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Higher education leadership and uncertainty during the COVID-19 pandemic

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ABSTRACT

► Editorial

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JEL Classification A23; I00; I23 The impact of the pandemic on higher education activities is a major concern around the world. Higher education is obliged to carry out the necessary measures of adaptation, innovation, and management change, which are promoted by leaders at various levels. The leadership is further committed to encouraging transformative changes to meet students' most critical needs. Leadership is expected to be able to use all resources in the organization, even in limited conditions due to pandemic impacts. The crisis condition during pandemic become the main approach in implementing higher education leadership. First, the leader develops effective multi-directional communication to mediate and respond to actual needs and changes, especially involving parties impacted or affected by policy changes. Second, the leader develops a cooperation network to support mutually one another to form productivity. It is necessary to network with all interests to formulate the best solution to reduce the adverse impacts of the pandemic. Third, the leader develops empathy to encourage the work environment, increase productivity, and combine efforts to promote health on their personal and professional sides. Fourth, lecturers develop an own set of heuristics for managing their classes using technology as the main work in the new normal situation.

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INTRODUCTION

The COVID-19 pandemic has taken place for more than one year starting in early 2020. Pandemics affect human life around the world, not only in the aspects of public health but also in the economic and social sectors in various activities (<u>Nugroho, 2020</u>). Various adjustments and anticipations have been conducted with the purpose of not enabling the pandemic to spread an adverse impact. The government, the business sector, and the community are making various efforts and working hard by implementing measurable health protocols. It is encouraging that vaccination has started in some countries, areas, and communities. This synergy is expected to find the goal of stopping the transmission of the virus comprehensively.

The impact of the pandemic on higher education activities is a major concern around the world. The impact is very significant, including the closure of educational institutions, fundamental management changes, shifting organizational culture, impact on the lives of students (<u>Khan et al., 2021</u>; <u>Sá & