulations regarding the import and export of fruits so that the needs of fruit (variety, safety, and quality) between two countries can be mutually met and archived as the agricultural policy. In this term, people will get the utmost benefit from the right policy.

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The contribution of rainfed rice farming to income and food security of farmers' household

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ABSTRACT

Increasing production from rainfed rice field farming is expected to have direct implications to farmers' income and food security. Improvement in farmers' income will ensure the fullfillment of quality food. This study aims to analyze the contribution of rainfed rice farming to the household income and household food security of the farmers who cultivate rice in rainfed rice fields. This research was conducted in Maros Regency in three districts, namely Lau, Maros Baru and Simbang. The sample of this research was 100 farmers in rainfed rice fields. The research used survey method with the instruments of observation, recording and interviews. Data were analyzed using quantitative description coupled with t-test for independent samples. The results showed that the rainfed rice farming contribution to the household income in Lau, Maros Baru and Simbang District was 90.0%, 70.0%, and 57.5%, respectively. In term of farm household food security based on the share of food expenditure, the farmers' households were food insecure with 73.33%, 83.33%, and 67.50% for each regions. This study suggests that farmers need to diversify their income source to crops other than rice. Such effort will be able to increase the income and food security of farmers' households.

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INTRODUCTION

The main activities and the major source of income of most people in rural areas still depend on the agricultural sector. It can be indicated that the livelihoods of most households depend on the agricultural sector (Anton & Marhawati, 2016). The agricultural sector accommodates more than 30% of the workforce, which in this case are farmers. Farmers are the first people who play a role in providing food for the community (Prasetyaningtyas & Nindya, 2017). Most of them are small farmers who have low income and are classified as poor (Aminah et al., 2015). More than 50% of the poor people in rural areas work in the agricultural sector (Feryanto, 2017). Rice commodity has a strategic priority in agricultural development, serving as the main food of most Indonesians, both in rural and urban areas (Setiawati et al., 2016).

Agriculture is the driving force for other sectors as it supports the goals of agricultural development, farmer's living standard, expand employment, and business opportunities in encouraging economic development. The growth dynamics of the rural economy will provide more opportunities for the

people's welfare especially in the countryside (Anton & Marhawati, 2016). Efforts to increase income and maintain the existence of lowland rice farming must be a priority for agricultural development. Rice farming is still a strategic program for agricultural development because, in addition to meeting the basic population food needs, rice farming absorbs labor and provides an income source for rural residents (Bulanta et al., 2019).

The national demand for rice continues to increase from year to year due to the increase in population. Thus, it is necessary to increase and develop other potential rice fields including rainfed rice. Rainfed rice is the second national rice producer after wetland rice. The development of rainfed rice is still facing problems, with the low productivity standing out (René et al., 2016). Rice production in rainfed farms cannot be separated from the problem of water availability which only relies on rainwater (Nurdin, 2010).

Rainfed rice production rate is usually lower than that of wetland rice. The international community in the field of rice research classifies rainfed rice fields as high-risk ecosystems because they are threatened by drought, flooding, salinity, and pest attacks (Arifin et al., 2019). Anticipation of risks is pursued through plant cultivation and cultivation techniques, and management of rice nutrients (Lailiyah et al., 2017). With the conditions and risks in the rainfed rice fields, the income of rainfed rice fields farmers from rice cultivation is limited only at the rainy season (Raes et al., 2007).

Increasing rice production plays an important role in maintaining food security and national economic growth (Siregar & Yurnaliza, 2017; Razak et al., 2013). Improved production and the role of a good selling price are expected to have direct implications for farmers' income (Tambi, 2019; Tashikalma et al., 2014). Efforts to achieve food security are mostly focused on increasing food self-sufficiency in each region, including provinces, regencies/cities, districts, and villages (Arlius et al., 2017; Pothukuchi, 2004). The increased need for food is in line with the increase in population and community income (Wardie & Sintha, 2018). These two components determine food needs and further determine food security (Ahmed et al., 2017; Sianipar et al., 2012). Purchasing power is one component of a household's ability to provide food or food affordability (Wardie et al., 2019; Piran et al., 2018).

In general, the motivation of farmers in working on a certain commodity is to get cash through selling the produce in an effort to meet family needs (Sari et al., 2018). The increase in farmers' income will affect the purchasing power of farmers to meet food and other non-food needs (Matus et al., 2012; Purwaningsih et al., 2010). Improvement in farmers' income will ensure the fulfillment of quality food in accordance with the nutritional needs needed (Abdulkadyrova et al., 2016; Arida et al., 2015; Emtamoile et al., 2016). Fulfillment of food reflects the level of welfare of the farmers that will be better (Sianipar et al., 2012).

Food security and poverty alleviation depend in large part on the sustainability of crop production. Rice is the staple food produced and consumed by more than half of the world's population. Rice is also a vital source of billions of people in Asia, as a source of livelihood and support for economic development. For lowland areas in Asia, rainfed and irrigated rice fields account for about 90% of rice production. Rice production has links to household and national food security, poverty alleviation and political stability in agriculture-based countries (Roy & Chan, 2015).

Research related to the contribution of rice farming and food security in partially rainfed rice fields, i.e. the contribution of rice farming to rainfed rice separately, as well as household food security of farmers who cultivated rice farming in rainfed rice have been widely carried out. However, research on the contribution of rice farming in rainfed rice fields to farmers' household income by combining it with household food security has never been done, especially in Maros Regency. The purposes of this study are to analyze the contribution of rainfed rice farming to farmers' household income, and to analyze household food security of farmers who cultivated rice in rainfed rice fields.

RESEARCH METHOD

This research was conducted in three districts of Maros Regency: Lau District (Allepolea Village), Maros Baru District (Mattirotasi Village), and Simbang District (Bonto Tallasa Village). The research location was chosen purposively with the consideration that it is one of the areas that have extensive rainfed rice fields in South Sulawesi. The research period was from March to June 2019.

This study used a quantitative approach coupled with a survey method. The data, comprised of primary

and secondary data, were collected using observation, recording and interview techniques. The population was farmers who cultivated rice farming in rainfed rice fields at the research location. The population number was 1,035 farmers. The number of respondents was 100 farmers. The samples were selected using the proportional random sampling method in three research locations. Data analysis used a descriptive quantitative technique with independent samples t-test.

The analysis of rice farming contributions to farmers household income was formulated as

$$\text{CRF} = \frac{\text{Farming Income}}{\text{Total Income}} \text{ X } 100\% \qquad (1)$$

Where CRF is the Contribution of Rice Farming. The criteria of rice farming contributions to farmers household income were classified as follows: (a) contribution of rice farming more than 50% means it contributes to farmers' household income, and (b) contribution of rice farming is less than 50% means it does not contribute to household income. The criteria for testing used independent samples t-test on the contribution of rice farming to farmers' household income.

Farm household food security can be measured using the share of household food expenditure approach. To find out the share of household food expenditure, the following equation was used:

$$\text{SFE} = \frac{\text{Household Food Expenditure}}{\text{Total Expenses}} \text{ X } 100\% \qquad (2)$$

Where SFE is the share of food expenditure. Indicators of the level of food security were approached with the criteria (i) food share expenditure less than 60% of total expenditure is food secure households, and (ii) food share expenditure ≥60% of total expenditure is food insecure households. The independent samples t-test was used on household food security of farmers.

RESULT AND DISCUSSION

Respondent Characteristics

The characteristics of farmer respondents are a general description of the condition of farmer households who cultivated rice in rainfed rice fields. Characteristics of farmer household respondents examined in this study include farmers' age, farmers' education level, area of arable land, and experience in rice farming. The characteristics of farmer household respondents are presented in Table 1.

Table 1. Respondents' Characteristics

Variable	Number of respondents	
	people	%
Farmer's age		
20-40 years	43	43
41-60 years	53	53
61-80 years	4	4
Average (years)	42.6	
Education level		
Elementary school	41	41
Junior high school	29	29
Senior high school	29	29
Bachelor	1	1
Farm size		
0.10-0.50 ha	28	28
0.51-1.00 ha	53	53
1.10-1.50 ha	13	13
1.51-3.00 ha	6	6
Average (ha)	8.9	
Farming experience period		
≤10 years	13	13
10-25 years	66	66
>25 years	21	21
Average (years)	19.9	

Table 1 shows that farmers had an average age of 42.6 years, with a minimum age of 24 years and a maximum age of 72 years. The most dominant age group is 41-60 years old (53%), followed by the 20-40 years old group (43%) and the 61-80 years old (4%). Based on this age group, the farmers were dominated by husbands at their productive age as the main actor in the farming activities. Productive age is closely related to physical abilities and the ability to make decisions. In general, as one's age increases, his ability to work will increase to a certain extent, and then decrease afterwards. Farmers in carrying out their activities used agricultural machines (hand tractors) for land preparation. The use of agricultural machinery can speed up work completion and the cost is lighter or affordable to farmers.

The farmers were mostly elementary school graduates, followed by junior and senior high school graduates, and university graduates, respectively. This shows that the level of formal education of farmers is relatively low. The approach to supporting optimal farmer work results is influenced by the level of education. Formal education can determine success for the development of reliable human resources in their fields, and the level of education usually affects

the way a person thinks. In practice, even though their level of formal education is low, those farmers had been running their farming for a long time. Most of them had been active in cultivating rice since childhood and on average had experience in it. They also attended and received non-formal education from various activities like extension and training programs. With these activities, farmers knowledge will be more advanced to support the progress of their farming.

The arable land managed by farmers was dominated by the area size of 0.51-1.00 ha, followed by 0.10-0.50 ha size, 1.10-1.50 ha, and 1.51-3.00 ha. This shows that the land area cultivated by farmers varies. Some farmers worked on their own land, but many farmers cultivated other people's land using a production sharing system. The usual production sharing system was that half of the harvest was given to the land owner and the other half was given to the smallholders. The latter had responsibility in processing the fields from land cultivation to harvesting.

Most farmers had the experience of farming for 10-25 years, followed by 25 years or over, and less than 10 years. This means that most farmers had been running rice farming for a long time. Most experienced farmers were continuing the business of their parents. Experience is important to support farming activities. Most farmers tended to develop their farming skills from their experience. In general, rice farmers with longer farming experience had better skills and a better understanding of the rice farming process. Farmers' experience was obtained from their parents as an inheritance from generation to generation as well as from non-formal education by agricultural extension agents. Farmers with relatively long farming experience will be able to consider the risks involved in farming.

Rainfed Rice Farming

Analysis of rainfed rice farming in terms of production, price, revenue, total cost, and average income are presented in Table 2. The analysis of the results of the rainfed lowland rice farming differed on average among locations. In terms of production, revenue, and total costs in the farming analysis component, the production component of Maros Baru District was the highest (5,246.67 kg), followed by Lau District (4,820.30 kg) and Simbang District (4,487.50 kg). The revenue component of Maros Baru District was the highest, followed by Lau and Simbang District. The total cost component of Maros Baru District was the highest, followed by Lau and Simbang District. The rice price was higher in Lau District compared to Maros Baru and Simbang District, where the rice price in the last two regions was the same. As for revenue, Lau District was the largest, followed by Maros Baru and Simbang District.

Table 2. Rainfed Rice Farming in Selected District, Maros Regency

Item	Lau	Maros Baru	Simbang
Production (kg)	4,820	5,247	4,488
Price (Rp/kg)	3,700	3,400	3,400
Revenue (Rp)	17,835,110	17,838,667	15,257,500
Total Cost (Rp)	3,712,990	3,825,935	3,090,129
Revenue (Rp)	14,122,120	14,012,732	12,167,371

The revenue earned in Lau District was greater than in Maros Baru District, influenced by the rice price and the total cost. The rice production obtained in Maros Baru District was greater but the rice price was lower so that it affected the revenue. The total cost, which was also large, affected the income earned.

The Contribution to Household Income

The different contributions of rainfed rice farming to farmers' household income in the three locations can be seen using the independent sample t-test analysis (Table 3).

Table 3. The Contribution of Rainfed Rice Farming to Household Income in Maros Regency

District	CRF≥50%	CRF<50%
	..... people	
Lau	27 (90.0%)	3 (10.0%)
Maros Baru	21 (70.0%)	9 (30.0%)
Simbang	13 (57.5%)	17 (42.5%)
Rice Farming Contribution t test:		
t_{count}(contribution by not contributing)	10.727***	
t_{count}(Lau with Maros Baru)	3.280 **	
t_{count}(Lau with Simbang)	1.403 *	
t_{count}(Maros Baru with Simbang)	2.140 **	

CRF is Contribution of Rice Farming
***, ** and *denote significance at p 0.01, 0.05 and 0.10, respectively

Table 3 shows that rainfed rice farming accounted for more than 50% of household income in Lau District, with as many as 27 farmers (90.0%). In the same way, there were 21 farmers (70%) and 13 farmers (57.5%) in the districts of Maros Baru and Simbang, in which more than 50% of their income was accounted for by rainfed fields. The t-test results revealed significantly different (p=0.01) calculation,

indicating that rainfed rice farming contributed to the farmers' household income in three districts.

In comparison, the contribution of rainfed lowland rice farming to the household income of farmers in Lau District was the highest. This was followed by Maros Baru and Simbang District. Meanwhile, the t-test showed significantly different calculation (p=0.05) among districts. Also, Lau and Simbang District displayed significantly different calculation (p=0.10).

Table 3 provides an overview of rainfed rice farming in contributing to household income. Most of the farmers earned their living by cultivating rice in rainfed rice fields as their main occupation. This means that rainfed rice farming is the main source that contributes to household income compared to other businesses. For farmers, rice farming plays a role in providing staple food and a source of household income for farmers (Barokah et al., 2014). The main activities and main source of income for the community, especially people in rural areas, still depend on the agricultural sector. This means that the livelihoods of most households depend on the agricultural sector (Anton & Marhawati, 2016).

The dependence of farmers on income from farming is still large. This is because farmers have not tried hard to seek additional income apart from farming. This rice farming income is what helps a lot in running the economy and fulfilling the daily needs of farmer families. Therefore, farmers need to diversify in terms of seeking additional income in order to meet family needs. Farmers' motive for diversification is often more oriented towards income stabilization (Nurasa, 2013). Farmers also need to add work skills to find other jobs besides farming.

Farmers' income outside of rice farming is very diverse, both in agriculture and outside agricultural sector (Syamsiyah et al., 2017). Other farms carried out by farmers are typically food crops, maize and pond farming. If the income from farming activities is not sufficient, the farmers' household tries to find work outside of farming and non-agriculture in an effort to meet the needs of family life (Norfahmi et al., 2017). The income of farmers from outside the farm includes rice motorcycle taxi, masons and laborers. With this source of income, the welfare of farmer households can be seen from the fulfillment of the farmer's living needs as measured by the standard of decent living needs (Pratiwi et al., 2018).

Farmers Household Food Security

Food security is a very strategic and important matter. Food is a basic need as well as the essence of human life. Therefore, the right to obtain food is a very important part of human rights (Aziz & Muharni, 2016). Food crop farmers, in this case, farmers who cultivated rice, are an important subject in food availability. Farmers are important actors in food availability, so it is necessary to identify the level of household food security (Purwaningsih et al., 2015). In three districts of Maros Regency, the difference of farmers' household food security of farmers in three locations can be seen using independent sample t-test analysis. The analysis results of household cultivation resilience of rice farming in rainfed rice are displayed in Table 4.

Table 4. Farmers Household Food Security in Maros Regency

District	SFE<60%	SFE≥60%
	..... people	
Lau	8 (26.67%)	22 (73.33%)
Maros Baru	5 (16.67%)	25 (83.33%)
Simbang	13 (32.50%)	27 (67.50%)
Household Food Security t test:		
t_{count}(contribution by not contributing)		14.996***
t_{count}(Lau with Maros Baru)		0.036
t_{count}(Lau with Simbang)		1.423*
t_{count}(Maros Baru with Simbang)		1.966*

SFE is share of food expenditure: SFE<60% food secure, SFE >60% food insecure
***, ** and *denote significance at p 0.01, 0.05 and 0.10, respectively

Table 4 shows that in term of household food security based on the share of food expenditure in Lau District, the food secure households were 26.67% and the food insecure households were 73.33%; in Maros Baru District, 16.67% were food secure, 83.33% were food insecure; and in Simbang District, 32.50% were food secure and 67.50% were food insecure. These results indicate that rainfed rice farming households display the performance of food insecure farming in all regions. Based on the t-test results, it was significantly different (p=0.01), indicating that farmer households were food insecure in all districts.

Based on the t-test results, the results were significantly different (p=0.05) in Maros Baru and Simbang District. This means that the percentage of the number of farmer households that are food insecure is smaller in Simbang District compared to Maros Baru District. For Lau District and Simbang

District area, it was significantly different (p=0.10). This means that in Simbang District, the percentage of the number of farmer households that is food insecure is smaller than Lau District. Whereas, Lau and Maros Baru District were not significantly different (p=0.05 and 0.10). This means that the percentage of farmer households in Lau and Maros Baru Districts that are food insecure is similar.

The composition of household expenditure can be used as a measure to assess the level of economic welfare of the community. The lower the percentage of expenditure on food to total expenditure is, the better the economic level of the community is (Rahmi et al., 2013). The share of food expenditure can be determined by household resilience because the share of food expenditure is inversely related to food security. The higher the share of food expenditure is, the lower the level of household food security is.

Research Implication

The government always pays great attention to efforts in increasing rice production. The system of providing agricultural facilities and infrastructure continues to be refined so that farmers can be more productive in farming (Jamaluddin, 2016). Increasing production of lowland utilization is very important because rice fields are the main natural resources in rice production (Danuri et al., 2017). The success of increasing rice production in recent years has been led by an increase in productivity, rather than strategy in harvested area. The increase in lowland rice productivity contributed around 56.1%, while the increase in the harvested area accounted for 26.3% (Jauhari et al., 2020).

Rice productivity in rainfed lowland is generally still low, due to limited water for the needs of rice plant growth which only depends on rainwater. Another problem is the imbalance of nutrient content in the rainfed lowland area. Efforts to improve crop production and maintain productivity can be carried out by meeting the needs of soil nutrients in a balanced manner or with balanced fertilization (Yartiwi et al., 2018). Likewise, farmers in Maros Regency in general made use of balanced fertilizers in managing rice farming in rainfed rice fields. The aim is to increase rice production and maintain nutrient content in rainfed lowland areas.

The contribution of rice farming in rainfed fields to farmers' household income in Maros Regency was still very dominant. This is because most farmers who live in rural areas depend on agriculture for their livelihoods. Agriculture is associated with rural areas and some people work in the agricultural sector, as well as an additional job opportunity (Zuhurony & Susilowati, 2020). Rice farming greatly contributes to the income of farmer families (Bulanta et al., 2019). The lack of occupational diversification carried out by farmers has created a very large dependence on rice farming. As a result, rice farming income dominates the income in the household. Therefore, an effort is required to find other sources of income to increase farmers' income to support income from rice farming.

The income obtained by farmers in Maros Regency, especially at the research location, was from the results of rice farming in rainfed rice fields, added by income outside rice farming, which had an impact on the household food security of farmers. In general, farmers are more food insecure. This occurs because there is no other income source apart from rice farming, so farmers cannot meet household food needs. Farmers have a strategic position in food security, so they must have the ability to produce food while also having sufficient income to meet family food needs (Soedarto et al., 2020). Food security can be achieved if sufficient food is fulfilled for the community in terms of quality and quantity (Rahmawati et al., 2020). Several aspects that can affect food security are food availability, food security, food access and food quality. These four aspects indicate that food must be available in sufficient quantities and be available at all times in a sustainable manner.

CONCLUSION AND SUGGESTION

This study shows the production of rainfed lowland rice farming in three districts of Maros Regency, that Maros Baru District had the highest amount of 5,247 kg, followed by Lau District (4,820 kg) and Simbang District (4,488 kg). Rainfed rice farming's contribution to farmers' household income in Lau District was 90.0%, Maros Baru District was 70.0%, and Simbang District was 57.5%. Farmer households in those districts had food insecurity with the food expenditure share 73.33%, 83.33%, and 67.50%, respectively.

Farmers need to diversify their business apart from rice farming. The effort that must be done is to improve work skills to increase household income. With the increase in income, the food security of farmers' households will increase to become food secure. Increased food security of farmer households

means that welfare increases, meaning that food is easier and more affordable for the households to obtain.

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Institution reinforcement of mosque in social economic empowerment of small merchants community

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ABSTRACT

Historically, mosque is the center for human civilization with various activities covering social, economy, and culture. However, its function have been shifted and specialized into a place of praying. This paper aims to describe the contribution of the Great Mosque of Attaqwa Pancor in social economic empowerment, particularly small businesses in Pancor, East Lombok, West Nusa Tenggara (NTB). The data were collected through observation, interview, and document study. The result of the analysis shows that mosque involvement in the small-scale economic activities has freed them from the difficulty of getting capital access and from dependence. In the first stage, from 2019 to August 2020, through Mawar Emas program, as many as 80 small-merchants in Pancor village were helped to be free from debt. The Great Mosque of Attaqwa with the support of Indonesia Sharia Economic Community (Masyarakat Ekonomi Syariah, MES) successfully distributed the total amount of 80 million rupiahs for the small business purposes. The existence of the Attaqwa Mosque proves and affirms that religious institutions can contribute to the social economic development. Considering the strategic position, this paper suggests the need for institutional reinforcement so that mosques to restore their broader role in fields other than religious affairs.

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INTRODUCTION

Under the leadership of Prophet Muhammad and the subsequent Chalips, mosques served as the center of civilization. All political and socio-economic activities were organized in the mosque. Dynamics of life and human problems were discussed and resolved at the mosque. However, in Indonesia today, the role of mosques is slowly diminishing. Activities in mosques are dominated by religious activities such as religious rituals implementation and religious discussions (Jannah, 2016). To return to their prior designated nature, several mosques try to expand their functions like those in the era of Prophet Muhammad. They mainly carry out empowerment to strengthen society's socio-economic condition (Musahadi, 2018). A mosque in Jepara, for instance, has played a role in reducing the socio-economic impact of the COVID-19 pandemic (Ilmi & Alhakim, 2020). The function of mosque as a center of social economic development has been well-known, yet the mechanism of the religious institution involvement to make a huge impact on social welfare improvement is not widely exposed. The study of

Saint-Blancat & Friedberg (2005) in Europe showed that the employment of mosque as the center for non-religious-related activities is controversial. Many of them argued that mosques can be abused if they also concern non-religious-related issues (Pierce, 2014). The considerable contribution and public acceptance on the role of mosques need to be studied carefully.

Studies on the function of mosques indicated that mosques are seen as a religious learning or education center (Riwajanti, Muwidha, & Candrawati, 2017). Even, a hadith that tells Moslems to "vitalize the mosque" is interpreted as performing more religious rituals. A research by Haqqoni (2020) on the function of a mosque other than a place of religious activities suggested that it has been used as a community health center (Haqqoni, 2020). The relationship between mosques and economic activities can be found in the study by Al-Krenawi (2016), Astari (2014), Riwajanti et al. (2017), and Wulandari (2017). In addition to exploring how mosques become social movements supporting societies' economic activities through capital funding, those papers also discussed the social networks which strengthen the institutional power to access economic resources. In Pancor Nusa Tenggara Barat, Attaqwa, a mosque with sacred values as a place of religious rituals, plays a substantial role in increasing social welfare. Supported by Indonesia Sharia Economic Community (Masyarakat Ekonomi Syariah, MES), the mosque runs a program to help merchants solve social-economic problems. A group of small-scale merchants with very limited capital in that district can successfully develop and secure the family welfare due to the mosque's assistance.

This research aims to complement the shortcomings of the existing studies by analyzing how the welfare of small-scale merchants can be achieved through religious institution approach. It specifically examines how mosques perform the function of community empowerment through institutional approach. This paper also shows that empowerment covers not only capital support for business expansion but also institutional strengthening to open up access for small-scale merchants to develop.

The latter is based on the argument that the economic development of small-business groups may not be achieved without any access expansion. The small-scale merchants will never make changes without an intermediary structure that bridges them into economic resources (Richter, 2019). Religious institutions can serve as intermediary structures that provide mentoring to guarantee the small-scale merchants' success in running the business.

RESEARCH METHOD

An in-depth study towards the Great Mosque of Attaqwa, Pancor, East Lombok, West Nusa Tenggara (NTB) province of Indonesia was conducted. The nature of the mosque as the center for human civilization has proven to provide a solution for the problems in the society through a program called *Mawar Emas* (Golden Rose). *Mawar Emas* is the abbreviation for *Melawan Rentenir Berbasis Masjid* (Fighting Moneylenders with Mosque). To run the program, the Great Mosque of Attaqwa is supported by Sharia Economic Society (Masyarakat Ekonomi Syariah/MES) that consists of NTB Syariah Bank, universities, and the provincial government.

This study employs a qualitative approach. The required data were obtained through interview, observation, and document study. The interviewed informants were selected based on their direct involvement in the cases studied. The respondents consisted of the Head of MES East Lombok District as the technical executive, NTB Syariah Bank as the provider of funds, and small-scale merchants in Pancor as the subject of the Mawar Emas program. Other informants represented universities and mosque administrators (*takmir*) who help supervise merchants (Table 1).

Table 1. Research Respondents

No.	Respondents	Amount
1	Head of MES	1
2	Officer of NTB Syariah Bank	1
3	Lecturers of Universitas Hamzanwadi	2
4	Lecturers of Universitas Nahdlatul Ulama	2
5	*Takmir* of Attaqwa Mousque	1
6	Small merchants involved on *Mawar Emas* Program	80
	Total informants	87

The interview with the MES and the NTB Syariah Bank aimed to obtain data regarding their role in providing support for institutional strengthening to the *takmirs*. Interviews with academics from universities and mosque *takmirs* strengthened the data about the *Mawar Emas* mentoring program. Whereas, the small-scale merchants provided information about their conditions before and after participating in the program.

To support the results of the interview, the documents associated with the Mawar Emas program were studied carefully. They included program planning, a list of merchants who participate in the program, and notes on their involvement with the high-interest loan. In addition, the situation of the merchants, the implementation process of the *Mawar Emas* program, and the impact of the programs were carefully observed. In order to obtain comprehensive and in-depth data, the researcher lived with the subjects of the study for 10 months, from December 2019 to November 2020.

Descriptive analysis was then used. The unnecessary parts were reduced while the necessary ones were classified according to their types and chronologies. Next, they were described, analyzed, and presented.

RESULT AND DISCUSSION

The Condition of the Small-scale Merchants

The Great Mosque of Attaqwa was established in 1976. It is located at a shopping complex in Pancor Village, Selong District, East Lombok Regency, NTB. Its worshippers are more than 200 people. They include farmers and small merchants around that area (DKM Masjid Attaqwa, 2020).

This study involved 80 small merchants with more than 5 years of working experience. They were found around Pancor market and across the streets. Due to limited funds, it was hard for them to develop their business. Even, many of them were stuck with loan sharks. The income had hardly met their daily needs for years and was even sometimes insufficient. Based on the business types and locations, the small merchants were divided into 5 categories: green-grocers, grocers, traditional snacks sellers in the market, food vendors along the streets, and vegetable pedlers around the village of Pancor (Table 2).

The difficulty of small merchants to meet their daily needs led them to borrow money from fund providers which were nearby, easy to reach, and very accommodating. Nearby means that the providers were located around them. The providers were easy to reach as they were willing to come to the merchants who need loan. They lent money to the small merchants with various amounts, ranging from 500,000 to 3,000,000 rupiahs. Such loan providers were called "Bank Subuh" by locals as they would usually collect the loan payment at daybreak. In Indonesia, this type of lenders is typically called "*rentenir*", in which the payment system creates a heavy burden for the debtors (Nasrulloh, 2020). The simple process encourages the small-scale merchants to get loan from those lenders. In the case of "Bank Subuh" in Pancor, the ease of the loan disbursement was granted without any condition, as basically they knew each other. However, this ease should be paid off with high interest, which was 2%, that must be paid daily. If the loan principal could not be paid off immediately, the debtor must pay daily interest.

Merchants were heavily burdened with interest payments on loans, which induced them to borrow more. At the beginning, the merchants variously borrowed from 500,000 to 3,000,000 rupiahs. It then happened over and over again so that the loan principal got bigger, while the installments and interest were also higher. Rohmiati Jalilah, one of traditional snacks sellers, could not be free from debt which got higher. She and the other small merchants could no longer think about business development but were more preoccupied with the way to repay the loan. This condition commonly happens until debtors face a debt-trap condition (Rahoyo & Nss, 2019).

Bank is the authorized financial institution that provides funding programs for micro, small, and medium-sized businesses (Diana, 2019). However, not all small merchants could access the funds in the bank. The few numbers of small merchants who access the banks' funding assistance were caused by internal and external factors.

Table 2. The Business Type of Small Merchants in Pancor, 2019

No.	Business Type	Location	Sample size	Percentage	Monthly Average Return
				%	rupiah
1.	Greengrocer	Pancor Market	24	30	3,000,000
2.	Grocer	Pancor Market	19	24	3,250,000
3.	Traditional snack seller	Pancor Market	16	20	3,300,000
4.	Street vendor	The streets of Pancor	13	16	2,750,000
5.	Vegetable pedler	Pancor village	8	10	2,750,000
	Total		80	100	

An internal factor was their inability to provide the collateral required by the bank. The collateral could be in the form of a certificate of vehicle ownership, home/land certificate, cash flow, the financial statements of the business, and so on. Misram, a chicken noodle vendor, stated that he never knew the physical form of the letters of guarantee required by the bank. Another internal factor was the low level of the merchants' formal education, making them unable to fulfill the administrative requirements imposed by bank, such as filling forms or writing statements. The external factor was the incomplete information received by merchants, resulting in their reluctance to access the fund. Therefore, the existence of banks and any other formal financial institutions in collaboration with communities is a must (Bustan, Divianto, & Setiawan, 2017).

Table 3. The Development of Small Merchants' Turnover in 2016-2018

No	Business Type	Stagnant	Decline
		..... %	.....
1.	Greengrocer	80.0	20.0
2.	Grocer	83.3	16.7
3.	Traditional snack seller	90.0	10.0
4.	Street vendor	87.5	12.5
5.	Vegetable pedler	80.0	20.0

During 2016 - 2018, 80% to 90% of merchants' businesses were in stagnant condition while the remaining merchants' businesses (10 to 20%) indicated a declining turnover (Table 3).

Empowering Small Merchants

The Great Mosque of Attaqwa Pancor is one of the mosques in Indonesia which performs a real action to help small-scale merchants solve their problems. From the end of 2019 to 2020, the mosque received funding from the Regional Board of MES in cooperation with the provincial government to strengthen the *takmir* institution of the mosque through various education and training activities. They were included in a program called *Mawar Emas*. Society empowerment by mosques proves that mosques' role is not only as a worship institution, but also taking care of society problems (Faizaturrodhiah, Pudjihardjo, & Manzilati, 2018).

The idea of *Mawar Emas* program was initiated by the Governor of NTB. It was then followed up by the local government, NTB Syariah Bank, Universitas Hamzanwadi and Universitas Nahdlatul Ulama. Through the program, the *takmir* of the Great mosque of Attaqwa Pancor was reinforced in the knowledge of (i) the role and function of mosque in Islamic civilization, (ii) operational management regarding financial management, (iii) the benefits of bringing mosque prosperous through economic and Islamic approach, (iv) social economic empowerment, (v) the potential of the social fund of Islam in improving the economy of society, and (vi) the introduction of a digital application to manage the mosque finances (DKM Masjid Attaqwa, 2020). Through the reinforcement, the mosque performed a real action in helping merchants overcome the capital issues.

The assistance program for small merchants by the mosque was planned in 2018 and has been implemented since the end of 2019. Recently, the mosque helped to empower 80 small merchants who had debts problems with informal loan providers such as "Bank Subuh". The main action of the mosque to strengthen their economy was reorganizing the merchants into groups. The grouping is intended to strengthen some individuals incorporated in capital management (Hadiyanti, 2008). It can also facilitate the formation of small-business networks and widen their linkage to other businesses. The group consisted of 8 – 20 members based on their business type. Microfinance-based groups have the potential for social capital. This can strengthen the intention and behavior to increase the commitment to repay their loan (Machfudz & Kamila, 2019).

Takmir, in cooperation with MES, provided mentoring for the merchants who get funding. The mentoring was held every week in the form of preaching. The topic of the preaching was not limited to the religious materials but training and feedback. The training materials were not only about religious issues, but also business ethics in Islam, product development, marketing, business management, and simple financial record. The feedback discussed was about the utilization of the funds that have been given. Within the weekly meetings, the merchants also paid off the loan as agreed.

Table 4. The Loan Installments, Phase I 2019 - 2020

Small Merchant Type	Group	Number respondent	Loan per Group	Return Period	On schedule return
		people	rupiah	week	%
Greengrocer	I	12	12,000,000	40	100
	II	12	12,000,000	40	100
Grocer	I	10	10,000,000	32	100
	II	9	9,000,000	40	100
Traditional snack seller	I	16	16,000,000	40	100
Street vendor	I	13	13,000,000	40	100
Vegetable pedler	I	8	8,000,000	32	100
Total		80	80,000,000		

Empowerment through Funding Assistance

The mosque institution has a chance to empower the congregation and the local communities. The mosque management as an empowerment agent then manages the funds for productive activities (Utama, Fitrandasari, Arifin, & Muhtadi, 2018). The empowerment given by the mosque to the merchants is in the form of funding assistance, as it is the most important aspect of small business. Therefore, capital access can be one of the strategies to ensure the small scale economic business is sustainable (Rahim, 2018).

The funding assistance was given based on a group. The installment was made weekly with a joint responsibility system. Joint responsibility means shared responsibility within a group. If one member cannot afford to install the loan, the other group members do a joint venture to pay off. The installment will not feel burdensome as it becomes the responsibility of many members.

The first stage of the loan capital was given in September 2019. The amount was 1 million rupiahs with 0% interest per individual, and it was given through the group. The recipient of the capital began to pay off weekly in the second month after receiving the loan. The amount of the installment was according to the borrower's financial condition with varying installment periods. Hayatin Nupus could afford paying 25 thousand rupiahs per week, so all the loan can be paid off 40 times or 40 weeks. If the group is successful in repaying the loan according to the contract agreement, they are allowed to propose for a greater amount of funding in the next stages. The success of the capital assistance through the program of the mosque is measured by the ability of the merchants to timely return the loan (Table 4).

Table 4 shows that since its opening in the end of 2019 to the mid-2020, the capital assistance for small merchants has proven merchants' ability to return the loan on schedule. According to *takmir* of the mosque, the timely return installment that was launched in the first stage loan indicated the smoothness of the businesses run by the capital recipients. Therefore, all merchants currently receiving the loan are on progress to receive subsequent loans after all the loans are paid off. All group members stated that *Mawar Emas* program helped them gain access to capital without complicated requirement and suffocating interest. Although they are not yet a hundred percent free from the previous Bank Subuh high-interest loans, Saenah hoped that *Mawar Emas* program would run smoothly so that she can be free from being entangled in debt.

The institution of the mosque can be a structural force that allows access extension in countering against the trap of the market economy (Amalia, 2012; Assari, Mahesh, Emtehani, & Assari, 2011; Cholil, 2016). The function of mosques in Indonesia have been limited to the center of worship and other religious activities. Meanwhile, its function for other, non-religious issues reflects how it was used during the leadership of Muhammad, in which it also served as a center for education and government administration (Riwajanti et al., 2017). During the era of the caliphs, its function was expanded to be the center for socio-economic activities through Baitul Maal, which managed the collection and distribution of zakat (Riwajanti et al., 2017; Utama et al., 2018). Mosques as a source of capital assistance for small merchants is a historical continuity upon the best practice in the Islamic civilization.

The Great Mosque of Attaqwa Pancor performs a new phase of society awareness on economic empowerment. Social economic empowerment in Indonesia occurred at least in 1905, which began with the establishment of Sarekat Dagang Islam. Sarekat Dagang Islam has become the basis for social economic power in which mosques became the strategic center for the prosperity of people since then

(Sager, 2014; Siam, 2012). Nevertheless, this movement was then protracted for political purification. Religion also went against the non-religious movements enacted under religion. Markets, despite being a place for the grassroots to survive, were under the authority of the kingdom which opened up concessions to the Chinese businessmen.

This paper, in addition to reviving the discourse of religious institutional role, also gives awareness of the importance of intermediaries structure (Richter, 2019) to build a small scale economy. This study shows that small merchants through the mediation of the mosque's role have succeeded in removing the problems of the market economy that plunged them.

Research Implication

Research findings show that mosque as a religious institution has a very important role for the surrounding community. The role must be optimized as done by the Great Mosque of Attaqwa Pancor and supported by MES. This study shows that the mosque functions as an intermediary that connects merchants with the economic resources (Sochimin, 2016; Utama et al., 2018) and enables a source for venture capital to merchants (Omar, Hussin, & Muhammad, 2017).

The approach which positions the mosque as a part of an integrated social system allows the possibility of discovering its great potential. Its nature, which was the center of civilization in Islamic tradition, returns due to the demand for the grassroots' economic condition which required an alternative approach to resolve. Conventional approaches through various programs of poverty alleviation have been unable to develop and empower small merchants who are trapped in poverty and dependence. The return of the mosque function as a social and economic institution widely known in Islamic civilization has affirmed the need for its development so that it is optimally exposed. This paper also confirms the importance of further analysis about the history of mosque in leading moslems' socio-economic development. Thus, the results of this study provide important implications for several parties.

First, empowering small merchants. By joining the *Mawar Emas* program, the merchants acquire knowledge and skills related to business development through various kinds of training which are scheduled once a week. In addition, it also raises merchants' awareness in obtaining a business capital loan. They are expected to no longer be tempted by irresponsible lenders or loan sharks, which in this case are more often called "Bank Subuh." The ease of access to loans no longer attracts merchants if the interest system and payment methods are burdensome. Moreover, the existence of a mosque is no longer seen as only a place of worship but also a religious institution that cares for the needs and welfare of the congregations and surrounding community. The relationship between the mosque and the merchants is increasingly intense covering the socio-economic aspect and broader aspects.

Second, mosque institutional improvement. The success of *Mawar Emas* program proved that the mosque can be a solution for small merchants who have debt problems in "Bank Subuh". It is common to see small businesses with the issue of the tendency to be stuck in the loan trap, instead of limited capital (Mohsin, 2013). The involvement of the mosque can be an institutional backup that empowers merchants' group. The success of Attaqwa Mosque through their first stage of loan beginning in September 2019 encouraged the *takmir* to prepare the next stages properly in which the second stage was conducted on August 2020. Therefore, Attaqwa Mosque strengthens its relationship with MES and ensures the sustainability of surrounding community empowerment. The next stage was planned to reach a wider range of people in need around the mosque.

Third, strengthening cooperation and networking within MES organizations. MES consists of parties who support and care for small scale business. MES brings together the potential of organizations such as NTB Syariah Bank, Hamzanwadi University, Nahdlatul Ulama University and local government. It supports Attaqwa Mosque and its *Mawar Emas* program in terms of finance, community education, and strengthening of mosque institutions. Later, it needs to expand more targets to other mosques by increasing the amount of loans disbursed. As such, this study reaffirms the prominence of religious relations with the economy (Kuznetsova & Round, 2014; Martens, 2014). The scientific discourse about the relationship of religion and economy stuck in the early 1990s (Abdullah & Aini, 2017). Religion is involved more with political discourse rather than the economic one so that moslem welfare gains less attention. Thus, supporting mosques to be society's economic boost becomes MES's primary concern.

Fourth, the results of this study can also have implications for how local governments take the

initiative. This study shows that local governments can consider making policies that support the program to expand the institutional role of mosques. Local government initiatives together with MES are encouraged more clearly to develop programs needed to solve economic problems around mosques.

CONCLUSION AND SUGGESTION

The Great Mosque of Attaqwa Pancor, East Lombok showed its role as an intermediary between small merchants and capital resources. Through *Mawar Emas* program from September 2019 to August 2020 in stage I, the mosque provided loans to 80 small merchants with the loan worth 80 million rupiahs, using an interest-free scheme. The program will continue to the next stage for further business development and settlement of debts to moneylenders. The structural institutional reinforcement of the mosque gains supports from MES. Cooperation between mosques and MES must be synergized to maintain program sustainability, provide community assistance programs, and foster the empowerment of small-scale merchants.

The study enriches the scientific reference about the existence of a mosque within complex entities yet limited only in a single region issue. A more comprehensive and comparative study is needed to understand how mosque culturally and structurally provides a basis for the strategic roles. In line with that, further research concerning the characteristics of particular region is needed because every mosque and community has its own specific culture. Furthermore, a historical approach is also necessary to examine the ups and downs of the position and role of the mosque besides religious ritual issues.

The research suggests many implications to strengthen small scale businesses around mosques. Firstly, mosques need to ensure that their existence supports social economic empowerment movements and functions more than a place for worship. Secondly, mosques need to strengthen the vision which emphasizes their function for the benefit of society. Thirdly, MES as a party that supports the mosques' social empowerment programs should strengthen and widen its networking. Finally, local governments must show a high commitment to protect small merchants and the poor from the perpetrators of the illegal loan practice.

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Spatial modelling of multidimensional poverty in rural area: Evidence from Malang Regency, Indonesia

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ABSTRACT

Poverty is a multidimensional phenomenon that causes difficulty for people to meet their needs. The research aims to scrutinize physical and social infrastructures concerning multidimensional poverty levels using the spatial approach. Jabung District, Malang Regency, Indonesia has 35% poor households in this case study. The objectives are to measure multidimensional poverty levels, social capital indices of the rate of participation (RoP) and density, and scrutinize neighborhood relationships among 15 villages using spatial regression analysis. Data collection is through a questionnaire survey of 274 heads of households. The research identified four poverty levels (very low to high), where five villages with high poverty levels (Jabung, Taji, Kemiri, Gunungjati, Slamparejo) became the targeted areas. The majority of the villages had a medium level of both the RoP and density, and the community had moderate social relations among community members. The spatial regression analysis indicates that the attribute of the RoP and weight matrix have a significant impact on the poverty level. It is recommended that poverty alleviation programs should focus upon the cluster of poor villages through social infrastructure development as the action to end poverty.

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INTRODUCTION

In the era of SDGs fulfillment, poverty is still a worldwide problem, particularly for developing countries, that have to be tackled by 2030. Poverty might be a direct result from having very low income or very limited resources which then brings further effects, for instance, undernourishment and hunger, exposure to infectious diseases and mental sickness and drug addiction. Poverty might emerge in a community when it has no basic abilities, no income, no adequate education, bad health condition, no safety, low confidence, or lack of rights such as freedom of speech (UNDP, 2016). Poverty is also a development problem of Indonesia indicated by lack of access to education and health services, insufficient access to hygienic water and sanitation, and difficulties of fulfilling basic needs of food, apparel, and housing (Adhi, 2009).

To reach the first goal of the SDGs, the Indonesian government has several programs to reduce poverty such as *Beras Miskin* (rice for the needy), *Beras Sejahtera* (rice for welfare), *Bantuan Pangan Non-Tunai* (non-cash food aid), and *Bedah Kemiskinan Rakyat Sejahtera* (poverty termination for welfare).

Poverty also has an impact on economic activity, especially on government programs. Poverty reduces

employment and Gross Regional Domestic Product. Local governments should handle regional finances more effectively to reduce poverty, especially community economic activities (Elia et al., 2020). Poverty is a multidimensional phenomenon that causes difficulty for people to get a healthy lifestyle and education (Aminou & Zahonogo, 2020).

The basic idea of this research is derived from the assumption that understanding the influence of both physical and social infrastructures as well as spatial neighborhood effect might develop an appropriate strategy for dealing with poverty alleviation (Ari et al., 2017). The Multiple Poverty Index (MPI) value from the first research objective will be a dependent variable, whereby poverty does not merely look from an economic aspect as it has three dimensions (MPI Research Team, 2015), representing the lack of physical infrastructures and its impacts (Adhi, 2009; UNDP, 2016). The independent variable consists of (i) access to physical infrastructures from home to the public facility, (ii) social capital value among households within village level that is labeled as social infrastructures, and (iii) spatial neighborhood effect between villages at the district. Social ties among households depict a function of the formation of social capital that might be able to mobilize both internal and external resources between individuals related to multiple memberships of certain institutions (Gibbs & Coleman, 1990; Putnam, 2001; Wasserman & Faust, 1994). In addition, according to an evidence review of public services in the United Kingdom, an inappropriate understanding of social networks and social capital might lead to wrong policy on how to deal with poverty through public services (Matthews & Besemer, 2014).

As one of the regencies in East Java Province, Malang Regency has a 10.37% population below the poverty line (BPS, 2018a). Moreover, Jabung District is one of the districts with 29% of households identified as poor households (BPS, 2018b).

To be able to propose recommendations for poverty alleviation through spatial modelling, the study has three research objectives. First, measuring the poverty level at each village in the district from three poverty dimensions using the MPI. Second, calculating indices of Rate of Participation (RoP) and Density as a reflection of social relationships among villagers (Ari et al., 2017) implying Social Network Analysis (SNA). Third, finding significant variables of poverty level at the district using Spatial Regression Analysis.

Therefore, the research is an attempt to propose a holistic approach on the development of poverty alleviation method through integration between access to a public facility, social capital, and geographical position between villages that generally previous researches did it in separate ways that it might guide to misleading on targeting poverty policy.

RESEARCH METHOD

Jabung District in Malang Regency was selected as the research area because the district is categorized as one of the thirty-three districts with a high number of poor households in Malang Regency (BPS, 2018b). Primary data collection was designed using a questionnaire survey consisting of three parts, i.e. personal identity, attributes of the three dimensions of MPI, and attributes of community memberships into the existing community groups at the village.

The sample of respondents was 274 households distributed proportionally at each village whereby the district consists of 15 villages and 22.275 households with a total of 75.113 inhabitants (BPS, 2018b). Collecting data took about three weeks including 1 week for the interview and 2 weeks for field observation of the infrastructure data and secondary data. The secondary data were collected at each village government office and community health center in the district. The first period of data collection was carried out in July 2019, but due to the unpredicted global pandemic of Covid-19, a re-survey was conducted in July-August 2020 to ensure data validity.

Analysis Method

a. Multidimensional Poverty Index (MPI)

The first objective of the research is to measure the MPI covering the dimensions of (i) education, (ii) health, and (iii) living standards of each village, where the primary data were the main source for its measurement. A family is considered an impoverished household when its value of C_i is ≥ 0.33 (OPHDI, 2010). C_i is labelled as the poverty index score of households i, which is equal to the sum of the total value of the whole number of households of its weights from indicator i ($W_{1...n}$) multiplied by 1 or 0 if respondents are included or not included in the indicator 1 ($I_{1...n}$).

Table 1. Dimension and Indicator of Multidimensional Poverty Index

Dimensions	Description of Indicator	Weights
Health	Nutrition: Child (<5 years) with malnutrition	1/6 = 0.167
	Child Mortality: Child (<5 years) has died in the household within the last five years	1/6 = 0.167
Education	Educational Years: No household member has completed twelve years of schooling	1/6 = 0.167
	School Attendance: Child of school-aged does not attend school until their age to complete 12 years of schooling	1/6 = 0.167
Living Standards	Cooking Fuel: manure, firewood, or wood coal	1/18 = 0.056
	Sanitation: unimproved household's sanitation facility, or improved shared household's sanitation	1/18 = 0.056
	Drinking-Water: no access to safe drinking water, or access to safe drinking water with roundtrip walking distance from home at about 30-minute or longer	1/18 = 0.056
	Electricity: no access to electricity network	1/18 = 0.056
	Floor: a soil, gravel, or manure floor	1/18 = 0.056
	Assets: do not have a TV, radio, mobile phone, motorcycle, car.	1/18 = 0.056

Table 1 displays the description for each dimension, and indicator of the MPI measurement based on the Indonesian situation, and for the weight for each indicator (UNDP, 2016). According to the Development Framework of Education (National Planning Board, 2016), each household member has to fulfil their study at a minimum level of senior high school at the age between 6 to 23 years old. Referring to the decree of the Indonesian Ministry of Health No.1995/Menkes/SK/XII/2010, the citizen will be defined as poor if in a family has one or more malnutrition and child mortality cases (KEMENKES RI, 2010). On the Technical Notes of Human Development Reports (HDR) (UNDP, 2016), the living standards comprise six indicators. A household is categorized as poor if (i) they use traditional cooking fuels such as firewood, (ii) have no private or even communal sanitation, (iii) do not have access to safe water network (such as acquire freshwater directly from well, spring, or river), (iv) do not get electricity supply, (v) use traditional floor material (such as dirt, sand land, animal manure), and (vi) have less than 1 asset of information, mobility, and livelihood. Referring to UNDP (2016), the weight is divided into three equally based on the number of dimensions. In more detail, 1/6 is the weight for each indicator since the first and second dimensions consist of two indicators. Meanwhile, the weight of each indicator of the third dimension is 1/18 since it has six indicators.

According to MPI Research Team (2015), MPI is measured by multiplying the percentage of the poor people or in other words, multiply the headcount ratio (H) with the intensity of poverty (A). In more detail, the headcount ratio (H) is a ratio between the number of poor multidimensional individuals (q) and a total number of population (n). Value of A is a ratio between sum up of poverty index score of households i to q (ci) and the number of poor multidimensional individuals. Then, the dimension contribution k to poverty is expressed as a ratio between sum up j member of k of the sump up c_{ij} from 1 to q (Σj∈k Σ_1^q cij) and a total number of populations (n), divided by the MPI value. According to the Module (MPI Research Team, 2015), the value of MPI's measurement can be differentiated into five levels, from very low (<0.09), low (0.09-0.18), medium (0.18-0.27), high (0.27-0.36), and very high (>0.36). The lower value of MPI means a better level of poverty or it shows lower level of poverty, and vice versa. Table 2 displays a detailed measurement of the indicator of each dimension in the MPI with binary choice (0 and 1).

b. Two Indices of Social Capital

The second research question is to measure two indices of social capital namely the RoP and density as the independent variable for the modelling (Ari et al., 2017; 2014; 2010). Referring to the SNA developed by Scott (2000) and Wasserman & Faust (1994), the two indices are calculated by UCINET 6.3 as the analytical software. The type of data is called affiliation data of the respondents' memberships to the groups of community and is stored in the form of a matrix. Firstly, the data were stored as incidence matrix (nxm) and then they had to be changed to adjacency matrix (nxn), as basic data on measuring a social relation between respondents at a village, where the two indices would represent their level of social capital.

The RoP is a ratio between the sum of the number of memberships of each household to community groups (x_{ij}) and a total number of respondents/head of households (g) in a village area (Wasserman & Faust, 1994). The value of the RoP is varied from one network to others, depending on the number of present groups of the community. The higher value of the RoP indicates the higher average of the total respondents in a certain area. The research classified the value of the RoP into three categories (low, medium, and high) to be able to compare the RoP among villages (Ari et al., 2017; 2014; 2010).

Table 2. Measurement of MPI Indicators

Dimensions	Indicator
Education	
Years of Education	1: less than senior high school level 0: senior high school and higher
School attendance	1: do not attend the school between age 6–23 years old 0: attending the school between age 6-23 years old
Health	
Nutrition	1: one or more cases of malnutrition in a household 0: no case of malnutrition in a household
Child Mortality	1: one or more cases of child mortality in a household 0: no case of child mortality in a household
Standard of Living	
Cooking Fuel	1: using firewood for cooking 0: using Liquid Propane Gas (LPG), Biogas and Electricity
Sanitation	1: no sanitation, jointly sanitation, and communal sanitation 0: personal sanitation
Drinking-Water	1: using no piped drinking water (river, well, spring) 0: using piping drinking water (PDAM, HIPPAM)
Electricity	1: no access to electricity 0: have access to electricity
Floor	1: infeasible floor pavement (soil, sand-land, animal feces) 0: feasible floor pavement
Assets	1: having <1 of information, mobility, livelihood assets 0: having a minimum 1 of the information assets, and 1 of mobility and livelihood assets

Density is used to identify how dense relationship among village members within a network (Scott, 2000; Wasserman & Faust, 1994), which is the ratio of the summation of the connected number of the respondents i to j ($\sum_i^g = 1 \sum_i^g = 1 x_{ij}^N$) multiplied by the number of respondents (g) and the number of isolated respondents (g-1). Isolated respondents were heads of households with no affiliation with others since they did not join in any kind of community group within a certain village. The value of the density is between 0–1 (Scott, 2000; Wasserman & Faust, 1994), and it will classify into three levels similar to the RoP (Ari et al., 2017; 2014; 2010). The higher value of density of an area defines the deeper social relations amongst respondents within the area.

According to Scott (2000), the data type for the SNA is the affiliations formed through links among people within each village from their membership in existing community group. Such community groups consisted of (i) male quran recitation, (ii) female quran recitation, (iii) quran recitation, and (iv) youth group. The first three groups were purely religious activity amongst Moslems for having a better understanding about their religion. Meanwhile, the last group was a communal activity of villagers related to their daily activity such as environmental cleanliness and annual independent day festival.

c. Spatial Regression Analysis

The Geographic Data Analysis (GeoDa) was used to identify spatial data analysis (Anselin, 1988; Griffith & Anselin, 1989) to address the third research question. The space concept was applied through a weight matrix, which described the position of the location of the area of connectivity in a set of data. In the study, neighbors in the district were described by the Queen weight matrix that determined a neighbor of the village as an adjacent edge or vertex. The characteristics of weights matrices were displayed in a connectivity histogram. Each bar explained the frequency of each neighbor in Jabung District.

Spatial autocorrelation (SA) denotes the positive and negative of a variable correlation with itself in spatial location. The positive value describes similar spatial clusters of high-high or low-low, meanwhile, the negative indicates different values of spatial outliers of high-low or low-high. The research calculated the SA by putting the values of the MPI as variable and the Queen weight matrix as spatial settings. The positive SA present during high values of the MPI correlated with high values of the neighboring, and vice versa (Anselin, 1995).

Moran Scatter Plot displays the type and strong point of the SA in a distribution of data, where the slope depicts the Moran's I value as observing of global clustering of the SA in a set of data. The scatter plot consists of four quadrants that display the

relationship between the MPI value of a village to its neighbors with the positive and negative SA (Yuriantari et al, 2017).

The presence or absence of significant or outlier spatial clusters for each position is specified by the Local Indicators of Spatial Association (LISA). In particular, the maps of LISA are effective for evaluating the proposition of spatial arbitrariness and recognize local hot spots.

RESULT AND DISCUSSION

Socioeconomic Characteristic

The following seven tables indicate general characteristics of education, health, and living standards dimensions at each village in the district from the secondary data compilation.

Table 3. Educational Attainment of Household

Village	Not Complete Elemen-tary School	Elemen-tary School	Junior High School	Senior High School
	..... %			
Sidomulyo	20	67	3	10
Kenongo	34	62	0	4
Kemiri	20	75	5	0
Gading Kembar	3	82	10	5
Jabung	2	87	11	0
Gunungjati	7	89	0	4
Ngadirejo	63	34	3	0
Argosari	0	95	0	5
Pandansari Lor	3	86	0	11
Slamparejo	24	68	5	3
Taji	8	84	8	0
Kemantren	17	71	5	5
Sukolilo	20	43	2	33
Sukopuro	21	60	10	8
Sidorejo	16	57	3	24

Table 3 illustrates the educational background of the resident within four categories: (i) not completing elementary school, (i) elementary school, (iii) junior high school, and (iv) senior high school. The majority level of education was elementary school, with the highest percentage in Argosari Village (93%). The residents of Sukolilo Village had the highest percentage of high school graduates (33%). Meanwhile, the highest number of residents who did not complete elementary school was in Ngadirejo Village. Referring to National Planning Board (2016), the results might imply that to avoid poverty minimum level of educational background should be no less than high school graduates.

Table 4 describes cooking fuel types used by households covering firewood, Liquid Propane Gas (LPG), Biogas, and Electricity. The majority of households used firewood (50,5%), while biogas was the most rarely used cooking fuel (1%). The highest firewood users lived in Taji Village (91%). Then, the second-largest type of cooking fuel was LPG (40%). The majority of households who used LPG lived in Sidorejo Village (91%). Referring to Technical Notes HDR 2016 (UNDP, 2016), the higher the number of residents who use firewood, the higher the poverty level of the area.

Table 4. Household Fuel Use of Cooking

Village	Fire-wood	Liquid Propane Gas	Biogas	No Cooking
	..... %			
Sidomulyo	67	30	1	2
Kenongo	17	83	0	0
Kemiri	63	34	0	3
Gading Kembar	68	29	0	3
Jabung	60	35	0	5
Gunungjati	93	7	0	0
Ngadirejo	30	70	0	0
Argosari	78	21	0	1
Pandansari Lor	59	39	1	1
Slamparejo	20	77	0	3
Taji	91	9	0	0
Kemantren	50	43	0	7
Sukolilo	26	72	0	2
Sukopuro	39	60	0	1
Sidorejo	7	91	0	2

There was four types of sanitation, i.e. personal sanitation, no sanitation, jointly sanitation, and communal sanitation (Table 5). Based on secondary data, 50% of residents of the district used personal sanitation, while communal sanitation was the lowest type used by the residents (5%). Villages with the highest number of personal, sharing, communal, and no sanitation were Sukolilo (82%), Gunungjati (39%), Argosari (44%), and Pandansarilor (56%), respectively. On one hand, residents characterized by joint, communal, and no sanitation increase the index of multidimensional poverty, and on the other hand, personal sanitation users are not classified as poor people, which then will not increase the poverty index (Research Team MPI, 2015).

Table 6 displays three types of access to drinking water in the district, which consisted of wells (without pipeline), HIPPAM (community-based water management using simple pipeline connection), and PDAM (local government drinking water company).

Based on the observation survey, the HIPPAM users were spread in ten villages. In the village of Sidomulyo, Kenongo, Pandansarilor, Taji, and Sukopuro, 100% of the households got access to clean water from HIPPAM service. PDAM service was only available in three villages, i.e. Gadingkembar, Kemantren, and Sukolilo.

Table 5. Household Sanitation Use

Village	Personal	Without	Sharing	Com-munal
		%		
Sidomulyo	35	43	12	10
Kenongo	44	50	4	2
Kemiri	77	10	11	2
Gading Kembar	64	23	12	1
Jabung	58	0	29	13
Gunungjati	61	0	39	0
Ngadirejo	50	40	9	1
Argosari	25	2	29	44
Pandansari Lor	32	56	12	0
Slamparejo	67	13	18	2
Taji	60	38	2	0
Kemantren	73	9	17	1
Sukolilo	82	3	13	2
Sukopuro	66	19	10	5
Sidorejo	49	45	4	2

Table 6. Household Drinking-Water Use

Village	Well	HIPPAM	PDAM
		%	
Sidomulyo	0	100	0
Kenongo	0	100	0
Kemiri	18	82	0
Gading Kembar	29	42	29
Jabung	100	0	0
Gunungjati	100	0	0
Ngadirejo	100	0	0
Argosari	50	50	0
Pandansari Lor	0	100	0
Slamparejo	33	67	0
Taji	0	100	0
Kemantren	90	5	5
Sukolilo	65	0	35
Sukopuro	0	100	0
Sidorejo	100	0	100

Access to electricity for each household in the study area consisted of (i) personal, (ii) sharing, and (iii) no electricity (Table 7) where the electricity was provided by the State Electricity Company. The first type means households who were registered as customers and had 'direct' electricity connection to their houses. The second one is households with an electricity connection via a neighbor who was a customer of the Electricity Company. Then, the last type is households without access to electricity. The number of households according to the types was 4,087, 2,313, and 12, respectively. Households with no access to electricity were located in six villages, i.e. Sidomulyo, Jabung, Argosari, Pandansarilor, Slamparejo, and Sukolilo. In addition, the majority of households with sharing electricity lived in Jabung Village, as many as 296 households. The number of households in the second and third types might increase poverty level due to the basic necessity of electricity for supporting daily activity.

Table 7. Household Access to Electricity

Village	Sharing	Private	No Electricity
		%	
Sidomulyo	24	76	0
Kenongo	37	63	0
Kemiri	55	45	0
Gading Kembar	48	52	0
Jabung	29	71	0
Gunungjati	4	96	0
Ngadirejo	20	80	0
Argosari	18	82	0
Pandansari Lor	49	50	1
Slamparejo	37	62	1
Taji	16	84	0
Kemantren	36	64	0
Sukolilo	54	46	0
Sukopuro	43	57	0
Sidorejo	79	21	0

Table 8. Household Floor Type Use

Village	Dirt	Cement	Tile	Cera-mic	Wood
			%		
Sidomulyo	55	29	3	13	0
Kenongo	29	8	42	12	0
Kemiri	82	7	18	6	0
Gading Kembar	61	28	1	8	0
Jabung	58	12	17	34	0
Gunungjati	51	22	0	5	0
Ngadirejo	63	11	8	21	0
Argosari	36	20	0	21	0
Pandansari Lor	67	19	0	12	0
Slamparejo	45	28	1	22	0
Taji	21	13	5	0	0
Kemantren	51	18	8	16	0
Sukolilo	34	30	10	33	0
Sukopuro	26	39	5	36	0
Sidorejo	18	38	16	31	0

There were five types of floors of the houses: dirt, cement, tile, ceramics, and wood (Table 8). There were nine villages where more than 40% of their households still had dirt as the floor, covering 3,436 households in total. Kemiri Village had the highest number of households with a dirt floor, while Taji

Village had the lowest number of it. It means that a higher number of households with dirt floors might heighten MPI value.

Table 9. Household Access to Assets Use

Village	Access to Informa-tion	Mobility Support	Livelihood Support
	..... %		
Sidomulyo	100	100	9
Kenongo	100	100	0
Kemiri	72	49	4
Gading Kembar	89	77	36
Jabung	80	77	7
Gunungjati	77	31	8
Ngadirejo	78	22	11
Argosari	64	71	21
Pandansari Lor	63	50	19
Slamparejo	55	44	5
Taji	100	60	100
Kemantren	98	97	7
Sukolilo	85	75	65
Sukopuro	78	69	28
Sidorejo	100	83	16

Table 9 shows three components of household asset: (i) access of information: household with one of the communication tools, such as television, radio, telephone/handphone, and laptop/computer; (ii) mobility support: household with one tool to facilitate mobility for human or goods such as truck, car, motorcycle, bike, animal train and motorboat; and (iii) livelihood support: household with one thing to support livelihoods such as refrigerator, horse, cow, sheep, goat, chicken, soil, garden or rice field.

In general, households at each village in Jabung District had over 50% of the asset of access to information. Under 50% of the households in three villages, i.e. Gunungjati, Ngadirejo, and Slamparejo had the asset of mobility support. Only two villages, i.e. Taji and Sukolilo, had the asset of livelihood support, while the rest did not. Slamparejo Village had the lowest number of households with a total of three assets, while Taji Village had the highest one. Since the better availability of the assets might reflect the better support for the villagers' daily activity, it may infer that households in the district do not have sufficient assets to ease their livelihood.

Table 10 illustrates the results of the poverty level of the MPI measurement, where the value and classification of poverty level at each village are described at the second and third columns, and its contribution of deprivation of each dimension is put at the last three columns.

It is identified that among five poverty levels (MPI Research Team, 2015), there were four poverty levels in Jabung District: very low, low, medium, and high level, and they occurred at 3, 2, 5, 5 number of villages, respectively. Moreover, Table 10 illustrates that the village of Kemiri, Jabung, Gunungjati, Slamparejo, and Taji had higher MPI values than others in Jabung District. Interestingly, the poorest village in the district was in Jabung village with an MPI value = 0.34 although it is also the capital of the district. In the meantime, the most wealthy village indicated by the lowest value of MPI was in Sukolilo Village (0.05). The higher MPI value indicates the more cases of poverty found in households in the village.

Table 10. Value of Multiple Poverty Index

Villages	MPI	Classification	Deprivation Contribution to Total Poverty		
			Education	Health	Living Standards
			..... %		
Sidomulyo	0.10	Low	44	0	56
Kenongo	0.16	Low	51	11	37
Kemiri	0.29	High	50	0	50
Gading Kembar	0.20	Medium	57	0	43
Jabung	0.34	High	55	0	45
Gunungjati	0.29	High	43	0	57
Ngadirejo	0.19	Medium	59	0	41
Argosari	0.22	Medium	48	4	48
Pandansari Lor	0.18	Medium	44	0	56
Slamparejo	0.29	High	60	0	40
Taji	0.31	High	64	0	36
Kemantren	0.05	Very Low	49	0	51
Sukolilo	0.04	Very Low	49	25	26
Sukopuro	0.23	Medium	46	0	54
Sidorejo	0.05	Very Low	78	0	22

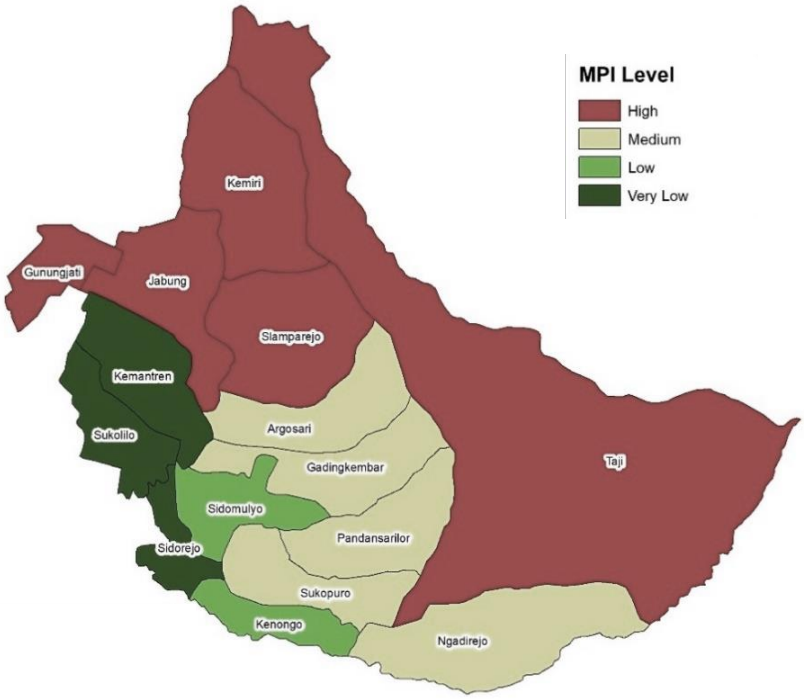

Figure 1. MPI level map of Jabung District

Based on MPI Data in 2017 (Humanitarian Data Exchange, 2020), the MPI of East Java Province was 0.011, slightly lower than the MPI of Indonesia at about 0.014. We may see from Table 10 that on average, villages in Jabung District Malang Regency had a higher level of MPI value than the East Java province. Even when compared to the lowest value of MPI at Sukolilo village, the value of the village was still higher than the province. In detail, the deprivation contribution of each dimension to total poverty of East Java Province was 30.51%, 33.11%, and 36.38% for education, health and living standards, respectively. If those are compared to the result of Jabung District, the district's poverty was contributed by dimensions of the Education and Living Standards, since the dimension of Health indicated better result at about 0–25%. In addition, detailed information on each dimension's contribution is valuable for figuring the deprivation structure of the district, so that it can be continued as a policy of ending poverty. Education and Living Standards affected the values of the MPI at all villages in Jabung District. Meanwhile, the Health dimension affected the values of the MPI in three out of fifteen villages, namely Kenongo, Argosari, and Sukolilo. It means that the poverty alleviation program in Jabung District can take two dimensions, i.e. education and living standards, into consideration.

Figure 1 describes a map of the MPI level per village for the whole Jabung District. The five villages with high poverty levels are geographically neighbors, along with the other five villages with medium poverty levels. It is quite different from the village with low and very low poverty levels, where the villages with high poverty levels tend to form a kind of 'geographic' cluster than the villages characterized by a lower level of poverty. The map gives an interesting fact that it can be assumed or even questioned whether poverty level and geographic areas have a connection to each other. Therefore, measurement of the MPI was continued with the second and third research questions for having a better understanding of the poverty occurrence.

Social Capital

In general, The Rate of Participation (RoP) illustrates the involvement rates of the community members to the present local institutional at a network (Scott, 2000; Wasserman & Faust, 1994) that will

describe the average participation of the villagers. Then, the density describes a level of relationship between residents within a network (Scott, 2000; Wasserman & Faust, 1994) that might give a significant difference of flowing of information or resource among residents in the village.

As displayed in Table 11, every village had a similar number of groups at about 4 types of local institution. There were 4 villages classified as having high RoP, i.e. Kenongo, Kemantren, Sukolilo, and Sidorejo, where the average households had an affiliation to 2–3 types of the local institution. Then, 11 of 15 villages had a medium level of the RoP. On average, households had an affiliation to 1–2 out of four types of local institution.

Table 11. RoP for Each Village in Jabung District

Village	Value	No of Institution	Level
Sidomulyo	2.40	4	Medium
Kenongo	2.76	4	High
Kemiri	2.00	4	Medium
Gading Kembar	2.20	4	Medium
Jabung	1.80	4	Medium
Gunungjati	2.15	4	Medium
Ngadirejo	2.33	4	Medium
Argosari	2.42	4	Medium
Pandansari Lor	2.50	4	Medium
Slamparejo	2.00	4	Medium
Taji	2.10	4	Medium
Kemantren	2.80	4	High
Sukolilo	2.75	4	High
Sukopuro	2.21	4	Medium
Sidorejo	2.84	4	High

Table 12 depicts three levels of density for each village: high (2 villages), medium (5 villages), and low (8 villages). In terms of social networks, when an actor has a connection to others in the network, it might open the happening of the information and resources flows. Hence, the higher density assumes that the community might have a higher possibility to mobilize both local and extra-local 'energy' within the network (Putnam, 2001).

A village with a higher level of the RoP indicates that the greater number of villagers become members of the greater number of local institutions. And, a village with a higher level of density specifies a deeper social relationship among its community members. The measurement of the two indices of social capital in the level of village indicates that generally social capital of the community in the district was not so strong. It might give an impact on their ability to utilize their internal and external information as well resources for their community's needs.

Table 12. Density for Each Village in Jabung District

Village	Value	Level
Sidomulyo	0.30	Low
Kenongo	1.00	High
Kemiri	0.44	Medium
Gading Kembar	0.44	Medium
Jabung	0.23	Low
Gunungjati	0.64	Medium
Ngadirejo	0.38	Medium
Argosari	0.22	Low
Pandansari Lor	0.18	Low
Slamparejo	0.31	Low
Taji	0.90	High
Kemantren	0.41	Medium
Sukolilo	0.41	Low
Sukopuro	0.24	Low
Sidorejo	0.30	Low

The research assumes that the two indices of social capital might be useful for the villagers to deal with their multidimensional poverty. Hence, the indices were placed in the model as independent 'social' variables along with travel time to physical infrastructures as the independent 'physical' variables. In other words, the RoP and density are the independent variables in conjunction with the geographical distance of the three-physical infrastructure in Spatial Regression Analysis.

Spatial Distribution of Poverty

In the spatial regression analysis, firstly Queen Weight Matrix was used to define neighbors of each village in the district. The characteristic of the weight matrix is plotted in Table 13 about the Connectivity Histogram that displays the number of neighbors of each village and its frequency. The minimum number of neighbors (one village with one neighbor) is signed by the blue color bar that occurs at one village. The orange color bar displays the village with the maximum number of neighbors (one village with 8 neighbors). Four villages have three neighbors and the other four villages have five neighbors indicated by the light green and pink bar. Hence, number of neighbors in the district is varied from each other. The nearest position can have similar characters (in this case is poverty) to the distant ones (Anselin, 1995) Then, to differentiate the MPI correlation, the value of MPI and contiguity matrix was used as input at the SA. The Moran Scatter plot visualizes the type and strength of the SA (Figure 2). The slope displays

positive autocorrelation of the village with its neighbors through the MPI values, which are High-High and Low-Low.

Table 13. Connectivity Neighbors

Number of Neigh-bors	Frequ-ency	Villages
1	1	Gunungjati
2	0	-
3	4	Kemiri, Sukolilo, Kenongo, Ngadirejo
4	3	Slamparejo, Sidorejo, Pandansarilor
5	4	Kemantren, Argosari, Gadingkembar, Jabung
6	2	Sukopuro, Taji
7	1	Sidomulyo

Figure 3 illustrates a detail of substantial spatial clusters for every village in the district, consisting of two types. First, the cluster of Low-Low occurred at three villages (Sukolilo, Sidorejo, and Sidomulyo) and three non-poor villages (characterized with the low value of MPI), where they are situated near each other geographically. It means that there is a tendency of forming clusters between the non-poor villages. Second, the cluster of High-High happened at two villages (Slamparejo and Kemiri) and two poor villages (indicated with the high value of MPI) which are geographically neighbors. Although the number of villages is slightly fewer than the first type of cluster, it seems that there is also a tendency to form a cluster between similar characteristics between poor villages which are physically adjacent.

Along with the first geography's law of Tobler (Anselin, 1995), the result of research reveals that neighboring villages have higher similarity in values than the detached ones. Therefore, we might infer that there is a tendency for both poor and non-poor adjacent villages to form a cluster to each other due to their structure of spatial. Policy recommendations of poverty alleviation for the district that might be proposed are as follows. First, prioritize development to the poor villages which form a spatial cluster to each other, so that the negative value might lessen and being contained within the existing villages. Secondly, maintain the dynamics of development of the non-poor villages, in particular for the clustered adjacent villages. In the long term, it might disseminate the positive value to other villages who are physically neighbors to each other or not.

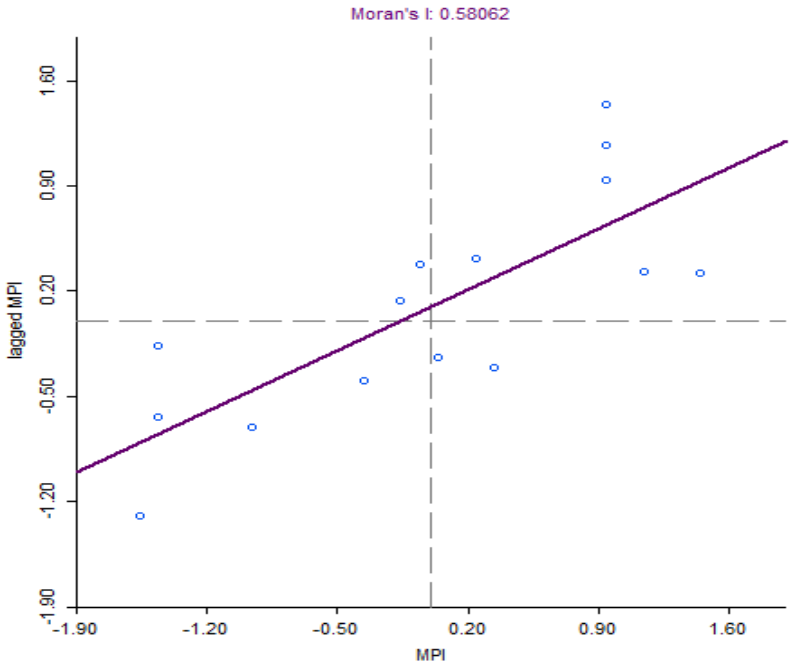

Figure 2. Moran scatter plot result

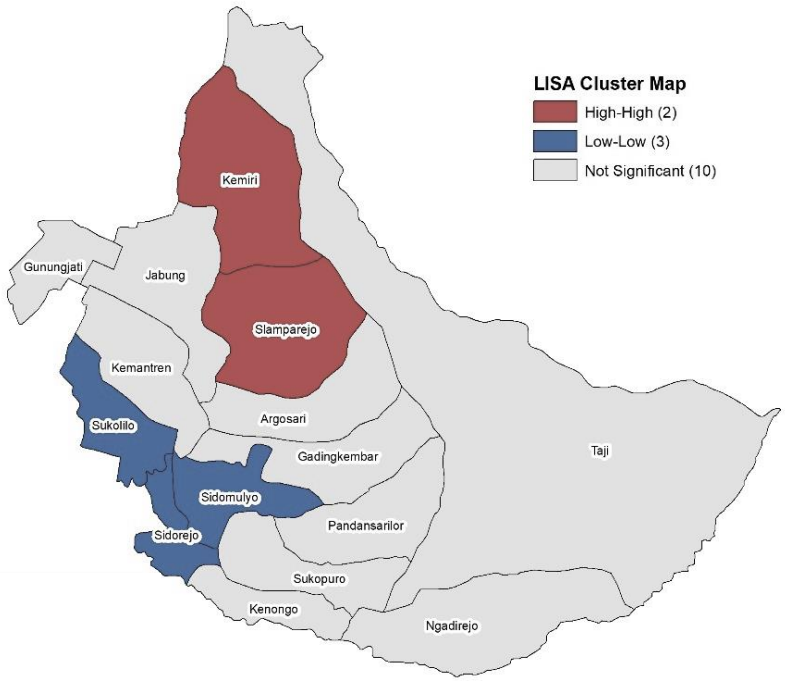

Figure 3. LISA cluster map of Jabung District

The first step of spatial regression analysis was operating the OLS model. At the first ordinary least square regression, the five independent variables were (i) two social capital indices comprise Rate of Participation (RoP) (X1), Density (X2), and (ii) three physical access described as travel time (TT) in minutes by motorbike mode consisting of TT to Senior High School (X3), TT to Hospital (X4), TT to District Center of Jabung (X5). The fifth independent variable was hypothesized to have a significant influence on the dependent variable of the MPI value. Except for the independent variable of X1 which accepted H0, the others were rejected. The following model displays the final result of the Spatial Regression Analysis.

$$\hat{y} = 0.64 + 0.38 \sum_{j=1}^{n} i \neq j \text{ Wijy} - 0.22 \text{ X1} \qquad (9)$$

in which $\hat{y}$ is Multidimensional Poverty Index (MPI) value, Wy is Weight matric, and X1 is Rate of Participation (RoP).

The negative value of the independent variable of the RoP was designed as the one significant independent variable where the stronger average participation of the community members might give a positive impact to lessen the poverty of the district, and vice versa. It means that fostering community participation will widen their opportunity to escape from poverty, since they can utilize their strong social connections between residents to develop welfare for the community (Gibbs & Coleman, 1990; Ostrom & Ahn, 2003; Putnam, 2001; Ari et al., 2017, 2019, 2020). In the model, the positive value of the weight matrix describes that physical nearness between villages has a significant influence on each other. Once a poor village has a closer distance to another poor village, they might have a higher possibility of having a higher level of poverty, and vice versa. As a whole, the model suggests that it is important to notice that the poverty action plan will face a bigger challenge to the poor clustered villages so that both physical as well social infrastructures development need to be tackled together.

Research Implication

Measurement of the MPI indicates that generally poverty in each village was contributed by the dimension of Education and Living Standards. Then,

the measurement of the two indices of social capital illustrates that the community did not have a strong social relationship that might bring them to have a better possibility to utilize their both internal and external resources. Hence, when the results were put together, the community still did not understand the bad impact of not having level of education according to the national standard since they had a common situation with other community members. A similar reason might happen toward the Living Standards dimension, where the impact was they might feel fine with their current assets to support their daily activity. It was different from the dimension of health. It seemed that the health program reached them effectively, so the contribution of deprivation of the health dimension was very low even though there were three villages with a quite significant percentage of contribution of deprivation of health dimension. Moreover, referring to Ari, et al. (2020), education level can be one of the causes of poverty because of the powerlessness of the community, as shown from the result of the two indices of social capital where most community members did not have a strong social relationship to change their preference regarding the importance of education level for their welfare. As a projection, if their understanding remains the same as the previous time, it might lead to endless problems of poverty, and the community might find it difficult to live in prosperity.

Results of the spatial regression analysis reflect that the level of community participation had a significant effect on poverty in the Jabung District. In addition, Yamin & Dartanto (2016) that the positive impact of social capital will increase better access to information for the people, so they might have opportunities to gain knowledge that widen their perspective on how to develop their welfare.

One thing that needs to be considered in the MPI poverty model that has been carried out through spatial regression analysis is the presence of spatial factors or neighboring factors that also have a significant influence on poverty. It can be seen in the LISA map results which show high-high and low-low clusters. This means that solving the problem of poverty is not only done in the one area with the worst MPI value, but the MPI in neighboring villages also needs to be paid attention to.

Based on the measurement of poverty through MPI, it can be seen that the cause of poverty in the district is not only related to weak economic conditions, but also to the dimension of low education and low social capital conditions. According to Malang Regency RPJMD 2016-2021 policies, creating jobs and reducing unemployment is indispensable to the poverty elimination action plan. It means that recommendations can be given for the government to consider the education factor and community empowerment through attractive programs in local community institutions so that people might actively contribute in institutions as a place or space to exchange both internal and external information as well resources.

CONCLUSION AND SUGGESTION

The MPI measurement indicates that poverty that occurs in the Jabung District was a result of the contribution of deprivation of Education and Living Standards dimensions since the majority of deprivation contribution of Health dimension was zero. Hence, from the point of view of MPI, policy recommendations on ending poverty should focus upon the development of Education and Living Standards dimensions. At the level of the village, the five villages with high MPI value that should become targeted areas on dealing with poverty alleviation consisted of Jabung, Taji, Kemiri, Gunungjati, and Slamparejo.

Furthermore, the research also indicates that there was a correlation between the value of MPI in Jabung district and the neighbor spatial condition shown through the LISA map. It denotes that if a poor village has the nearest physical border with one or more poor villages, the difficulty level for the village to be out of poverty is higher than the cluster of the non-poor village. As a consequence, it is still easier for a poor village that is surrounded by non-poor villages to be lifted from the poor situation than the poor nearest to the other poor villages. In detail, the result specifies that the cluster of High-High was shaped by the village of Kemiri and Slamparejo. In other words, the focus of the poverty development to the cluster of poor villages, characterized by High-High MPI values is an inevitability. Thus, the poverty alleviation program might focus upon those areas, where social infrastructure development is necessary to be strengthened.

Participation of the community to the existing community groups was quite good. It indicates that the majority of their participation is in the medium

level. Meanwhile, when the relationship among community members was scrutinized through density index, it showed a bit lower result, where the majority village had a low-density level. It means that at the level of the village, the district does not have strong social capital yet. Hence, it might be concluded that the district poverty is also caused by the weak social ties of the residents since they cannot maximize the utilization of their internal relationship to catch up with both internal and external information and resources for the betterment of their life.

We put together the results of MPI as the dependent variable, access to public facilities, and two indices of social capital as independent variables into spatial regression analysis. The result infers that poverty in the district is affected by quality social ties within community members and neighboring locations. Therefore, paying attention to the poor village which has the nearest physical boundary with another poor village through social infrastructure development as a priority on how to culminate poverty in the district is vital.

This research proposes a more comprehensive approach by putting together three dimensions of poverty: social and physical infrastructures, as well as geographical location, to give a better understanding of poverty in a certain area. Hence, if the approach is applied to other areas, it might give academicians and policymakers the ability to propose a more suitable action plan on dealing with poverty, together with the community members.

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Socioeconomic and demographic characteristics as sources of social capital: A study of Indonesia

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ABSTRACT

Over a decade, the development in Indonesia has achieved a good performance in macroeconomic indicators: stability in the economic growth and declining trend of poverty rate; however, this development tends to ignore the social phenomena in terms of social capital, in which the social capital index decreases dramatically during the past ten years. This paper aims to examine the sources of social capital in Indonesia. Consequently, the policymakers obtain some information to improve the social capital index in Indonesia. The present study utilized the Indonesian Happiness Measurement Study (SPTK) 2017 covering 72,317 households around Indonesia and involves trust and tolerance, collective action, and group and network dimensions as a proxy of social capital. This study employed Ordinary Least Squares (OLS) analysis and found that education is essential in predicting social capital. Besides, this study confirmed that gender and location significantly affect social capital, where males and rural residents are likely to have higher social capital than females and urban residents in Indonesia. Eventually, based on research findings, this study offers some policy implementation for enhancing the social capital index in Indonesia: expanding the free educational program, encouraging women's participation in the community, and continue the village funds program.

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INTRODUCTION

Todaro and Smith (2014) said that in addition to pursuing accelerated economic growth, poverty alleviation, and overcoming income inequality, development goals should also cover various fundamental changes to social structures, public attitudes, and national institutions. In other words, development should not only focus on achieving economic indicators but also must perceive changes in social aspects such as trust, tolerance, attitude, discipline, and collective action. However, development in Indonesia during this decade does not seem to have provided a better social change and is still too focused on economic indicator targets. Indonesia's BPS (2021) data reveals that the country has experienced an excellent economic performance in which the growth is relatively stable at around 5% from 2009 to 2017. Besides, the development carried out by the government, successfully reducing the number of people living under the poverty line, where the poverty rate decreases gradually from 14.15% in 2009 to 10.64% in 2017 (BPS, 2020b). On the other

hand, the social capital which encompasses trust and tolerance, collective action, and group and network, drop dramatically nearly 10 points from 57.67 in 2009 to 47.86 in 2017 (BPS, 2017b). Therefore, this paper aims to examine what determinants of social capital in Indonesia for the policymakers to obtain some information and suggestions in enhancing social capital in Indonesia.

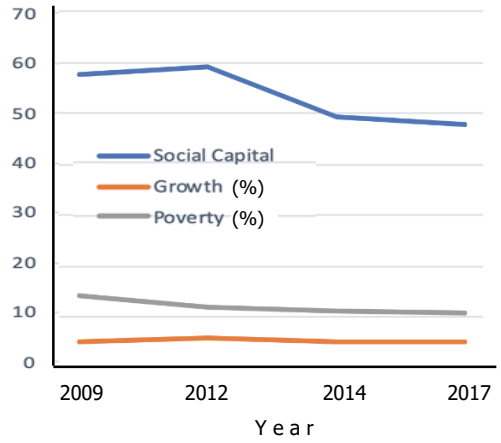

Figure 1. Social capital index, GDP growth, and poverty rate in Indonesia, 2009-2017

Several experts have carried out some studies related to the sources of social capital in various countries. For example, Hauberer (2010) conducted a study related to access to social capital in the Czech Republic. He found that social capital is formed because of socio-cultural aspects such as norms of reciprocity and trust, and ownership of collective assets such as economic, technological, and historical background, as well as individual characteristics such as gender, age, education, and ethnicity. Christoforou (2011) examined the determinants of social capital in European countries and discovered that both individual characteristics: income, education, gender, age, marital status, and employment, and macro-level factors: GDP per capita, income inequality, corruption, and unemployment, proven effect social capital in European countries. Moreover, Parts (2013) uncovered that age, income, having children associates positively with social capital, with education and democracy satisfaction as the most influential factors of social capital, while town size and individualism have a negative relationship on social capital in Europe. In Indonesia, Muzayanah, Nazara, Mahi, and Hartono (2020) investigated social capital in some cities in Indonesia and found that education, age, marital status, and gender are essential factors in perceiving most social capital dimensions Indonesia's urban areas. To conclude, those previous research revealed that individual characteristics (age, gender, marital status, education, income, number of children, employment, and residence) and aggregate factors (GDP per capita, income inequality, corruption, unemployment rate, politics, democracy, and historical background) are two major factors determining social capital. This study only focuses on examining individual characteristics as sources of social capital in Indonesia because it is crucial in perceiving the degree of social capital (Glaeser, Laibson, & Sacerdote, 2002; Muzayanah et al., 2020; Parts, 2013; Rupasingha, Goetz, & Freshwater, 2006).

The novelty of the current paper lies mainly in the following aspects. First, this study employs different dimensions of social capital: trust and tolerance, collective action, and group and network, which cover 24 indicators. Secondly, while some previous studies, particularly in Indonesia, utilized the data from the multipurpose surveys such as The National Socioeconomic Survey (Susenas) or The Indonesia Family Life Survey (IFLS) to measure social capital, the current study uses The Happiness Measurement Study (SPTK). SPTK is the only study that focuses on measuring happiness and social capital in Indonesia. Besides, this article involves more potential sources of social capital than previous studies in Indonesia: age, gender, married, education, location, income, employment, and leisure time. Eventually, this research may offer some recommendations and suggestions for policymakers regarding improving Indonesia's level of social capital based on the results.

RESEARCH METHOD

This study utilized secondary data of SPTK, a unique study to measure happiness index and social capital index in Indonesia, conducted by BPS on 5-30 April 2017. SPTK uses a two-stage one-phase sampling method (BPS, 2017b, 2017a), with 72,317 households a total samples from all provinces (34 provinces) and districts/cities (487 districts/cities) in the rest of Indonesia. In the survey, not all household members could be selected as respondents because several questions, such as work, household income, and family harmony, could only be answered accurately by the head of the household or his partner.

Therefore, the head of the household or spouse was chosen as the respondent to represent the household. Hence, individuals in this paper are heads of households or their partners.

Before examining the data to obtain determinants of social capital, the present study needed to calculate the social capital dimension index first, adopting the method by BPS (2009) as follows. The first step was factor identification by Principle Component Analysis (PCA). As mentioned before, the social capital in SPTK covers three dimensions, seven sub-dimensions, and 24 indicators. Each indicator has a particular contribution to social capital in which the contribution is not determined by the same value or based on subjective assessments. However, it was calculated based on data distribution using statistical methods, namely PCA as a factor extraction method. The criteria considered for assessing whether the resulting factor arrangement at a particular calculation stage is the most optimal were as follows: score of eigen values was more than one, percentage of variances was at least 60 percent, and the score of loading factors for each variable was greater than 0.4. Variables that did not meet these criteria were excluded from the dataset and followed by iterative program execution of the dataset's remaining variables. The composition of factors resulting from the PCA process produced eight factors, including 23 variables, and explained the diversity of data by 69.34 percent.

The second step was measuring the weight of each variable. Each variable's weight was calculated based on the loading factor's value on the variable in question and the rotation sums of squared loading (% of variance) on the formed factors. The weight measurement for each variable was carried out in 2 (two) stages: determining the weight of each variable in factors with the formula:

$$W = \frac{LF}{TLF} \times RSSL \quad (1)$$

where W is weight; LF is loading factor; TLF is total loading factor in one factor; $RSSL$ is rotation sums of squared loading (% of variance). After that, the normalized weight of each variable in the dimension was determined with a formula:

$$w = \frac{W}{RSSLD} \quad (2)$$

where w is the normalized weight; W is weight; $RSSLD$ is rotation sums of squared loading (% of variance) in one dimension. The results of data processing with factor analysis and the weight of each variable are presented in appendix 1.

The last step was measuring the score of social capital dimensions. Each individual's social capital dimension index was calculated by multiplying each variable's normalized weight by the score of each variable obtained by the individual.

$$d_i = \sum_j w_{ij} x_j \quad (3)$$

Where, d_i for the i-th score of social capital dimension; w_{ij} for the j-th normalized weight of variables and i-th dimension; x_j for the j-th score of variables.

Since the social capital scores ranged from 1 to 4, it needed to be transformed into an index value ranging from 0 to 100. This index is known as the Social Capital Dimension Index, and the current research employs this index as an approach of social capital aspects. The social capital dimension index formula is as follows:

$$D_i = d_i \times 25 \quad (4)$$

Where D_i for the i-th of social capital dimension index owned by each respondent on a scale of 0-100; while d_i for the i-th score of the social capital dimension for each respondent, which is still on a scale of 1-4.

After calculating the social capital dimension index, the current paper adopts Muzayanah et al. (2020) formula at the individual level by involving some modifications to examine sources of social capital in Indonesia. If it used Logistic Regression Model (Logit), this research engages Ordinary Least Square (OLS) with the numerical dependent variable and adds broader potential determinants of social capital. The analysis model in this study is as follows:

$$\begin{aligned} SC_i = {} & \beta_0 + \beta_1 Age_i + \beta_2 Age_i^2 + \beta_3 Gender_i + \\ & \beta_4 Marital_i + \beta_5 Edu_i + \beta_6 Inc_i + \beta_7 Emp_i + \\ & \beta_8 Loc_i + \beta_9 Leisure_i + \varepsilon_i \end{aligned} \quad (5)$$

where, SC_i for the degree of social capital index (trust and tolerance, collective action, and group and network); Age for age of respondent; $Gender$ for gender of respondent; $Marital$ means marital status (single, married, widow/divorce); Edu for attainment education level (no education, primary, secondary, and tertiary); Inc for income level (<Rp. 1,000,000, Rp. 1,000,001-1,500,000, Rp. 1,500,001-2,500,000, Rp. 2,500,001-4,000,000, >Rp. 4,000,000); Emp for employment status; Loc for living location (urban and rural); $Leisure$ for leisure time.

RESULT AND DISCUSSION

Social Capital in Indonesia

According to BPS (2017b), Indonesia has experienced a downward trend of the social capital index in nearly a decade. In 2009, social capital in Indonesia reached the point of 57.67, and it increased slightly to 59.34 in 2012. After that, Indonesia's social capital dropped dramatically, almost 10 points, to 49.45 in 2014. In the last measurement of social capital by BPS in 2017, it was only 47.86. Regarding the comparison of social capital among provinces in Indonesia, the highest three of social capital index were D.I Yogyakarta (55.14), Central Java (54.77), and North Sulawesi (53.25). At the same time, Riau (38.71), East Kalimantan (41.33), and DKI Jakarta (41.66) were provinces with the bottom three of social capital index in 2017.

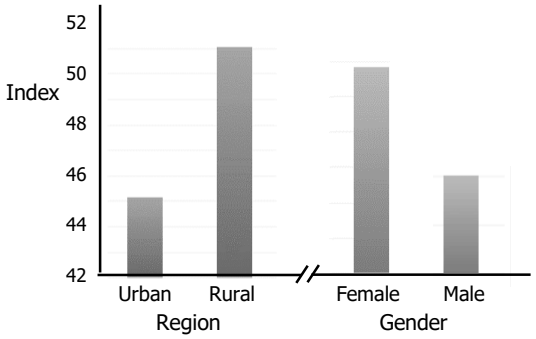

Figure 2. Social capital index by region and gender in Indonesia, 2017

In term of region classification, Indonesians who live in rural areas tended to have social capital index higher (51.05) than people who live in urban areas (45.16). The difference between urban and rural areas can also be found in the difference in dimensional indices. The most striking difference is primarily in collective action and reciprocity dimensions, with the rural index of 57.49 while the urban one is 49.61. This difference shows that rural residents tend to carry out collective action and act reciprocally compared to urban residents in Indonesia. Additionally, males had social capital index better than females in Indonesia, 49.86 and 46.00 respectively. If viewed based on the social capital index per dimension, some differences tend to be large, especially in the social capital index of group and network dimensions, where the dimension index for males was 38.46 while females only 32.77.

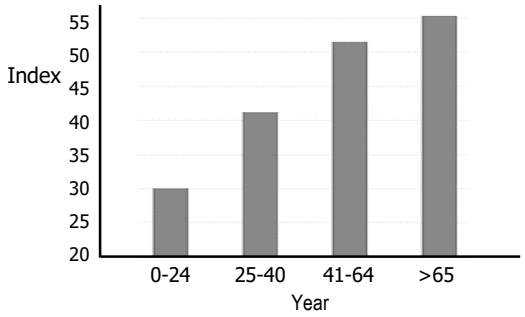

Figure 3. Social Capital Index by Age Group in Indonesia, 2017

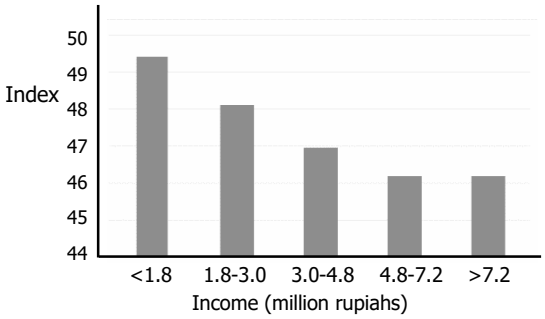

Figure 4. Social capital index by household's income group per month in Indonesia, 2017

Furthermore, BPS (2017b) records that the unmarried population had the lowest social capital index (35.32), lower than the married population (47.76). Meanwhile, the widowed had the highest social capital index (52.08) compared to the unmarried, married, and divorced (48.13) in Indonesia in 2017. Judging from the dimensions that make up the social capital index, the three dimensions show that a person with widowed status has a larger dimension index compared to other statuses, which was 60.89 for the dimensions of trust and tolerance, 56.98 for the dimensions of collective action and reciprocity, and 52.08 for the dimensions of groups and networks. Besides, Figure 4 shows that in Indonesia, people in the older age group have a greater social capital index. The population aged 24 years and under had the lowest social capital index, 30.01. Whereas the population aged 25-40 years had an index of 41.18, the 41-64 year age group had a social capital index of 51.55, and the population aged 65 years and over was 55.34. Therefore, it can be

concluded that the value of the social capital index increases as a person age, or the social capital index is directly proportional to age.

Following the demographic characteristics, Figure 5 reveals that economic characteristics in terms of income differences also yield various social capital indexes in Indonesia. In 2017, people who earned more than IDR 7,200,000 had the smallest social capital index compared to other income groups, 46.19. The opposite happens to residents with an income of IDR 1,800,000 and below, who had the largest social capital index, 49.39. Likewise, each larger income group has a smaller social capital index when compared to the smaller income group. Based on its dimensional index, the lower-income group has a higher dimension index for either group and network dimension indexes, collective action and reciprocity dimension indexes, or trust and tolerance dimension indexes. In addition, when viewed based on the sub-dimensional index, a striking difference is found in the trusting attitude sub-dimension index. For households with an income of more than Rp. 7,200,000, the trust attitude dimension index was 56.72 and continued to increase until it reached 66.49 in the group of households with an income of less than Rp. 1,800,000. This data illustrates that the lower the household income is, the higher is the tendency to trust.

Sources of Social Capital

This section explains whether independent variables: age, gender, marital status, education, income, employment, location, and leisure time influence dependent variables (trust and tolerance, collective action, and group and network) in Indonesia by examining the sign, level, and statistical significance of the coefficient on variables on regression outputs. Besides, this section tries to explore more why the statistical results happened by comparing to previous findings and current phenomena, particularly in Indonesia. Eventually, at the end of the section, the study provides some recommendations and suggestions for policymakers on improving Indonesia's level of social capital based on research findings.

Table 1 reveals that age is an important variable to predict social capital in Indonesia. It has a strong relationship on all social capital dimensions at a 1% confidence interval level. Even though the sign shows that the effect of age on social capital is mix in which age positively impacts trust and tolerance, and collective action, but has a negative impact on group and network. In addition, age square has a significant negative effect on all social capital dimensions at a 1% significance level. It implies that age has an inverted U-shape relationship with social capital. Regarding gender and marital status, males significantly had higher social capital dimension index levels than females at a 1% level of significance. At the same time, singles tend to have a higher level of trust and tolerance compared to the married and divorced/widowed. Yet, singles are likely to have less collective action and group and network index than married and divorced/widowed at 1% level of the confidence interval. Table 1 also informs that education level has a strong and significant effect on social capital at a 1% significance level. While income seems enormously significant relationship on trust and tolerance dimension, tend to insignificant on collective action dimension, and is likely fragile on a group and network dimension. Employment status has no significance on trust and tolerance but is strongly significant on collective action and group and network. Finally, location and leisure time proven empirically having a significant effect on social capital index though have a different sign among social capital dimensions.

Table 1. Variables Estimate Affecting Social Capital

Explanatory Variables	Trust and Tolerance	Collective Action	Group and Network
Age	0.0518***	0.8688***	-1.0933***
Age2	-0.0004***	-0.0078***	-0.0093***
Gender	1.1193***	1.2213***	4.0955***
Marital Status:			
Married	-0.9837***	7.6285***	8.3394***
Divorced	-0.9935***	4.1465***	4.3390***
Education:			
Primary	0.3301***	2.7537***	4.2676***
Secondary	1.4018***	3.8753***	8.3721***
Tertiary	2.3556***	5.0914***	13.2957***
Income (rupiahs)			
1.0-1.5 million	0.3206***	0.3300**	0.6631***
1.5-2.5 million	0.8176***	0.0520	0.0723
2.5-4.0 million	0.4723***	-0.2909	0.7569***
>4.0 million	0.8061***	-0.3573	-0.7729**
Employment	0.0892	2.2292***	3.2723***
Location	-0.3405***	-3.0135***	-3.4729***
Leisure Time	0.0091***	0.0060**	-0.0189***
Constanta	63.708***	30.535***	-3.0737***
Observation	72,317	72,317	72,317
Prob (F test)	0.000	0.000	0.000
R-squared	0.0176	0.0949	0.1019

***, ** and *denote significance at p 0.01, 0.05 and 0.10, respectively

Furthermore, the research finding, as in Table 1, confirms some previous social capital study results. For example, age turns out to influence essentially as determinants on social capital (Christoforou, 2005; Kaasa & Parts, 2008; Parts, 2013) in which higher age yields bigger trust (Van Oorschot & Finsveen, 2010) and collective action dimensions (Muzayanah et al., 2020), In contrast, older people and retirees tend to avoid participating in formal and informal networks (Kaasa & Parts, 2008; Parts, 2013). According to Lambert et al. (2006), social capital is the result of the accumulation of a person's experience during their life which is along with increasing age. The more mature a person's age, the more awareness to interact in the social community, which improves the degree of social capital. On the other hand, diversity of cultural tradition leads to elderly and retirees have less participation in community meetings and group members among countries. It is different from developed countries where older people tend to live apart from family and nursing home, causing them to participate in a voluntary group to escape from loneliness and alienation (Veenhoven, 1989). In Indonesia, nursing homes for elders are not common, and the elders prefer to live and spent their retirement with their families so that they may not feel lonely.

Moreover, the present paper results support the prior studies conducted by Glaeser et al. (2002), Muzayanah et al. (2020), and Rupasingha et al. (2006) who discovered that the life cycle hypothesis exists in the relationship between age and social capital. This theory said that level of social capital increases and reaches the peak at productive age (18 to 40); after that, social capital decreases when people get older. In addition, this research confirms that the life cycle hypothesis occurs in trust and tolerance, and collective action dimensions, but it disappears in the group and network dimensions. Using Wooldridge's (2013) formula to calculate the turning point, this study found that the age to reach the maximum trust and tolerance and collective action in Indonesia is 65 and 56, respectively. At the same time, Table 1 reveals that participating in community meeting and group in Indonesia drop dramatically when the individual gets older. This finding contradicts Christoforou's (2011) study, stating that participating in group membership rises in both the younger and older groups. As mentioned in the previous paragraph, the variety of cultural traditions may lead the contradiction to occur.

With regard to gender, differences of gender still matter concerning predicting the level of social capital aspects in Indonesia. Particularly, in participating in community meetings and group membership, males involve dominantly in this aspect where the regression coefficient is highest among other aspects. In line with Mondéjar Jiménez, Mondéjar-Jiménez, Meseguer-Santamaría, and Vargas Vargas' (2011) finding that gender differences are empirically proven to impress social capital components: institutional trust, social participation, and political participation in Central Europe countries. In the case of Indonesia, around 35% females at age 15 and over serve as a housekeeper in their own families: looking after the children and doing house chores (BPS, 2021b). It probably causes women to tend to have high networking inside their families (Christoforou, 2011). However, they face the barrier to join some groups outside the household, such as voluntary organizations and unions (Alawiyah & Held, 2015), which become approaches group and network aspect in this study. Besides, *arisan*, one of the unique activities related to community interaction in Indonesia (Hardini & Wasiaturrahma, 2020) which primarily involves females compared to males, has an immense contribution to enhancing the level of collective action aspects. It may yield relatively low regression coefficient differences of collective action between genders (1.2213) compared to the group and network aspects. In addition, the present study strongly supports the preceding arguments (Christoforou, 2005; Hauberer, 2010; Kaasa & Parts, 2008) that males appear to have a higher level of the social capital index.

In term of gender, the current study discovers that married and divorced/widowed probably have higher collective action and participation in group and network than singles in Indonesia. It is possibly because for Indonesians, marriage is a sacred bond not only between 2 individuals but also two big families. BPS (2017a) added that marriage is part of human social relations in society based on various personal interests and goals and is followed by social considerations. The bonds created resulting from marriage are as strong as blood ties, thereby increasing social networks and collective activities between these individuals. Besides, the individual who has married and creates family will lead to their expenditure rise (Rustiadi & Nasution, 2017) in terms of consumption, housing, education, and health. As a

result, those life necessities encourage individuals to take part in the community and attract to work together with others to get some benefit for their interests (Jumirah & Wahyuni, 2018).

The interesting finding of this paper is that education appears to play a crucial role in Indonesia's sources of social capital. The biggest score of education coefficient on all social capital components indicates that education is the essential element determining social capital in Indonesia. For instance, in the relationship between the level of education and group and network components, the individual who has tertiary education attainment probably have around 13 points of group and network index higher than people with no education. Fidrmuc and Gërxhani (2004) added that individual who has higher education or is currently studying would have the opportunity to participate in voluntary activities or organizations and have more social networks. Additionally, the statistical results exhibit that the higher level of education generates a higher degree of trust and tolerance, collective action, and group and network components, as found by earlier research (Lee, Yoo, Ha, & Seo, 2018; Mondéjar Jiménez et al., 2011; Muzayanah et al., 2020; Parts, 2013). In Indonesia, only 9.5% population graduated from the tertiary educational level in 2020 (BPS, 2020c), so people see those graduates as the problem solvers of various issues in the neighbourhoods and the communities. In addition, someone who has a higher level of education will enhance their chances of getting a job and a more decent position: civil servants, professional, managerial, and administrative positions. Therefore, it presents an important role and high social status for individuals in the community, neighbourhoods, and work (Budiati & Rochmat, 2020).

In term of the role of income variable in estimating level of social capital in Indonesia, the empirical evidences show that the effect of income on social capital aspects is fragile. As mentioned, income is likely to be important for trust and tolerance aspects, is not significant to predict collective action, and destabilize relationships on group and network aspects. Uslaner (2002) remarked that higher and growing income produce optimism for individual, leading to increasing trust among each other. In parallel, Ananyev and Guriev (2019) recorded a decreasing 5% social trust in Russia caused by a declining 10% in income. They added that the risk aversion and the beliefs about the fairness of the world caused by declining income are two reasons why people lose trust to others. Hence, optimism and fair feeling produced by growing income may also create trust others among Indonesian. Moreover, the regression results indicate that for Indonesian, income is not the main consideration for helping each other and working together. For example, when a neighbour is struck by a disaster or needs help, Indonesian people will be happy to help according to their respective abilities, regardless their income. Apparently, economic factors in term of income have not been able to replace the long-established norms and beliefs for Indonesian citizens.

Another variable referring to the spectrum of individual determinants questioned in the empirical observation is employment status. The regression output indicates that the individual with a job can cooperate with others and participate more actively in group and community meeting compared to the unemployed in Indonesia. In line with the prior studies, which discovered that the people without jobs seem likely to keep away from partaking social activities for public interests (Dieckhoff & Gash, 2015; Kunze & Suppa, 2017). The explanation for it is that the unemployed probably spend their leisure time involved in the labor market and seeking a job so that they do not have enough time to take part in social activities. Likewise, Kunze and Suppa (2017) remarked that the jobless seem likely to be interested in being engaged in a personal relationship with those considered owning a channel to a job opportunity. Hence, they might avoid participating in a community meeting or group memberships which is judged as wasting their time without the certainty of getting a job.

Next, the current paper points out location as the individual factor that likely determines social capital in Indonesia. Once again, the results strongly prove the earlier studies that villagers likely have higher social capital than urban residents (BPS, 2017b; Muzayanah et al., 2020; Rupasingha et al., 2006). This study also claims the superiority of rural residents in Indonesia on all social capital dimensions: trust and tolerances, collective action, and group and network. Contrarily, Sørensen (2012, 2014) examined whether rural residents had better social capital than urban residents in Denmark. He concluded that social capital in rural areas is not higher than in urban areas: voluntary associational work is higher in rural areas than urban areas, while trust and association membership is

equally high in rural and urban areas. In Indonesia, high-density, ethnic diversity, and rapid speed of activities in cities may weaken traditional ties (Wang, Xue, Liu, Chen, & Qiu, 2018), and people tend to avoid taking part in community meetings or group memberships. In addition, *gotong royong*, the unique Indonesians' rural areas tradition in which people work together to overcome common problems in terms of building infrastructures and public facilities, probably causes social capital in rural areas to be better than in urban areas.

The last point worth noting from the current paper is how the leisure time variable influences social capital in Indonesia. The research finding exposes that leisure time has an inconsistent effect concerning social capital in Indonesia. On the one hand, individual with longer leisure time seems likely to enjoy more trust and tolerance, and collective action. On the other hand, longer leisure time means less participation in community meetings and group memberships. Conversely, Lindström (2011) and van Ingen and van Eijck (2009) revealed that leisure time, particularly leisure-time physical activities, positively influences social capital indicators: trust, civic engagement, and helping. A possible explanation for this is that most Indonesian people prefer to spend their leisure time taking a rest (watching tv and listening to music), having recreation with family or friends, socializing with neighbors, and doing hobbies rather than attending group or community meetings. SPTK 2017 revealed that more than 80% of respondents spend their time taking a rest and socializing with neighbors. Therefore, leisure time might improve trust and tolerance among individuals in the neighborhoods, but it diminishes community meetings and group membership involvement.

Research Implication

Based on those findings, the current study would like to offer policymakers some suggestions to enhance the social capital level, particularly in Indonesia. First and foremost, because education plays an essential role in social capital, the policymakers should consider expanding the educational program that frees up not only school fees from elementary to high schools but also free university fees for all. Recently, there were only 9.5% of people who owned university diplomas in Indonesia in 2020 (BPS, 2020c). This number may increase rapidly by low-cost education so that more people with a well-educated can give higher contribution and participation to their communities. Budiati and Rochmat (2020) added that in the context of Indonesia, social status has the critical key for social interaction in the communities; when the individual has a higher level of social strata, the more tremendous respect is given for them. They also stated that the best way to lift the social status in the communities is through a higher level of education. In other words, a higher level of education will improve the level of social capital in Indonesia.

Secondly, the policymakers should encourage women's participation in their communities by funding, coaching, and supporting small-micro enterprises involving mothers and women as employees or entrepreneurs, especially in rural areas. BPS (2020a) recorded that although gender inequality in Indonesia experiences a declining trend for nearly two decades, it is still higher than the average of the world and East Asia and Pacific countries. Moreover, gender inequality, including women's participation in parliament and labor force participation in rural areas, tends to be higher than in urban areas. The attention and full support of the government for the woman cooperative (*Koperasi Wanita*) will provide access for women to be more involved in collective action, network, trust, and norm (Widiyanti, Pudjihardjo, & Saputra, 2018) without abandoning their household obligation. Hence, it might raise women's empowerment and achieve social capital equality for Indonesian.

Thirdly, the village community empowerment programs through village funds (*Dana Desa*) and labor-intensive programs should be continued. According to Mutolib, Nikmatullah, & Effendi (2019), the village funds program had contributed to improving the village-owned enterprises (BUMDes), in which the village government allocated around 25% of the budget total for establishing and improving community economic business. Moreover, Welan, Kawung, and Tumangkeng (2019) remarked that community participation and village community empowerment increased because of the village funds program. In parallel, Zeho, Prabowo, Estiningtyas, Mahadiansar, and Sentanu (2020) found that accountability in managing village funds involving stakeholders' collaboration strengthens society participation in assessing program activities. Therefore, excellent and transparent village fund management should improve welfare and social

capital in the countryside. In addition to encouraging collective action among villagers and providing employment opportunities, the program can reduce urbanization which results in high density in urban areas. For example, before the COVID-19 outbreak, there was a lot of community-based tourism programs in Indonesian's village such as Kampung Pujon Kulon in Malang and Umbul Ponggok in Klaten that provided job opportunities for youth or fresh graduates and avoided labor force mobility to the cities.

Finally, to respond to the current situation under COVID-19 outbreak, the policymakers still need to maintain social capital in communities without face-to-face interaction among members by optimization the role of digital communication: television and social media. Pitas and Ehmer (2020) stated that enhancing adherence to and promoting efficacy, physical distancing, avoiding the crowd, staying at home, and other protecting actions will succeed if the communities have high social capital. Furthermore, they added that policymakers at the village and neighborhood level can utilize social media: Facebook, Twitter, Instagram, and WhatsApp groups, to spread curated, accurate information about the pandemic and actively eliminate conceivably dangerous misinformation. With excellent infodemic management, trust in the government will increase through adherence to communities on health protocols (Nugroho, 2020). As a result, people in some communities agree to do collective action to help their neighbors who are in self-quarantine due to COVID-19 infection and to prevent the virus spreading in their communities.

CONCLUSION AND SUGGESTION

BPS (2017b) stated that a community with high social capital can solve problems more efficiently because there has been good cooperation with each other. In contrast, communities with low social capital will find it more difficult to solve problems. The differences in social capital that exist usually vary between groups based on their socioeconomic and demographic characteristics. In Indonesia, people in rural areas tend to have a higher social capital index than those who live in urban areas, males have better social capital index than females in Indonesia, people in the older age group have a greater social capital index, and larger income group has a smaller social capital index when compared to the smaller income group. In general, Indonesia has experienced a declining trend of social capital over the last decades. This study is present to explore the determinants of social capital dimensions: trust and tolerance, collective action, and group and network in Indonesia. By knowing what the sources of social capital are, this paper hopes that policymakers will get some input regarding how to increase the social capital index in Indonesia. In order to obtain those objectives, the current study utilizes data of SPTK 2017 conducted by BPS and examines some individual factors that can potentially affect the social capital index in Indonesia.

According to the empirical evidence, this paper declares that education is the most important factor concerning sources of social capital in Indonesia. Education appears to have a significant and positive effect on all social capital dimensions. Besides, education has the highest coefficient among individual factors tested in the model analysis. Following education, gender is significantly proven to hold a relationship on social capital, in which males seem likely to possess a higher level of all social capital aspects than females in Indonesia. The next individual factor that significantly affects Indonesia's social capital is the location, where individuals living in rural areas tend to enjoy higher trust and tolerance, collective action, and group and network than urban residents. Regarding age, marital status, and leisure time, they have mixed associations with social capital. Although those variables significantly affect all social capital components, they likely have contradictory influence among social capital dimensions. In addition, employment status has a tendency to raise the level of collective action and group and network, but it does define the level of trust and tolerance. Eventually, this paper finds that income is the most fragile individual factor in prognosticating social capital compared to other factors in the model. It is only significant on trust and tolerance aspects, leading to irrelevant in providing collective action, and seems likely unstable to predict the level of participating in community meetings and joining groups.

The present paper suggests that policymakers can enhance the social capital in Indonesia by expanding the educational program, encouraging women's participation in their communities, continuing the village community empowerment programs, and optimizing the role of digital communication in the pandemic.

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Appendix. Loading Factor, Variance, and Weight by Dimension and Indicator of Social Capital

Dimension	Subdimension	Indicator	Loading Factor	% of variance	Name of Factors	Weight	Normalized Weights for Dimension
(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)
Trust and Tolerance	Trust	Trust to commit the children to neighbors	0.8639	6.75	Trust to neighbors	3.3992	0.1044
		Trust to commit the house to neighbors	0.8516			3.3508	0.1029
		Trust in village's figures	0.8346	7.40	Trust in figures	2.8182	0.0866
		Trust in religious figures	0.5457			1.8427	0.0566
		Trust in village's apparatus	0.8112			2.7392	0.0841
	Religious Tolerance	Response to development of other religion worship place	0.8091	9.27	Religious Tolerance	3.0849	0.0947
		Response to activities of other religions	0.8594			3.2767	0.1006
		Different religion friendship	0.7628			2.9084	0.0893
	Ethnic Tolerance	Different ethnic marriage	0.8272	9.14	Ethnic Tolerance	3.0946	0.0950
		Different ethnic friendship	0.8496			3.1783	0.0976
		Response to activities of other ethnics	0.7664			2.8671	0.0881
Collective Action	Reciprocity	Easiness to get help	0.7848	5.70	Reciprocity	2.8087	0.1944
		Ready to help others	0.8079			2.8913	0.2001
	Collective Action	Participation in joint activities to public interest	0.5707	8.75	Collective Action	1.8603	0.1287
		Participation in religious social activities	0.7809			2.5455	0.1762
		Participation in joint activities to assist people	0.7895			2.5735	0.1781
		Participation in socieaty social activities	0.5432			1.7707	0.1225
Group and Network	Participation in Group	Frequency of community meeting	0.8477	13.82	Participation in Group	3.4892	0.1563
		Society decision making	0.8541			3.5155	0.1574
		Participation in community meeting	0.8897			3.6620	0.1640
		Participation in giving an opinion in community meeting	0.7661			3.1533	0.1412
	Network	Number of group participated	0.9475	8.51	Network	4.2642	0.1910
		Position in group	0.9434			4.2458	0.1901

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Information and communication technology, inequality change, and regional development in Indonesia

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ABSTRACT

Although the advancement of technology provides numerous opportunities to boost economic growth and development, equal distribution may not be guaranteed. Thus, this study seeks further elaboration as to whether information and communication technology (ICT) development has a role to play in the inequality in Indonesia. Using municipal level data from 2018, the study provides both linear and non-linear models to be estimated using OLS and 2SLS. Major findings include: (i) the availability of basic ICT infrastructure was strongly linked to the reduction of inequality; (ii) the actual ICT use was positively associated with inequality, albeit at a diminishing rate, revealing a non-linear relationship similar to Kuznets' curve; (iii) the ICT skill variable comprising the education level had direct correlation with ICT use instead of inequality, with an additional score on ICT skill being associated with an increase in ICT use; (iv) the relationship between ICT use and inequality differed depending on the level of economic development, with lower-income regions experiencing the inverted U-shaped relationship as in the original Kuznets curve and higher-income regions experiencing the U-shaped curve.

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INTRODUCTION

Inequality has been a center of discourse for decades due to its persistence around the world, regardless the countries' income levels. According to World Inequality Report (2018), inequality has swiftly dominated North America, India, Russia, and China since 1980. As a matter of fact, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) called Indonesia out on account of its high inequality contribution toward the region between 1990s and 2010s, along with China and India as the most densely populated nations (UNESCAP, 2018). This urgent call was not a trivial matter for it bore damaging effect on economic and society.

Meanwhile, during the past decade, Information and Communication Technologies (ICTs) brought by high-speed Internet has continued to spread at unprecedented speed and scale throughout the world. In line with the trend of global ICT development, the ICT development in Indonesia is also expanding, with internet penetration rate reported to have reached 47.69% or over 126 million internet users as of 2019 (BPS, 2020). With the emergence of technology, it certainly offers a great deal of opportunities to boost

economic growth and economic development while equal distribution may not be guaranteed.

Past studies evaluating the effect of ICT development on regional economies have been inconclusive on whether it will further aggravate or alleviate inequality. On the constructive side, technology enables productivity enhancement that allows the economy to accelerate (Czernich et al., 2011; Jahangard & Pourahmadi, 2013) and knowledge sharing that helps society to access basic resources as well as services, thus granting more equal distribution (Sun et al., 2014). On the other hand, it may exacerbate the existing inequality when there is lack of access due to limited infrastructure and capabilities supporting the poor (Vicente & López, 2011).

In the wake of rising internet prominence, researchers have been focusing more on its role within regional dynamics. Taking into account globalization and tax policy, Ningsih & Choi (2018) studied the internet penetration effect on income inequality among Southeast Asian nations and concluded that technological change, represented by the number of internet users, has significantly reduced income inequality. A more recent study by Kocsis (2020) highlighted the user acceptance as a key driver in reducing inequality regarding internet infrastructure. He argued that if one cannot find any reasonable advantage of using internet, it is highly unlikely that he/she will embrace the technology due to lack of knowledge or instruments.

Unlike the previously mentioned research, Kim (2012) scrutinized two kinds of curves depicting how technology-inequality relationship changes with the level of technological development. The first is an inverted U-shaped curve which is based on the role of technology as the engine of growth, whereas the second is a U-shaped curve that is based on theory of innovation by Schumpeterian. The cross-national study supported the second version where inequality initially goes down before rising with technological advancement once it reaches a certain threshold. The U-shaped curve is also found in the works of Gravina & Lanzafame (2019).

In light of such dispute, it is said that Indonesia incorporates a stimulating start-up ecosystem that covers five sectors including e-commerce, online media, online transportation, travel, and digital financial services, leading to a large coming of the digital economy. Yet its penetration rate is considered lower than many of its peers in Asia Pacific, owing to the inadequate ICT infrastructure and uneven digital utilization among its users (McKinsey, 2016). As a result, a deepening internet divide appears across socio-economic groups (Sujarwoto & Tampubolon, 2016).

This study differs from the previous study in the way that it attempts to probe into ICT development as a factor of inequality in Indonesia, instead of the other way around (Sujarwoto & Tampubolon, 2016). Instead of inequality among individuals, the inequality here is defined as how each region differs to one another in terms of the living standards of its residents or other elements like public access to education and health services. The result of this study is expected to equip the government with a better understanding of ICT involvement in shaping regional inequality in the hope of avoiding serious policy implications. Moreover, this empirical study will provide more insight for future studies concerning inequality across regions and ICT development in Indonesia.

RESEARCH METHOD

The study was conducted using municipal level data from 2018, covering all 514 regencies and cities. In terms of inequality, the Gini index was used to represent overall inequality of household expenditure in a district based on the data from National Socio-economic Survey (Susenas) published by Indonesian Central Bureau of Statistics (BPS). The value ranged from 0 to 1, meaning perfect equality and complete inequality, respectively. Gini is considered a good measure because it satisfies the minimum requirements: symmetry, mean independence, population size independence, and Pigou-Dalton transfer sensitivity.

Meanwhile, the ICT development incorporates ICT readiness, ICT use, and ICT skill. The ICT readiness, indicating the availability of ICT infrastructure, was represented by the percentage of villages covered by at least 3G mobile network within a district/city. The information on ICT infrastructure distribution across regencies came from the BPS-published Indonesian Village Potential Census (Podes) 2018. ICT use and ICT skill, on the other hand, are indices composed of several indicators that portray the actual use of the ICTs and the capacity to operate them, respectively.

Through Principal Component Analysis (PCA), several original measures could be reconstructed with few components that summarized the maximum

possible and various information to some extent. The ICT use forming variables were the percentage of households with telephone (both fixed and mobile telephone), percentage of households with computer (either fixed in one place or a portable one), percentage of individuals using the internet within the last three months from any location via fixed or mobile network, and percentage of individuals who own mobile cellular phone.

Unfortunately, indicators capturing abilities to operate ICTs are currently unavailable. Hence, the level of education and literacy can be considered as a good proxy especially in developing countries such as Indonesia in which education level can be a major barrier. And with the inclusion of ICT in school curricula, attending school means higher chance for students' exposure to ICTs. Thus, the ICT skill forming variables were average years of schooling, secondary gross enrolment ratio, and tertiary gross enrolment ratio.

As for the control variables, this study included the inter-regional recent migration and trade openness to account for the level of mobile labor, goods, and services in a region since regional economies are considered much more open than national economies due to the minimum barrier to trade including tariff, distance, socio-culture, and legal or political considerations. Other control variables, including log of population, log of population density, and log of GRDP per capita, were added, accounting for social and economic structure of each regions.

To assess the impact of ICT development on inequality thoroughly, the study incorporated several model specifications covering both linear and non-linear specifications. Both were estimated not only with Ordinary Least Squares (OLS) but also Two-Stage Least Squares (2SLS). The latter was particularly employed to deal with endogeneity problem, causing instrumental variables (IV) to come into play. The model specifications are as follows:

(i) Linear Model estimated by OLS

$$Gini_i = \beta_0 + \beta_1 ICT\ Readiness_i + \beta_2 ICT\ Use_i + \beta_3 ICT\ Skill_i + \beta_4 Z_i + u_i \quad (1)$$

(ii) Non-linear Model estimated by OLS

$$Gini_i = \beta_0 + \beta_1 ICT\ Readiness_i + \beta_2 ICT\ Use_i + \beta_3 ICT\ Use^2{}_i + \beta_4 ICT\ Skill_i + \beta_5 Z_i + u_i \quad (2)$$

(iii) Linear Model estimated by 2SLS

$$Gini_i = \beta_0 + \beta_1 ICT\ Readiness_i + \beta_2 ICT\ Use_i + \beta_3 Z_i + u_i \quad (3)$$

$$ICT\ Use_i = \pi_0 + \pi_1 ICT\ Skill_i + \pi_2 Ln\ Pop\ Density_i + \pi_3 Ln\ Pop\ Density^2{}_i + \pi_4 Z_i + v_i \quad (4)$$

(iv) Non-linear Model estimated by 2SLS

$$Gini_i = \beta_0 + \beta_1 ICT\ Readiness_i + \beta_2 ICT\ Use_i + \beta_3 ICT\ Use^2{}_i + \beta_4 Z_i + u_i \quad (5)$$

$$ICT\ Use^*{}_i = \pi_0 + \pi_1 ICT\ Skill_i + \pi_2 ICT\ Skill^2{}_i + \pi_3 ICT\ Skill^3{}_i + \pi_4 Ln\ Pop\ Density_i + \pi_5 Ln\ Pop\ Density^3{}_i + \pi_6 Ln\ Pop\ Density^4{}_i + \pi_7 Z_i + v_i \quad (6)$$

where $Gini$ represents overall inequality of household expenditures; $ICT\ Readiness$ represents the availability of ICT infrastructure and access; $ICT\ Use$ represents the actual use of ICTs; $ICT\ Skill$ represents the capacity to operate ICTs; Z represents control variables used in this study including recent migrant, trade openness, log of population, log of population density, and log of GRDP per capita; u represents the error term; and the subscript i refers to the observed municipalities.

Since the response variable is the Gini index which has a value bound between 0 and 1, the use of common linear regression might result in fitted values that are outside of the lower and upper bounds Ferrari and Cribari-Neto (2004). Consequently, a transformation of the response variable was required, with its values assumed to be on the real line and its mean modelled as a linear predictor based on a set of exogenous variables. This kind of model is called a beta regression model. Thus, a betafit regression established by Ferrari and Cribari-Neto (2004) was applied as a robustness check for models a and b.

There were two equations involved in models c and d: a structural equation and a reduced form equation, respectively. The endogenous variables in these models were $ICT\ Use$ for linear relation and $ICT\ Use^*$ for non-linear relation. The latter comprised the $ICT\ Use$ and $ICT\ Use^2$. Simultaneously, the instrumental variables employed for the linear model were $ICT\ Skill$, natural log of population density ($Ln\ Pop\ Density$) and its squared term. And, naturally the non-linear model has more instrumental variables, consisting of $ICT\ Skill$, $ICT\ Skill$ squared and cubed, as well as $Ln\ Pop\ Density$, its cubed term and to the fourth power.

To be able to deliver unbiased estimation, it is essential that an IV designed for an endogenous variable satisfy the following pre-requisites: it should not have any correlation with the residual and must be relevant or correlated with the instrumented variable. According to International Telecommunication Union (ITU), the level of ICT use is mainly supported by ICT skills or capacities since knowledge and expertise related to ICT are considered necessary for maximum utilization. Additionally, for population density, as one would expect, the reason behind the high level of ICT use in a region is partially due to the high volume of people within a region. Consequently, this study argues that both ICT skill and population density may serve as IVs for ICT use. Meanwhile, adding IVs of some squares and additional terms such as the cubed term and to the fourth power of the exogenous variables is considered as general approach in the face of non-linear model estimation (Wooldridge 2010).

RESULT AND DISCUSSION

The ICT Development in Indonesia

Each region of Indonesia has a different level of ICT development, leading to the so-called digital divide. In relation to ICT readiness, the infrastructure delivering network service was still unavailable in many regions, especially those outside Java and Bali. This shortfall was particularly apparent to the Papua region since there were 90% of regencies and cities whose villages were covered by lower-than 50% mobile network (Figure 1). With the limited access to the infrastructure, the actual use of ICT in those areas was bound to be lower in comparison to municipalities in Java and Bali. The percentage of individuals accessing internet were barely over 50% in the majority of regions outside Java and Bali (Figure 2). In addition, the low use of ICT could be attributed in part to the municipality's low educational level. Considering the average years of school and gross enrolment of both secondary and tertiary school, Figure 3 suggests that only few regions enjoyed high level of education by scoring higher ICT skill index than their peers. The gap was remarkably large as the high-rank regencies scored three up to four times higher than those in the low-rank regencies.

Meanwhile, the inequality as determined by Gini index was relatively similar across Indonesia in 2018 (Figure 4). Even so regions in Java, Bali, Sulawesi and Papua appeared to have, on average, higher inequality than their peers in Sumatera, Nusa Tenggara, Maluku, and Kalimantan. In fact, provinces with highest proportions of regencies or municipalities whose Gini index more than that of National were Papua Barat, Yogyakarta, and Jakarta. With this revelation, the correlation of ICT development toward inequality in Indonesia needs to be assessed further since regencies and cities in Java, Bali, Sulawesi and Papua region scored higher inequality than their peers in other regions, even though the two previously mentioned regions (Java and Bali) had greater access to ICT infrastructure and use of ICTs while the latter two (Sulawesi and Papua) had limited access to ICT infrastructure.

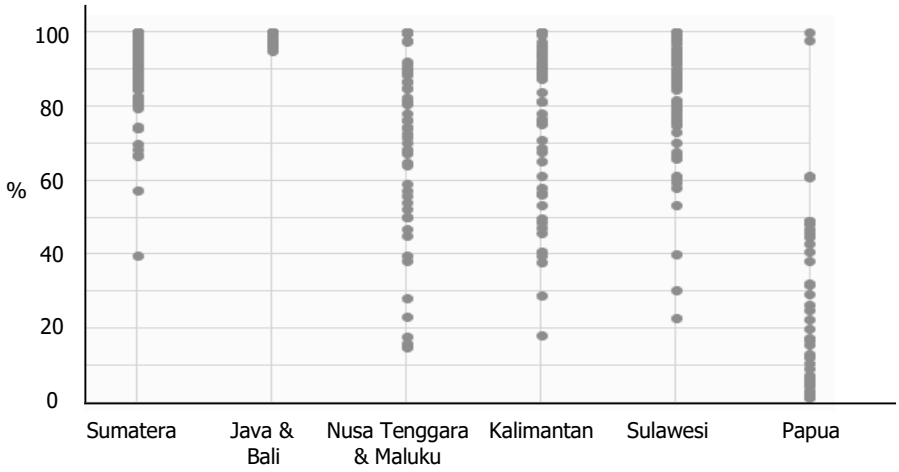

Figure 1. The percentage of villages covered by at least 3G mobile network within municipalities in 2018

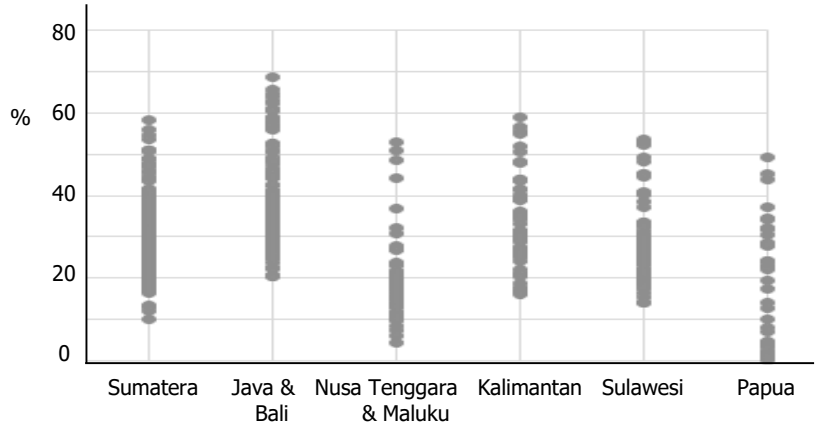

Figure 2. The percentage of individuals using internet within municipalities in 2018

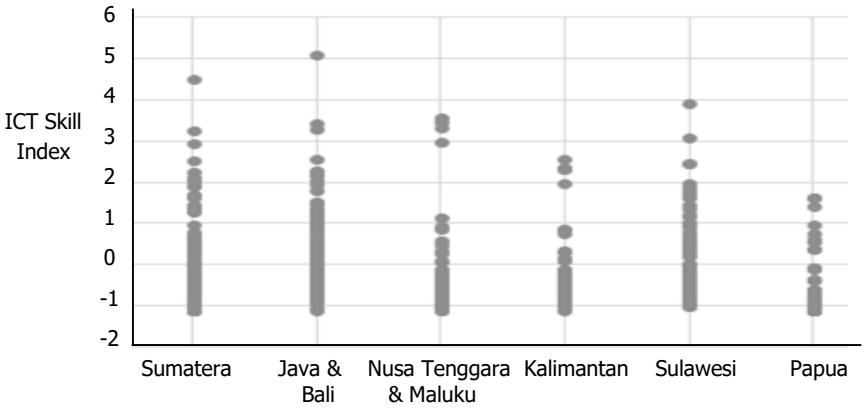

Figure 3. ICT skills across regions Indonesia in 2018

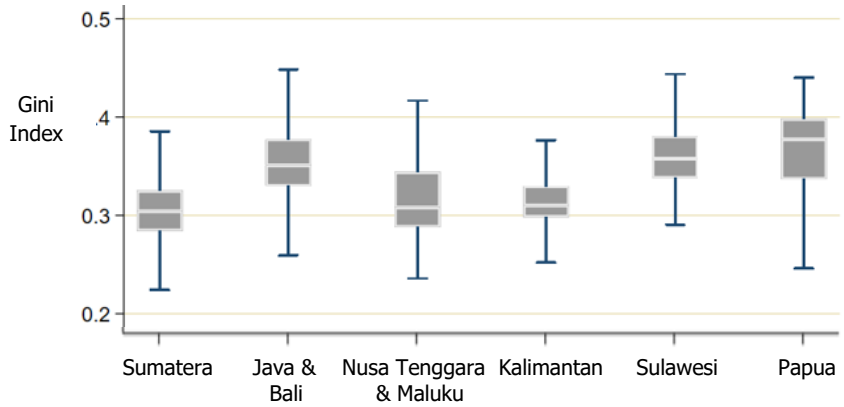

Figure 4. Inequality across regions in Indonesia in 2018

Table 1. Variable Estimate Affecting on Indonesia's Inequality

Variable	Gini (Linear OLS estimation)	Gini (Non-linear OLS estimation)	Gini (Linear 2SLS estimation)	Gini (Non-linear 2SLS estimation)
ICT Readiness	-0.0595***	-0.0805***	-0.0689***	-0.117***
	(0.0108)	(0.0135)	(0.0111)	(0.0214)
ICT Use	0.0181***	0.0187***	0.0304***	0.0469***
	(0.0043)	(0.0043)	(0.0038)	(0.0072)
ICT Use Squared		-0.00439**		-0.00854***
		(0.0017)		(0.0033)
ICT Skill	0.00226	0.00374		
	(0.0026)	(0.0027)		
Recent Migrant	0.221***	0.241***	0.153*	0.114
	(0.0794)	(0.0794)	(0.0811)	(0.0847)
Trade Openness	-0.0124***	-0.0118***	-0.0132***	-0.0132***
	(0.0032)	(0.0032)	(0.0032)	(0.0033)
Ln Population	0.00518**	0.00506**	0.00441*	0.00409*
	(0.0024)	(0.0024)	(0.0024)	(0.0025)
Ln Population Density	0.00242	0.00457**		
	(0.0018)	(0.0019)		
Ln GRDP per capita	-0.00806**	-0.00810**	-0.0154***	-0.0245***
	(0.0038)	(0.0038)	(0.0039)	(0.0052)
Constant	0.374***	0.384***	0.492***	0.647***
	(0.0573)	(0.0571)	(0.0623)	(0.0857)
Observations	514	514	514	514
R-squared	0.199	0.209	0.185	0.132

***, **, and * denote significant level 0.01, 0.05, 0.1
Numbers in parentheses are standard errors

ICT Development and Inequality

The empirical results of ICT development on Indonesia's inequality are presented in Table 1. According to the results, each model is fairly equivalent by comparison of R-squared values. And based on the heteroskedasticity test, each model is efficient under homoskedasticity, suggesting that the value of explanatory variables has no information containing the variance of the unobservable.

Concerning ICT readiness, it can be argued that it does have a role in alleviating the inequality since the coefficient sign was negative and statistically significant. By having coefficient value ranging from 0.06 to 0.12, it means that every one percent increase in the percentage of villages covered by at least 3G mobile network within a district/city contributed to the drop of inequality by 0.06 up to 0.12. In this case the lack of access towards vital resource such as ICT infrastructure can be a barrier in technology diffusion, which facilitates the transfer of information and, as a result, reduces socioeconomic disparities between regions (Celbis & Combrugghe, 2014).

Conversely, ICT use appears to exacerbate the inequality since the result was significant and positive towards inequality. However, its correlation comes across as nonlinear as the squared form of ICT use index was significantly associated with the inequality as well. Considering that the squared term of ICT use had a negative relation with inequality and coefficient value less than that of the ICT use, it can be inferred that the effect of ICT use on inequality was non-constant as the additional use of ICTs may initially worsen the inequality before gradually rectifying it.

A robustness test was performed using betafit regression, and the marginal effects of ICT variables on Gini (Table 2) confirmed that the relationship between the use of ICT and inequality was indeed non-linear, with the inverted U-shaped curve. This relationship is an extension of Kuznets curve in which technology becomes the key driver of economic growth. As economy grows, so does inequality. Naturally, those successfully embracing technology and taking part in the growth are the main beneficiary, leaving behind others and widening the wealth gap. As emerging innovations become more widely adopted, the initial benefit will fade, resulting in a narrowing of the income gap (Barro, 1999). Thus, it is completely unsurprising to find an inverted curve as in the Kuznets curve in this study.

As for ICT skill, instead of having direct and significant correlation with inequality, it became a satisfactory IV for the third and fourth model specifications along with log of population density. Based on the first regression of 2SLS (Table 3), it had

significant and positive correlation with ICT use, whereas its squared and cubic forms had significant relation towards the squared form of ICT use. With the coefficient value of 0.3, it can be argued that one additional point in ICT skill induced the increase of ICT use by 0.3. This finding is in line with the notion that one should have basic knowledge on technology and discover the fringe benefit of utilizing it before fully adopting the technology (Kocsis, 2020).

In addition, several tests concerning the relevance of IV were also performed in the first regression of 2SLS (Table 2). The under-identification test showed the p-value where the rejection of null hypothesis indicates that the model was identified. Whereas, the weak instrument identification test applied proved that IVs were sufficiently strong as the Cragg-Donald Wald F statistics shown were higher than 10 (Baum et al., 2003). Finally, the p-value displayed in over-identifying restriction test reflected the acceptance of null hypothesis, revealing that the instruments used were valid as they were uncorrelated with the error term, and that the IVs were correctly excluded from the estimated equation.

Table 2. Marginal Effects of ICT Variables on Inequality

Variable	Gini (Linear)	Gini (Non-Linear)
ICT Readiness	-0.058***	-0.081***
	(0.011)	(0.013)
ICT Use	0.018***	0.019***
	(0.004)	(0.004)
ICT Use Squared		-0.005***
		(0.002)
ICT Skill	0.002	0.004
	(0.003)	(0.003)
Recent Migrant	0.215***	0.235***
	(0.079)	(0.079)
Trade Openness	-0.013***	-0.012***
	(0.003)	(0.003)
Ln Population	0.005**	0.005**
	(0.002)	(0.002)
Ln Population Density	0.002	0.004**
	(0.002)	(0.002)
Ln GRDP per capita	-0.008**	-0.008**
	(0.004)	(0.004)

***, **, and * denote significant level 0.01, 0.05, 0.1
Numbers in parentheses are standard errors

Table 3. Variable Estimate Affecting IT Use

Variable	Linear 2SLS Estimation	Non-linear 2SLS Estimation	Non-linear 2SLS Estimation (ICT Use^2)
ICT Skill	0.288***	0.307***	-0.0125
	(0.0224)	(0.0303)	(0.0683)
ICT Skill^2		0.0174	0.429***
		(0.0275)	(0.0620)
ICT Skill^3		-0.00783	-0.0603***
		(0.00631)	(0.0142)
Ln Population Density	-0.262***	-0.227***	0.625***
	(0.0569)	(0.0593)	(0.134)
Ln Population Density^2	0.0390***		
	(0.00465)		
Ln Population Density^3		0.00779***	-0.0226***
		(0.00173)	(0.00390)
Ln Population Density^4		-0.000448***	0.00239***
		(0.000142)	(0.000321)
ICT Readiness	1.194***	1.240***	-3.294***
	(0.121)	(0.122)	(0.274)
Recent Migrant	3.538***	3.549***	2.485
	(0.751)	(0.753)	(1.699)
Trade Openness	0.0835***	0.0822***	0.194***
	(0.0309)	(0.0307)	(0.0693)
Ln Population	0.0329	0.0334	0.0151
	(0.0233)	(0.0233)	(0.0525)
Ln GRDP per capita	0.463***	0.459***	-0.164**
	(0.0316)	(0.0318)	(0.0717)
Constant	-6.727***	-6.641***	2.352**
	(0.479)	(0.483)	(1.089)
Observations	514	514	514
Under identification	0.000	0.000	0.000
Weak identification	251.97	24.40	24.21
Over identification	0.103	0.2135	

Table 4. Variable Estimate Affecting Inequality across Groups of Municipalities in Indonesia

Variable	Gini (OLS)	Gini (2SLS)
ICT Readiness	-0.0865***	-0.113***
	(0.0133)	(0.0230)
ICT Use	0.0258***	0.0541***
	(0.0046)	(0.0072)
ICT Use Squared	-0.0064***	-0.0084
	(0.0023)	(0.0056)
Above-median Group	-0.0090*	
	(0.0054)	
Above-median Group*ICT Use	-0.0235***	-0.0329***
	(0.0050)	(0.0059)
Above-median Group*ICT Use Squared	0.0112***	0.0124**
	(0.0031)	(0.0051)
ICT Skill	0.0032	
	(0.0027)	
Recent Migrant	0.2490***	0.1410*
	(0.0779)	(0.0826)
Trade Openness	-0.0113***	-0.0125***
	(0.0031)	(0.0033)
Ln Population	0.0045*	0.0045*
	(0.0024)	(0.0024)
Ln Population Density	0.0051***	
	(0.0020)	
Ln GRDP per Capita	-0.0077	-0.0273***
	(0.0047)	(0.0064)
Constant	0.3920***	0.6650***
	(0.0611)	(0.0960)
Observations	514	514
R-squared	0.250	0.176

***, **, and * denote significant level 0.01, 0.05, 0.1
Numbers in parentheses are standard errors

With the confirmation of the nonlinear relation of ICT use on inequality, its margin was assessed in search of variations in the role of ICT use among different levels of economic development. Thus, instead of categorizing based on the spatial arrangement, it focused on the comparison between regions with GRDP per capita above the median value and those below-median value. Based on the regression results (Table 4), both OLS and 2SLS estimations confirmed the defiance of the above median group which belonged to the higher-income regions. The ICT use interactions with the group exhibit a U-shaped curve, with the inequality initially decreasing with additional use of ICT but gradually increasing after reaching a turning point.

Simultaneously, the predictive margins and average marginal effects of ICT use across the groups were calculated to provide a more vivid picture of the differences between the higher-income and lower-income groups. Figures 5 and 6 show the different associations between the use of ICT and inequality within the two groups. The low-income saw the inverted U-shaped curve in which inequality increase with the additional use of ICTs before making a downturn at the higher end of it. On the contrary, the higher-income regions experienced the U-shaped curve as inequality slightly declined with the increasing use of ICTs only to rebound and score even higher inequality.

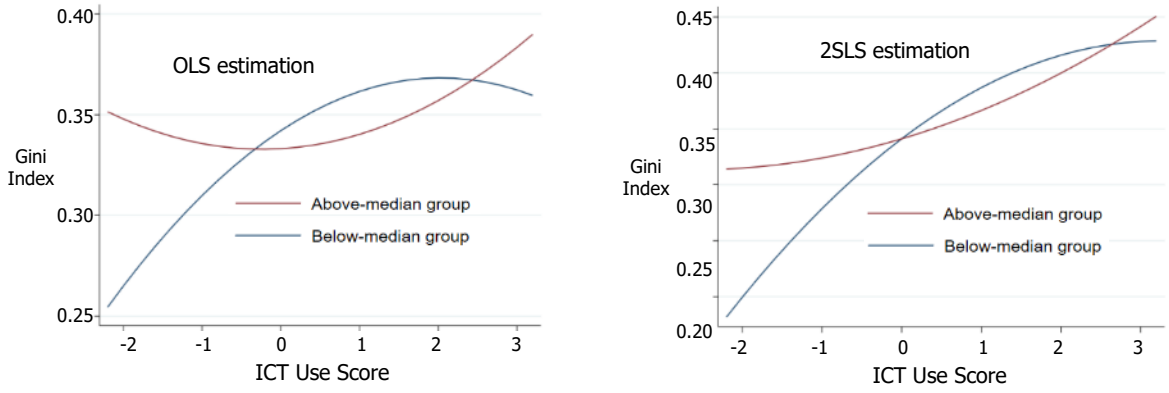

Figure 5. Predictive margins of ICT use on inequality across groups of municipalities

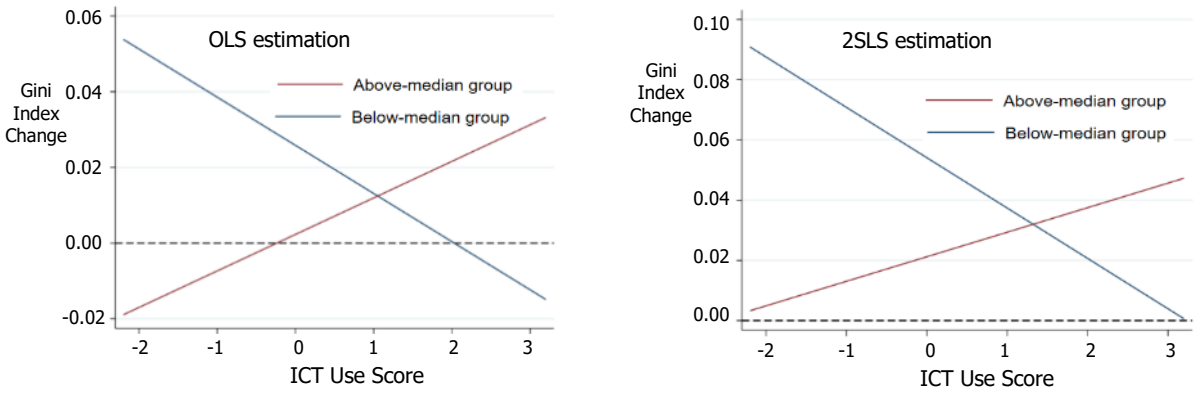

Figure 6. Average marginal effects of ICT use on inequality across groups of municipalities

How this polarization is closely related to the development stage of each region is further explained as follows. First, in the lower level of economic development, the additional use of ICT promotes not only economic growth but also inequality in the region as the economy shifts, from a struggling and less technologically advanced sector such as agriculture to a thriving and more technologically advanced sector such as industries. Those moving to a more advanced sector are benefited from the higher income, resulting in the widening income gap. Eventually, the inequality caused by sectoral mobility decreases as the transition is completed.

Second, for the higher-level economic development, the nature of innovation constitutes the developmental phases. In the early phase, the role of ICTs is as an equalizer because brand new products and processes are developed in result of numerous innovative initiatives by new entrepreneurs, causing barriers induced by the former innovation to be lowered or even wiped out. Albeit this 'creative destruction' known as Schumpeterian innovation Mark I, the later phase, known as Schumpeterian innovation Mark II, shows a strong tendency toward "creative accumulation," in which only few large firms having a significant amount of physical or human capital drive the technology innovation, thus setting high barriers for new entry and causing inequality to soar.

Research Implication

Given that today's world is closely interrelated through ICTs, assessing the impact of ICT development on inequality in Indonesia has a number of critical implications for policymakers. First, as ICT readiness turns out to have strong and negative association with inequality, ensuring the availability and access to ICT infrastructure is essential in reducing inequality. However, there has been unequal distribution of telecommunications services such as electricity, landline networks, internet cafés, mobile phone signal networks, and base transceiver stations (BTS) across regencies in Indonesia (Sujarwoto & Tampubolon, 2016). This unequal access to ICT infrastructure leads to unequal economic opportunities. As confirmed by Untari et al. (2019), there is a positive association between ICT infrastructure and economic growth in Indonesia which in turn lowering the level of inequality. Besides, the advancement of technology has a positive impact on overall socioeconomic development (Wang et al., 2021). Hence, providing basic ICT infrastructure and network at a minimum throughout the archipelago is indispensable, particularly towards regions outside Java and Bali. All the more since the internet has become ever more prominent during the COVID-19 pandemic and digital transformation is set as one of the key objectives in the Medium-Term National Development Plan (RPJMN) 2020-2024.

Second, promoting digital inclusiveness should be the next primary agenda because the inequality induced by the use of ICT is in part due to only a fraction of the society benefiting from it, leaving behind others who have not adopted ICTs. According to Patria and Erumban (2020), a certain adoption rate should be obtained for ICT use to have a positive impact on the level of inequality. Although the inverted U-shaped curve indicates that the increasing effect of ICT use on inequality is only temporary, it is critical to

ensure that no one is left behind once the digital transformation occurs, because leaving the digital divide unattended can result in unbalanced socioeconomic development (Wang et al., 2021). Furthermore, the availability of ICT infrastructure and network does not automatically lead to full ICT adoption due to various factors such as technology resistance and low digital literacy. Thus, it requires strategic and far-reaching policies able to embrace all segments within society especially the poor and disadvantages.

As previously stated, resistance to technology and a lack of digital literacy are barriers to ICT adoption, implying that user acceptance is the most important factor in embracing the technology (Kocsis, 2020). This user acceptance is heavily reliant on having a basic understanding of technology as well as the benefits of using it, both of which can be gained through education. Following the findings of this study, it was revealed that there is a strong and positive relationship between educational attainment and the use of ICTs, rather than a direct correlation with inequality. Not only will education help to bridge the digital divide (Sujarwoto & Tampubolon, 2016; Wang et al., 2021), but it will also improve access to and skilled use of ICT, which in turn reducing the inequality through activities that generate income and provide benefits to consumers (Mushtaq & Bruneau, 2019). For that reason, improving education should be an integral part of any digital inclusion strategy.

Even though the educational level may not have direct correlation to the inequality, but the level of inequality can impose pitfall in reaching equal opportunity for education (Asongu et al., 2019). Therefore, the government's redistributive policies and spending such as cash transfer, subsidies, and other forms of social assistance, are extremely vital for relieving the inequality caused by ICTs. However, because the ramifications of ICT-induced inequality differ depending on the level of development of each region, the redistributive policies should be designed specifically based on each region's stage of development. For regions with the inverted U-shaped curve, the policies should be directed to overcome the possible digital divide once ICTs become the driver of the economic growth. As for regions facing the U-shaped curve, the policies should be designed to prevent any conditions that may impair the fair competition in the new more-technology-advanced sector by reducing the entry barrier or enforcing rules and regulation. Such personalized policies can be provided by each regional government with the support of the central government, indicating the importance of institutional development to alleviate the ICT-induced inequality (Adams & Akobeng, 2021).

CONCLUSION AND SUGGESTION

By utilizing the municipal level data covering all of 514 regencies and cities, this study attempts to look into the role of ICT development on inequality in Indonesia. The ICT development includes the availability of basic ICT infrastructure, the use of ICTs, and the capacity to operate it. Given the data limitation, data from 2018 was used, resulting in a cross-sectional study. The study provides both linear and non-linear models to be estimated using OLS and 2SLS, aiming for a thorough assessment.

The major findings of this study include the following matters. First, the accessibility on basic ICT infrastructure has a role in alleviating inequality, contributing to its drop up to 0.12. However, the actual use of ICTs has a non-linear relationship with inequality; at a lower level of ICT use, it gives rise to inequality before the pace of the increase slows down at a higher level of this variable, revealing a pattern similar to the Kuznets curve. Second, the ICT skill variable comprising the education level appears to have direct correlation with ICT use instead of inequality, in which an additional score on ICT skill will induce the increase of ICT use by 0.3, confirming that basic knowledge is a prerequisite for engaging in ICTs. Finally, the association between ICT use and inequality varied across economic development levels, in which lower-income regions exhibit the inverted U-shaped curve as in the original Kuznets' curve whereas higher-income regions are subjected to the U-shaped curve, further revealing the contrasting role of ICTs on inequality across regions in Indonesia.

As the world today is closely interconnected with ICT, analyzing the role of ICT development on inequality in Indonesia has several critical impacts on policymakers. First, providing a minimum level of fundamental ICT infrastructure and network across the archipelago, especially to regions outside Java and Bali, is essential. The next primary agenda should be to promote digital inclusion through strategic policies, which can encompass all the sectors of society, particularly the poor and the disadvantages. Educational improvement should be an integral part of

any digital inclusion strategy. Last, the government's redistributive policies and spending are extremely vital for relieving the inequality caused by ICT. However, it should be designed specifically in accordance with the developmental stage of each region since the ramifications of inequality induced by ICT differ from each region in relation to its level of development.

To expand the current study, one might want to conduct a longitudinal study or a panel study as it allows to study changes or developments in the characteristics of the targeted population over period of time. Apart from that, the inequality applied in this study is limited to inequality within region rendering regions as separate entities. It is highly recommended that the future study takes into account the spatial effect, enabling one to assess the technological interdependence towards inter-regional inequality and further probe into the existent of regional convergence.

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The traditional clothing industry of Banjarmasin Sasirangan: A portrait of a local business becoming an industry

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ABSTRACT

Sasirangan is a traditional fabric typical of the Banjar tribal community and has now been developed into an industrial product in Banjarmasin. Sasirangan's business development shows a significant development and it becomes very essential to pay attention to how to maintain its business. This article aims to describe the business operations and distribution patterns in the Sasirangan clothing industry. The qualitative approach was used in this study coupled with data collection through interviews, observations, and documentation. The results showed that Sasirangan fabric products are produced by artisans who work individually or in groups and marketed by traders. Marketing of Sasirangan cloth products uses a direct distribution pattern to consumers, and indirectly uses a merchant intermediary who then resell them to consumers. The collaboration of Sasirangan artisan and traders can be further enhanced to develop a convection industry based on local culture. The findings of this study provide a further description of how local culture-based businesses require support from the government and other parties to maintain business sustainability.

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INTRODUCTION

Culture-based industries compete in the economic field by involving various elements of business actors. The line of business of the culture-based industry can be traditional fabric, local food, local drinks, and other aspects of regional culture. A culture-based industry is an industry that functions as the mainstay of a region's economy by developing local culture and increasing economic growth (Akhir et al., 2018). Industrial products based on local potential have long been carried out by various countries, including the Miao people in China. Chinese local culture has become a source of rural economic development involving various elements, strategies, and cooperation (Chen et al., 2021). So, as in Malaysia, for example, the traditional fabric-based industry has made a significant contribution to the community's economy. Traditional fabric industry is the second highest industry in Malaysia, influencing imported commodities and labor (Ismail et al., 2019; Akhir et al., 2017).

In Indonesia, the highly potential local traditional fabrics has been developed as an industrial product. Traditional cloth is an art and culture that is found in numerous regions in Indonesia. This product is created by the skill of human hands using a loom. This ancestral heritage is an asset that must be preserved and developed as a feature of the nation's culture. Traditional fabrics are fabrics associated with local

culture, produced traditionally and for the benefit of certain customs. However, nowadays, various traditional fabrics have been developed into the community's economic activities. The production of traditional fabrics is not only for cultural purposes but also for industrial purposes with economic value. Batik, a type of traditional cloth in Indonesia, has now been developed into an industrial product. For example, Tuban batik cloth which was initially only produced to show social status, group identity, rituals, and life philosophy, turns into an item created dynamically into various industrial products in the form of clothing, accessories, and various other creations (Kristianto et al., 2021; Ciptandi et al., 2018).

The development of traditional fabrics into industrial products has expanded the dimensions of meaning, principles, and goals of traditional fabric production (Sunarya, 2018; Sunarya & Anas, 2014). Sasirangan fabric has been used to create various products such as clothes, bags, shoes, sandals, and accessories (Jumriani et al., 2019; Prasetiyo et al., 2016).

One of the traditional fabric products in Indonesia that evolves in the industrial economy is Sasirangan. Sasirangan is a traditional fabric from Banjarmasin, South Kalimantan Province. This traditional cloth was originally related to the community's belief for healing the sick (Redho, 2016). According to the data from the Department of Industry and Trade of the City of Banjarmasin, Sasirangan fabric occupies the first rank of industrial commodity, with an average investment value of 26 million rupiahs and value production of 11,934 million rupiahs per year. Based on these data, it can be said that in the field of industry, Sasirangan fabric has the potential to support the industrial activities in the city of Banjarmasin. This development cannot be separated from the distribution pattern carried out by the involved parties. The sustainability of economic activity focuses not only on production and innovations made to suit consumer needs, but also on how the products can reach consumers (Krisdayanti et al., 2020; Nabay et al., 2020; Смерічевський et al., 2018). Therefore, distribution has an essential role in economic activity. It is focused on selling products and includes activities to distribute goods produced according to consumer demand (Philip Kotler; Gary Armstrong; Yati Sumiharti, 1999; Rachman & Yuningsih, 2010). Distribution activities are also a means to connect with community needs.

Sasirangan fabric industry is originated in Sasirangan Village. Sasirangan Village refers to Seberang Mesjid Village, Banjarmasin City because the people of this village develop Small and Medium Enterprises (SMEs) devoted to the Sasirangan fabric. In 2019, this village had 13 business units producing Sasirangan products. To face challenges and market competition, SMEs must be able to survive by determining patterns and strategies that can support their economic activities. SMEs that rely on local products must implement various steps to increase marketing and product sales according to consumer behavior and needs.

The production and distribution process of Sasirangan fabric involves a number of actors and their derivative industries and requires the support of other parties to ensure business continuity. This article aims to describe business operations and distribution patterns in the Sasirangan fabric clothing industry in Sasirangan Village, Banjarmasin.

RESEARCH METHOD

The research was conducted in Sasirangan Village, which is located at Seberang Masjid Village, Banjarmasin. This study used a qualitative approach in which data collection was done by interview and direct observation to respondents. The interview was carried out openly and interviewees answered the questions freely. The results of the interview recordings were then written into a word-for-word transcript. To obtain valid data, the results of interviews were cross-checked with the other respondents.

In the process, researchers were involved in every stage of the economic activity of Sasirangan fabric, especially in production and distribution activities. The stages started from production, packaging, to distribution to the consumers' hands. Observations were employed at several production sites for Sasirangan fabrics, ranging from individual businesses to Sasirangan fabric industry, which was incorporated in one business group. The observations aimed to identify the production and distribution pattern. To ensure the validity of the research data, the results of the interviews were also cross-checked with the results of observations and documentation, in which the secondary data were obtained from several literature studies and information relevant to the research.

The data analysis technique followed the pattern of Miles and Huberman, consisting of data reduction, data presentation, and verification (King et al., 2018; Sugiyono, 2013). First, the data analysis process was done by selecting data relevant to the research focus. Then, the data were presented in a narrative form to get a conclusion from the data obtained. In analyzing the data until the verification stage, the researcher also continued to test the validity of the data. Referring to the opinion of Creswell (Creswell & Poth, 2016), several steps can be taken to obtain the validity of the data. In this study, researchers used extended observations and triangulation of sources, techniques, and time to test the validity of the data obtained in research activities

RESULT AND DISCUSSION

Products of Sasirangan

The results of observations showed the conditions of the production and distribution process, and the activities that shaped the social interaction of industrial actors in Sasirangan Village. The primary data of research were the registration documents of industrial business actors in Sasirangan Village obtained from the Seberang Mosque Village Office, Banjarmasin, Indonesia. The research interviewed respondents of several owners of Sasirangan fabric business and the artisans (Table 1).

Sasirangan was initially a cloth related to the people's belief about its usefulness for healing the sick. Sasirangan cloth has various motifs (Table 2). Each motif has a certain meaning, so Sasirangan is also referred to as the Pamintan cloth, which means cloth of demand. Thus, Sasirangan cloth was originally made only to fulfill the requests of people in need.

Table 1. Demographics of Respondents Working on Sasirangan Product

No	Name	Age	Education	Expertise
		Years		
1	HL	32	Junior high school	Painting
2	ST	40	Primary school	Baste
3	RJ	28	Senior High School	Painting
4	MS	35	Junior high school	Baste
5	MN	50	Primary school	Baste
6	RD	25	Junior high school	Coloring
7	RN	36	Junior high school	Coloring
8	ML	50	Senior High School	Owner
9	IR	48	Senior High School	Owner
10	SS	45	Senior High School	Owner

Sasirangan motifs can be classified into three types. First, the stripe motif, which is arranged lengthwise with specific characteristics such as perpendicular lines and curved lines. Second, the fried rice motif, which is a motif that usually stands alone without any decoration on the central motif. Third, the variation motif, which is a decorative motif to beautify the appearance. This motif usually involves the addition of images around the central motif.

Table 2. Sasirangan Motifs

Traditional Motif	
– *Gigi Haruan*	– *Tampuk Manggis*
– *Gagatas*	– *Gagatas*
– *Kangkung Kaombakan*	– *Mayang Maurai*
– *Iris Pudak*	– *Gelombang*
– *Ular Lidi*	– *Bintang*
– *Tampuk Manggis*	– *Hiris Pudak*
– *Kulat Karikit*	– *Kembang Sakaki*
– *Daun Jaruju*	– *Ombak Sinapur Karang*
– *Kembang Kacang*	– *Naga Balimbur*
– *Bayam Raja*	– *Bintang*
– *Ramak Sahang*	– *Jajumputan*
– *Daun Katu*	
Modern Motif	
– *Gradasi*	– *Ketupat*
– *Langsat*	– *Abstrak*
– *Sarigading*	– Rainbow
– *Naga*	– *Batung Batulis*
– *Laba-laba*	– *Musik Panting*
– *Galuh Manginang*	– *Kupu-Kupu*
– *Bakantan*	– *Mandulang Intan*
– *Pasar Terapung*	

Initially called pamintan cloth solely for medicinal purposes, Sasirangan is now used as a material for making clothes. Even, Sasirangan is produced with various variations and nuances. Along the way, Sasirangan fabric is produced not only to meet the demand for medical care but also to be a part of a community economic activity.

The origin of the word Sasirangan is "Sirang", a verb adopted from the process of manufacturing the cloth, which is "Menyirang". Another characteristic of Sasirangan fabric that makes it different from Batik is the production stage, which is done by drawing patterns manually on a piece of cloth. The pattern is then sewn using the basting technique. "Menjelujur" is an activity carried out by Sasirangan fabric artisan by sewing a pattern that has been painted on a piece of cloth (Figure 1 and 2). Fabrics that have been sewn with the basting technique will be wrinkled and then colored. The results of basting and coloring will form the desired pattern according to the pattern of the Sasirangan fabric (Figure 3).

Figure 1. Patterns and product Sasirangan fabric

Figure 2. Sasirangan fabric patterns

Figure 3. The activity of artisan drawing Sasirangan fabric patterns

Table 2 shows various motifs of Sasirangan fabric, displayed in the names of local motifs. These motifs have their own particular meaning, a certain symbol, message, or hope to be delivered from the pattern of Sasirangan. Research by Ramli et al. (2017) showed the motif of a traditional cloth representing images or symbols of plants and the surrounding environment. Traditional fabrics also have various aesthetic values and the meaning of each pattern created (Vivithkeyoonvong et al., 2021; Akhir et al., 2017). Likewise, Sasirangan fabric motifs have been developed and modified without leaving the characteristics of the original ones (Jumriani et al., 2019; Redho, 2016).

Production activities of Sasirangan fabric still use traditional technology, equipment, and methods. The various stages in the production of Sasirangan fabric are carried out traditionally, with simple equipment and by utilizing human labor manually, such as in the stage of painting Sasirangan motifs.

Sasirangan Village can be part of the One Village One Product (OVOP) program developed by the Ministry of Industry of the Republic of Indonesia. This is one of the approaches to increase the potential of featured products with the characteristics of the local area. In other words, OVOP is a program that utilizes the products of community culture (Jumriani et al., 2019). Sasirangan fabric was initially a local product as a regional specialty, but now it has economic value as it goes through production and distribution. Thus, this activity can maintain one of the cultural aspects of South Kalimantan while using it as a product that can provide economic benefits. There are two advantages to developing OVOP, i.e. it can increase people's income as business actors, and it can increase the community's sense of pride and confidence in local products with an added value.

An industrial area or village pays attention to several aspects such as local workers, worker positions, transportation, marketing places, and other services that can support business continuity. The development of a village is influenced by physical and non-physical aspects. The physical aspect here is closely related to the structure of the location and the position of the location, while the non-physical aspects include the availability of facilities, infrastructure, and marketing. The relationship between individuals plays an essential role in how a village develops (Philip Kotler; Gary Armstrong; Yati Sumiharti, 1999; Tamaya et al., 2013). Developing Sasirangan fabric industry is to accelerate industrial growth, provide convenience for industrial activities, encourage industrial activities, and provide local industrial facilities that are environmentally sound (Johnson et al., 2019; Sunarya, 2018). Furthermore, Sasirangan Village is expected to have a pattern of community economic empowerment that aims to develop the community's economic potential in an area and support local economic activities in the region.

Business Activity

Industrial business people in Sasirangan Village play an essential role in maintaining the sustainability of industrial activities. One of them is the role in carrying out distribution activities so that their products can reach consumers. Distribution is defined as a process of delivering a commodity from producer to consumer with a series of distribution patterns. The distribution pattern is a series of interdependent organizations involved in making a commodity ready for use or consumption (Syaharuddin et al., 2020; Tamaya et al., 2013).

Industrial business actors in Sasirangan Village include artisans and traders. Skills and business capital are significant for business actors in Sasirangan Village. The role of artisans is carried out by those who have skills in producing Sasirangan fabric. Meanwhile, the traders do not have the skills but contribute the capital in trading activities for Sasirangan fabric. The artisans in Sasirangan Village who work in groups join either one of the 2 (two) groups known as *Kelompok Usaha Bersama* (KUBE/ Joint Business Group), namely KUBE Kenanga and KUBE Orchid. Each group consists of 6 artisans. They have expertise in every stage of making Sasirangan fabric. The main focus of the expertise of Sasirangan fabric lies in their ability to draw patterns of traditional motifs. The expertise of Sasirangan fabric artisans can also be seen in their ability to perform the technique known as attacking by basting in making the product. Tracing is the activity of sewing lines that have carefully been patterned as it is not exposed to the dye.

The difference between independent artisans and those joining group management lies in the source of capital. For the artisans who work independently, the business capital comes from personal funds. Meanwhile, for artisans who join group management, the source of capital is obtained from the loan of the

social service of the KUBE, which was formed in 2006. Initially, the assistance was in the form of tools and materials. The next assistance was in the form of funds for business capital. In 2008, capital assistance was provided up to ten million rupiahs per person.

Distribution Pattern

Distribution activities involve all parties in economic activity to create and retain customers. On this basis, distribution activities play an essential role in helping a business actor achieve his goals (Ellram & Ueltschy Murfield, 2019; Hao et al., 2018; Johnson et al., 2019; Katz-Gerro & Sintas, 2019). The distribution pattern of Sasirangan cloth products in Sasirangan Village is closely related to how artisans and traders collaborate in Sasirangan Village (Figure 4).

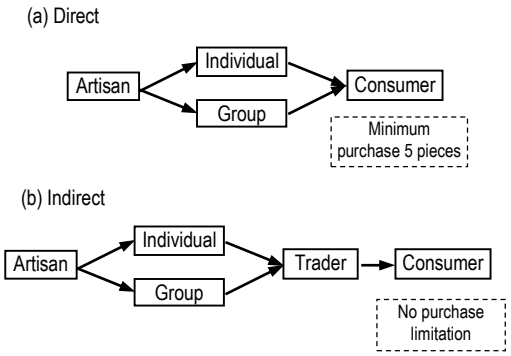

Figure 4. Distribution pattern of Sasirangan fabric

The artisans, either individually or in groups, market their products directly to consumers, as presented in Figure 4(a). Consumers can directly buy Sasirangan products from artisans with a minimum purchase of 5 (five) pieces of Sasirangan fabric.

Meanwhile, the artisans, either individually or in groups, also market their products through traders, who then sell them to consumers, as seen on Figure 4(b). Through traders, consumers can buy Sasirangan fabric products at retail price without any minimum purchase amount.

From the two distribution patterns, it can be said that the continuity of distribution activities in Sasirangan Village cannot be separated from the cooperation between traders and artisans in Sasirangan Village. The partnership is built due to the limitations of traders in carrying out production so that they can participate in selling Sasirangan fabric in Sasirangan Village. A collaboration was welcomed by artisans who both work in groups (KUBE) or independently.

The existence of the cooperation generates a significant advantage to both artisan and traders. The artisans can still distribute their products through merchant shops, while traders can still participate in selling Sasirangan fabrics in Sasirangan Village even though they do not have the expertise in doing production. The relationship that occurs between the artisan and the trader is a collaboration between two parties to exchange benefits and achieve common goals (Kristiningtyas, 2012). In the distribution pattern, a mechanism is used as a connecting system for a product to consumers. In general, the purpose of distribution activities is to satisfy consumers by offering goods and services related to pricing and promotion to achieve the expected goals (Harjanti et al., 2015; Ismono & Restiana, 2011). The distribution system contains the order of ways that must be taken to distribute goods and services to consumers. For the distribution process to run smoothly, distributors must pay attention to various conditions from the producer and consumer sides (Abbas et al., 2019; Abbas & Rajiani, 2017; Bačík et al., 2019; Rajiani & Abbas, 2019; Ramli et al., 2017).

Research Implication

An economic activity contains essential elements that support production and distribution activities. This study found that the effectiveness of traditional fabric-based clothing industry is closely related to the role of the artisans. Their ability to innovate the product will affect the amount of demand for a Sasirangan fabric product. According to research results by Indarti et al. (2020), innovation in Malaysia's traditional fabric industry affects industrial companies' performance. Evolution in the traditional fabric industry will bring various innovations in terms of production processes to distribution methods. The results of empirical analysis on traditional fabric research in Malaysia also showed that only product innovation has a significant effect on company performance (Akhir et al., 2018; Ramli et al., 2017). Therefore, it can be said that the number of requests from consumers strongly influences the size of the distribution of Sasirangan fabric. Sasirangan fabric product innovation in terms of motifs and product creations determines the number of requests.

In China, local products can develop into an industry that supports the community's economy. This

requires a strong integration not only in the production system but also the distribution channels with the principle of cooperation. The mechanism is also characterized by a framework that allows all elements to be involved, such as the community, government, and various policies (Chen et al., 2021). In this regard, in the Sasirangan fabric industry, the distribution pattern illustrated the cooperation between Sasirangan artisans and traders. In general, artisans were able to produce the fabric but they showed a lack of capital in their business. Therefore, they marketed their products to traders to be distributed to consumers. There should be a neat arrangement between artisans and traders in a local product distribution system of a traditional clothing business. The role of the Banjarmasin City government is essentially needed in regulating the Sasirangan business. It is suggested that the government issues a regulation system in terms of investment incentives, workers training, promotion, and infrastructure improvement.

CONCLUSION AND SUGGESTION

The Sasirangan fabric industry in the city of Banjarmasin is able to transform traditional fabric products to be a part of the community's economic activities. The success of the industry is highly dependent on the role of economic actors in carrying out economic activities. The expertise of artisans in producing Sasirangan products is supported by the involvement of traders who give funding contribution to market products to consumers. The pattern of distribution of Sasirangan fabric products takes place in collaboration between artisan and traders. The distribution pattern occurs directly by the artisan who sells their products to consumers. Meanwhile, the indirect distribution pattern is carried out through intermediary traders who resell Sasirangan products to stores or individually to consumers.

The collaboration between artisan and traders is essential to maintain and develop innovations in terms of production and distribution of Sasirangan fabric products to a wider market area. This collaboration can be a model to maintain and improve the sustainability of local production industries as superior products of regional identity and developed into industrial economies of scale.

The traditional clothing industry of Sasirangan fabric serves as a means to maintain the existence of local culture. The sustainability of the Sasirangan fabric business requires the role of the government to support and regulate the business to become more developed. It is recommended for the government to issue policies in terms of investment incentives, worker training, promotion, and infrastructure improvement. The skills of artisans for Sasirangan fabric products should be improved to innovate, develop motifs and product creations according to the needs and trends that consumers are interested in.

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Carrying capacity and food self-sufficiency of paddy field resources: NDVI analysis in Batang Regency, Central Java Province, Indonesia

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ABSTRACT

Food self-sufficiency policy in Indonesia relies on the sustainability of productive land that meets the requirements for carrying capacity of agricultural land. But the fact is that in various regions, the existence of agricultural land resources is increasingly being degraded in terms of quantity and quality. This study aims to evaluate paddy field with NDVI analysis with extensive GIS calculations and integrated with the food self-sufficiency formulas. Monitoring of paddy field area using remote sensing and mapping techniques has been well recognized and efficient. The research was conducted in Batang Regency, Central Java Province, Indonesia, that annually produces 104,211 ton rice on average. The results showed that the production of lowland rice is sufficient to meet the daily rice needs of 897.19 gr per capita. The regency also showed a surplus of rice production of more than 342 gr per capita above the daily needs, fulfilling the criteria of food self-sufficiency. Food self-sufficiency classification is associated with the carrying capacity analysis found ca. 4.179 ($\alpha>1$), revealing that rice production can fulfil the needs of the population of Batang Regency.

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INTRODUCTION

The growth of population has resulted in increased development activities in various fields to meet the needs of the community (Li et al., 2017). It is associated with the construction of settlement facilities, infrastructure networks, commercial facilities, or social facilities. The increase in development activities will undoubtedly be accompanied by the rise in land requirements to accommodate these development activities (Trihatmoko, 2020). It means that the higher activities in the development lead to less land availability.

Since the imposition of regional autonomy in 2001, local governments in Indonesia have had broader authority in determining the right development policies and programs for improving the welfare of the people and the progress of their respective regions. The management of natural, human, and other resources requires development priorities by paying attention to regional importance (Mawardi, 2007). The balancing of the potential local excellence with emphasis on the carrying capacity of the environment will be able to create efficiency and effectiveness in regions. The condition related to the use and management of

development resources can improve community welfare and regional development.

The concept of land carrying capacity is widely applied to animal studies, especially to measure the amount of environmental capacity to support animal life expressed per unit in certain area. Later, the carrying capacity of the environment is also applied to the human population. Another carrying capacity analysis is also based on plant biomass (rice) produced by rice fields in a certain area and time. Thus, the carrying capacity is the ability of the environment to be able to support human life (Li et al., 2017).

The development of regional potentials such as the agricultural sector refer to the Law No. 41/2009 concerning Protection of Sustainable Food Agricultural Land (PLP2B). The PLP2B program protects the agricultural sector in each region so that both quantity and quality of corresponding resources are maintained. One of the implementations of this program is the one based on productive land in Indonesia that meets the requirements for the carrying capacity of agricultural land. However, the fact is that agricultural land in many regions in Indonesia is decreasing both in quantity and quality (Asmuti & Tjandra, 2020).

Most of the population in Batang Regency work as farmers who highly depend on the availability of the land to meet their needs. In addition, Batang Regency is also known as a fertile agricultural area for its various food crops or annual crops. Also, it potentially features the low geomorphological dynamic on its lowland areas especially most of the coastal areas (Trihatmoko, 2020). The low geomorphological dynamic indicates that this area is suitable for massive development in particular for food crop production. On the other hand, Batang Regency also displays very dynamic economic development in its coastal areas, along the Java Sea coast (Marfai et al., 2019). The economic development is also seen at the fact that this regency has been targeted for the development of an industrial area which is very attractive for investment (KFMAP, 2021). In this regard, it is necessary to research the environmental carrying capacity of Batang Regency based on land availability and needs for agricultural sector, specifically to protect rice field availability and the PLP2B program.

This research was aimed to reveal the carrying capacity using geographic information system (GIS) by Normalized Difference Vegetation Index (NDVI) analysis from the series of Sentinel-2 satellite images. The Sentinel-2 satellite images were chosen as the free and newest medium-high spatial resolution (10 m). In certain periods, the satellite has a regular frequency of return geostationary visits (10 days and combined constellation revisit in 5 days) for three to four harvests of paddy in a year. The research is also related to how paddy field resources in Batang Regency, Central Java Province, Indonesia, indicate the carrying capacity of food self-sufficiency, especially for rice production. The combination of GIS-NDVI processes and land carrying capacity for food self-sufficiency analysis are also expected to fill the gap of the previous researches that were mostly conducted separately or being positioned as the preliminary statement for one to another (Sukmono & Ardiansyah, 2017; Zhou et al., 2020).

RESEARCH METHOD

This research was conducted in Batang Regency, Central Java, Indonesia. Research area selection was conducted in all its 15 districts. The object of research focused on all types of paddy fields, i.e., technical irrigation paddy fields, simple irrigation, and rainfed paddy fields.

The primary data were from the latest cross-check field data of changes in land use the and agricultural commodity productivity. The secondary data included statistical and satellite image data. Geographic information system data were taken from the website of the Geospatial Information Agency (BIG), as well as satellite imagery data from the United States Geological Survey (USGS).

The Sentinel-2 satellite imagery relies on multispectral high-resolution optical observations over the global terrestrial surface, including land change monitoring, emergency response and security services activities. The use of Sentinel 2A Satellite imagery emphasized the design of a reliable multispectral land observation system by featuring a Multi-Spectral Instrument (MSI) with 13 spectral bands ranging from visible and near-infrared to shortwave infrared. Spatial resolution varied from 10 m to 60 m, depending on the spectral band, with a field of view of 290 km. The combination of high spatial resolution, wide field of view, and broad-spectrum coverage showed an advantage over other multispectral images.

Normalized Difference Vegetation Index

Vegetation index is analyzed based on digital brightness values as a result of the near-infrared (NIR)

and red band reflectance and absorption from vegetation (Campbell, 2002; Zhou et al., 2020). This is part of the analysis and manipulation processes in GIS scope (Aronoff, 1989) that is conducted for experiments measuring biomass or vegetative level. NDVI measures flourishing green vegetation and also investigates changes in the ecological environment (Li et al., 2017). The combination of the different formulation of normalization and the use of the highest absorption and reflection of the chlorophyll makes it durable under various conditions (Syamsia et al., 2018). The index value ranged from -1 to 1. The general range for green vegetation is 0.2-0.8 (Rouse et al., 1974), with the following equation.

$$NDVI = \frac{(NIR-Red)}{(NIR+Red)} \quad (1)$$

NDVI was calculated by adjusting the bright visualization from NIR effect. The function was being normalized by the difference/sum ratio of red band.

Land Availability

Land availability was determined based on the total of local actual production data of each commodity in a particular area, added up with the products of all commodities. For agricultural commodities, land availability analysis was carried out by calculating land availability. The formula for land availability used the equation below (Ministry of Environment, 2009).

$$SL = \frac{\sum(Pi \times Hi)}{Hb} \times \frac{1}{Ptv\acute{o}} \quad (2)$$

in which SL is land availability (ha), and Pi is the actual production of each type of commodity (the unit depends on the type of product), including agriculture, plantation, forestry, and animal husbandry. Hi is the unit price for each type of commodity (Rp per unit) at the producer level. Hb represents the unit price of rice (Rp per kg) at the producer level. Pt is Rice productivity (kg per ha).

The Needs of Land

Population pressure on the carrying capacity of land was determined by the value of the ratio between the population and the percentage of farmers with a minimum area of land to live properly. The land requirement formula used in research is shown in the following equation (Ministry of Environment, 2009).

$$D_L = N \times KHL_L \quad (3)$$

DL is the needs of land in total equal to rice (ha). N represents population and KHLL is the needs of land to live properly.

Carrying Capacity of the Land

Food self-sufficiency is an attempt to meet their own food needs by cultivating food crops such as cereal (rice and the like), secondary plants, cassava, and others. Another researcher suggested that land capability implies land carrying capacity (Notohadiprawiro, 1987). Previous research said that the land carrying capacity degradation is influenced by an increasing population and a low percentage of farmers (Trihatmoko, 2020).

The carrying capacity of the land was obtained from a comparison between the availability of land (SL) and land requirements (DL) (Ministry of Environment, 2009):

$$Cc = \frac{S_L}{D_L} \quad (4)$$

If $s_L > D_L$, a surplus of land carrying capacity. If $s_L < D_L$, a deficit of land carrying capacity. To get the precise carrying capacity of the land (α) the calculation was continued as follows.

$$\alpha = \frac{X}{K} \quad (5)$$

X is the available area on site location, calculated using the following formula.

$$X = \frac{Total\ Area\ of\ Harvest}{Population} \quad (6)$$

Meanwhile, K stated in the formula as follows:.

$$K = \frac{minimum\ rice\ consumpsion\ (kg)}{Average\ rice\ production\ per\ ha} \quad (7)$$

The surplus of land carrying capacity was emphasized on the rice production analysis by using formula:

$$Rice\ production\ in\ Total = Total\ area\ of\ paddy\ field\ (ha) * IP * productivity\ (tons\ per\ ha) \quad (8)$$

The total rice production was assumed as the conversion value of milled unhusked rice (GKG) then the value of rice obtained is as follows.

$$Rice = Index\ GKG * total\ harvest \quad (9)$$

The level of productivity of paddy fields in meeting the needs of the population of rice in Batang was calculated based on the following formula.

$$Supply = \frac{Rice\ production\ in\ 1\ year}{Population\ in\ one\ regency} \quad (10)$$

RESULT AND DISCUSSION

Spatial Pattern and Land Use

Batang Regency is a hilly area both in the north along the shore line of Java Sea and in the southern region bordering Banjarnegara Regency. The south part of the region was dominated by tea plantations, which were located in an upland area with a cool climate. Most of the southern part of Batang Regency area (30.2%) was plantation area (Table 1). The forest area in the north was mostly cultivated for teak forest or tree plantations. The industrial area development in Batang Regency was predominantly spread along the north coast road as the densest traffic path in Indonesia (Hartatik, 2016), i.e. Kandeman, Tulis, Subah, and Banyuputih Districts. This condition is the main consideration for industrial development that requires adequate accessibility.

Table 1. Land Use Distribution in Batang Regency, 2016

Land use type	Area Size	
	ha	%
Forest	13,309.4	15.5
Industry and Tourism	141.9	0.2
Water body	1,275.6	1.5
Grassfield	615.1	0.7
Dry field	3,134.4	3.6
Mix garden	6,158.5	7.2
Settlement	11,209.4	13.0
Garden	25,980.7	30.2
Paddy Field	24,081.4	28.0
Total	85,906.4	100.0

Source: Spatial Plan (RTRW) data analysis of Batang Regency.

Batang Regency has favorable and reliable natural resource potential for food crop agriculture (paddy) on condition that proper resource management support is met. In the region, the area of irrigated paddy fields amounted to 28% of the regency area (Table 1) and was spread over all districts (Table 2).

Most of the paddy fields were located in the northern and southern areas of Batang Regency (Figure 1). The central area was dominated by teak forest area. It was also used for residential and industrial areas. The districts with the small size area of paddy fields were Warung Asem, Limpung, Pecalungan, and Tulis districts. Those areas were mostly hilly and some of them showed an indication of growing rapidly in industrial sector.

Table 2. Paddy Field Area by District in Batang Regency, 2019

District	Area size	
	%	ha
Bandar	2,436.3	10.2
Banyuputih	1,228.1	5.1
Batang	1,830.2	7.6
Bawang	1,782.0	7.4
Blado	1,420.8	5.9
Gringsing	2,143.2	8.9
Kandeman	1,565.3	6.5
Limpung	1,324.5	5.5
Pecalungan	866.9	3.6
Reban	1,685.7	7.0
Subah	1,998.8	8.3
Tersono	1,878.3	7.8
Tulis	987.3	4.1
Warung Asem	1,252.2	5.2
Wonotunggal	1,661.6	6.9

Source: BPS (2021)

Maintaining the existing spatial pattern in Batang Regency is a necessity for all stakeholders, including the community, the private sector, universities, and the government in order to support PLP2B policy. At the same time, the agricultural sector is also the leading sector of the region in terms of gross regional domestic product (GRDP) (BPS, 2021). In addition, the agricultural sector of Central Java has an important role in contributing to the economy, ranking the third in regional GDP with an economic share of 14.30% GRDP, while the highest share was the manufacturing industry at 34.52% (Central Java Province GDP 2016-2020). Therefore, the province of Central Java is expected to become one of the supporters of national food resources, especially rice. This is influenced, among others, by the availability of fertile paddy fields and the application of increasingly modern technology and equipment (Putri, 2016). This technology will support more effective and efficient farming. This progress is expected to increase farmers' yields in terms of quality and quantity.

Carrying Capacity of the Land

Batang Regency has abundant natural resource potential in agriculture, especially the availability of paddy fields. The area of paddy fields reached 24,081.4 ha or equivalent to 28.0% of the total area of Batang Regency. This did not include rainfed rice fields which reached 3,134.4 ha or equivalent to 3.6% of the total land area. This condition indicates that Batang Regency has a very significant carrying capacity of agricultural land as stated in the Central Statistics Agency (BPS, 2018) (Table 3).

Table 3. Land Carrying Capacity Status of Batang Regency in 2017

District	Land Availability	Land Required	Carrying Capacity of the Land[1]
Wonotunggal	3,523.65	218.25	32.66
Bandar	3,299.83	409.60	16.54
Blado	1,570.51	539.15	6.48
Reban	1,241.75	624.59	4.58
Bawang	1,828.26	540.98	7.82
Tersono	4,855.25	167.85	60.74
Gringsing	5,132.30	247.64	41.90
Limpung	3,411.77	210.02	33.43
Banyuputih	1,567.76	565.71	5.97
Subah	3,278.63	319.41	23.11
Pecalungan	2,203.62	367.13	13.50
Tulis	3,801.68	197.82	50.18
Kandeman	3,173.66	306.32	20.95
Batang	1,340.23	808.28	13.32
Warungasem	4,665.30	325.50	28.83

[1]All district showed surplus status (BPS, 2018)

Table 3 shows that 15 districts indicated high carrying capacity of land. The highest carrying capacity was at Warungasem District which is located at the lowland in the coastal area. The lowest carrying capacity was found at Reban District which is located at the highland area (southern part). Furthermore, Table 3 indicates that the government should ensure strict control over the development of built-up area as the side effect of the rapid economic development that is commonly concentrated in north coast of Java Island (Marfai, 2011; Hartatik, 2016; Trihatmoko, 2020).

The NDVI analysis identified the rice fields from the amount of chlorophyll that reached its maximum point in its growth phase. NDVI analysis was able to estimate that the area of rice field reached 6,967.5 ha. The mature rice plants were visually recorded from the spectral reflection which was very bright compared to other plants. NDVI can identify high brightness sensitivity even though it is lower than the brightness of water bodies (Figures 2, 3, and 4). In panchromatic satellite image analysis, the amount of cloud cover will cover or reduce the accuracy of image classification.

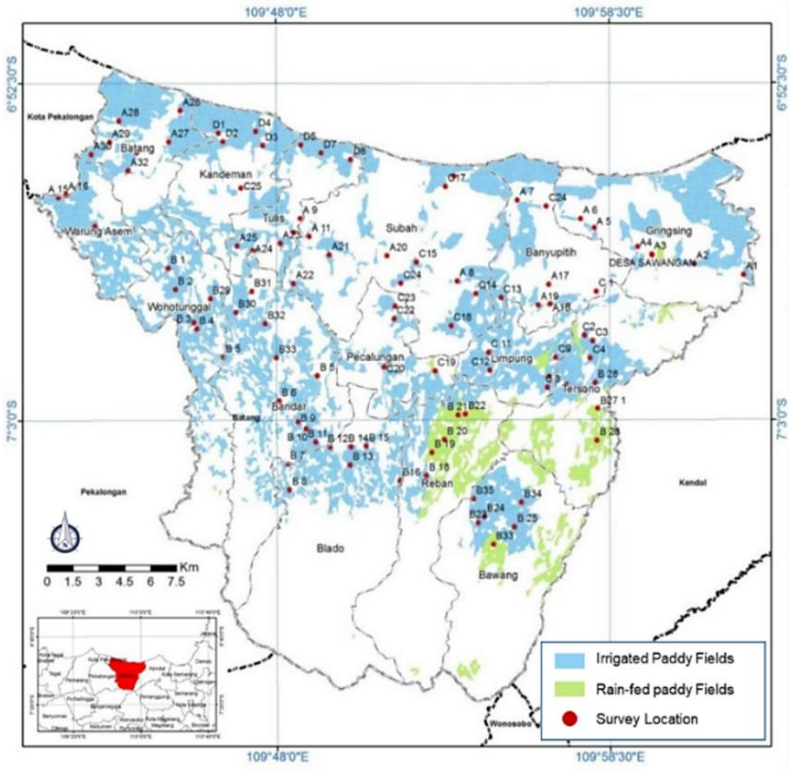

Figure 1. Paddy field area by district in Batang Regency

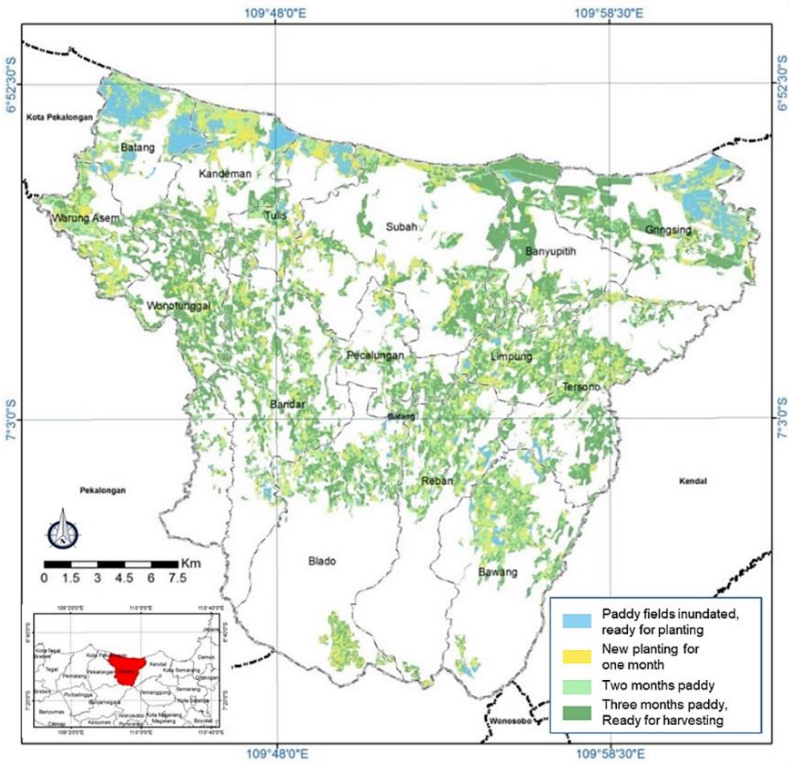

Figure 2. The paddy field area identification in February 2017

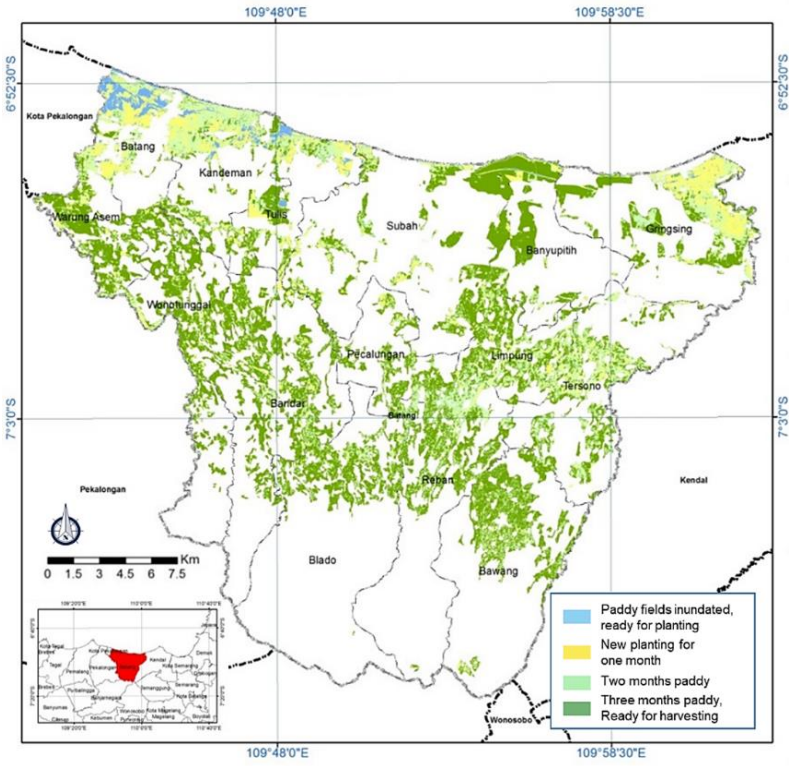

Figure 3. The paddy field area identification in August 2017

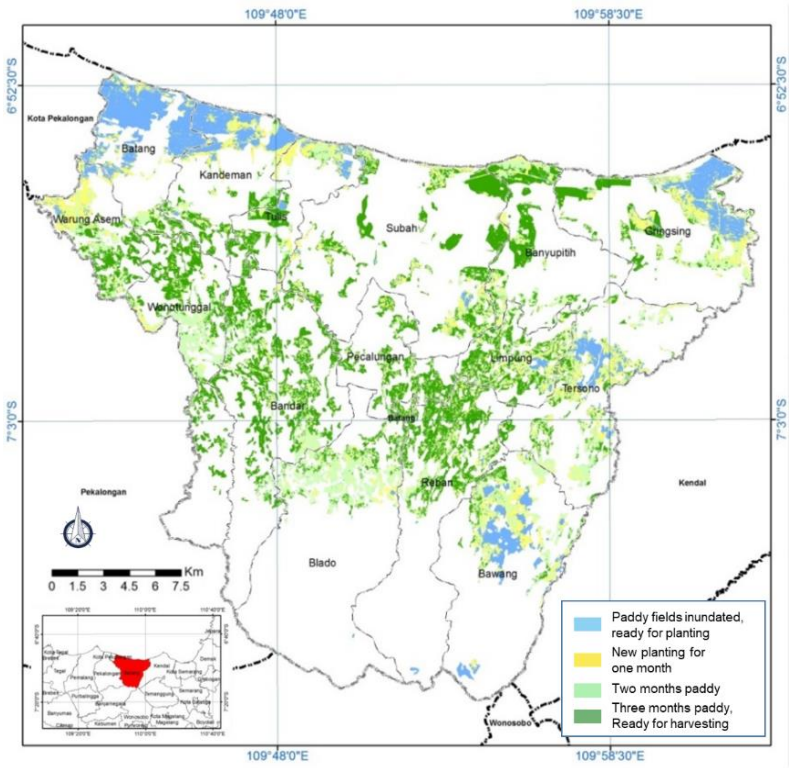

Figure 4. The paddy field area identification in October 2017

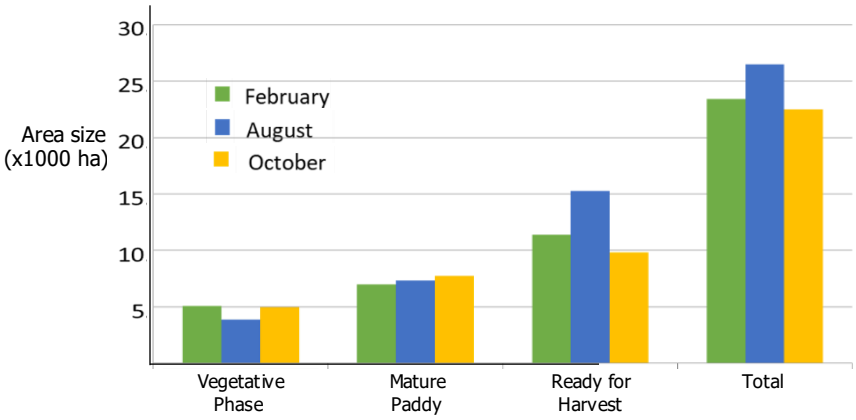

Figure 5. The paddy field area calculation from Sentinel 2A in 2017

Overall, observations of the Sentinel 2A Satellite imagery (Figure 5) indicated that Batang Regency had a very suitable planting area. This means that paddy fields can be cultivated throughout the year, both in the rainy and dry seasons. This can be justified by observing the imagery of rice planted land that did not show extreme differences between the northern and southern parts of Batang Regency (Figure 6), represented by survey locations A2 and B8, respectively, as shown in Figure 2. Meanwhile, areas with simple to technical irrigation showed relatively productive farming management. NDVI analysis has indeed proven to be able to provide an accurate assessment of the observation of paddy fields, and it allows for the development of other environmental analyzes (Zhou et al., 2020). The NDVI analysis also

fills research gaps related to the abundance of rice fields in Batang Regency as requested by the local government in the process of this research being conducted.

The evaluation of daily rice consumption was found to be 342 gr per capita or equivalent to 124.89 kg per capita annually. Meanwhile, the average productivity of rice was 6.5 tons per ha, so that the K value was 0.0192. With the values of X and K, the carrying capacity of the land (α) was 4.179 (Table 4). Average rice production per ha was converted from paddy to rice (62.74%). The value α is used as an indicator of the ability of paddy fields to the population in one region (Ma, 2017). Value of α is used as an indicator of the capacity of paddy fields relative to the population number in an area. The α value more than 1.0 means that the area has a functional carrying capacity so that it indicates food self-sufficiency. On the other hand, α value less than 1.0 indicates that the area does not have the carrying capacity so that food self-sufficiency is not met. When α value equals to 1.0, the region has an optimal carrying capacity, and the availability of food can support the community needs in or outside the region.

Supply and Demand Balance

The sequence analysis results demonstrated that the production of the rice was double the rice demand (Table 4). It means one-time harvesting equalled to two years of consumption for population in Batang Regency.

Table 4. Production, Consumption and Carrying Capasity of Paddy Field in Batang Regency

Variable	Unit	Value
Production	ton per year	245,516
Demand	ton per year	104,211
Surplus	ton per year	141,305
Number of populations	people	749,720
Consumption per capita	Kg per year	124.890
Area of harvest needed per capita (X)	ha per capita	0.803
Consumption/production ratio	-	0.019
Carrying capacity of the land (α=X/K)	-	4.179

The area of paddy fields with irrigation systems was 24,081.4 ha (28% of the total area in Batang Regency), which was very likely to produce significantly more rice production. In addition, the planting intensity (planting index) in several locations also employed three planting seasons in a year. The results of the study showed that the average planting index reached five harvests in 2 years or the equivalent of 2.5 times a year, with an average productivity of 6.5 tons per ha. Thus, the total rice production in all Batang Regency was calculated as ca. 391,323 tons per year or 245,516 tons per year in milled grain (62.74% conversion). The production was higher than the demand for one year (104,211 tons per year), which shows an indication of a production surplus. Furthermore, the calculation of food needs (Wilis et al., 2020) found an annual production of 327.476 kg per capita or equivalent to 897.19 gr per capita.

The total demand for rice in Batang Regency was 104,211 tons per year. The amount of production has been met to achieve food self-sufficiency. This result placed Batang Regency as a mainstay agricultural area for rice production, and was then asked to contribute to meeting the rice needs of other districts or regions, because Central Java province was not self-sufficient in food during the 2014-2018 period (Pratiwi et al., 2020). Considering this strategic position, the government needs to consider the allocation of more industrial estates in Batang Regency or instead find alternative allocations to outside the region (KFMAP, 2021). Planning for rice production needs estimate without considering the main potential of land resources can lead to degradation (Wilis et al., 2020).

Research Implication

By considering the carrying capacity of paddy fields and its variables such as land availability and land requirements for rice production, this study contributes to policy formulation as a guideline for evaluation and control in the management of the PLP2B program, especially to support agricultural development. As discussed, this research is also related to regional development, as well as development planning especially for Batang Regency. Also, the results of this study can be used as evaluation material for the government in importing rice policy which is still being carried out nowdays (Widarjono, 2018). The implementation of the PLP2B program to maintain agricultural land in Batang Regency needs more attention. The proposed allocation of industrial estates must be reconsidered because Batang Regency has the potential to become a "rice barn" in Central Java and even at the national level (KFMAP, 2021).

Along with the industrial estate development plan, the government needs to consider the speed of change that will occur due to the growth of new economic centers (Putri, 2016), which will ultimately affect the agricultural sector. Ante et al. (2016) stated that the rapid development brings consequences for the widespread use of agricultural land along with the socio-economic changes of the urban to rural transition. This is due to the development of modernization in which urban residents perceive that the non-agricultural sector is better than the agricultural sector, thereby encouraging the conversion of agricultural land into non-productive land. This tendency becomes a serious threat if it occurs continuously.

The potential of rice farming by considering the carrying capacity of land, land availability, and population should provide incentives for farmers' livelihoods or at least increase the farming activity pride. The farmers of Batang Regency can carry out rice farming activities and have an interest in supplying outside the region or export, where the value of α reaches 4.179. This means that the achievement of a surplus occurs up to more than four times the threshold. This can be a source of pride for farmers because it yields high number of production.

This research led to multidisciplinary studies approach which involves the fields of GIS, regional planning, and environmental science as part of the geographical analysis. It means that the research directly affects the geography study development as well as the management of natural and environmental resources. Furthermore, this research can enrich and gain the focus on research roadmaps for research activities with multidisciplinary approaches in land resource conservation associated with efforts to develop food self-sufficiency.

CONCLUSION AND SUGGESTION

Overall, all districts in Batang Regency have sufficient availability of paddy fields. By 2017, Batang Regency indicated surplus of productive rice fields, with an area of 24,081.4 ha of irrigated rice fields (equivalent to 28% of the district's area). Such large number has not been added to the rainfed rice fields which amount to 3,134.4 ha (3.6% of the district area).

Based on the observations of Sentinel 2A satellite imagery, Batang Regency has a suitable cultivated land throughout the year during the rainy and the dry season. This can be identified by paddy field planted area that does not show significant imagery difference at some occasions. The most significant differences are found at the rainfed rice fields in the district areas located along the coast, while the upland consists of areas with simple to technical irrigation.

The total demand for rice in Batang Regency reaches 104,211 ton per year. Meanwhile, the results of the calculation of the daily rice needs of the population in Batang Regency reaches 897.19 gr per capita. According to the criteria, Batang Regency is classified as having a surplus because the daily supply is 342 gr per capita, exceeding the daily needs.

Batang Regency can be categorized as having food self-sufficiency. Its value of the carrying capacity is 4.179, which means the rice production in the region is able to meet the needs for population, even generating a substantial surplus.

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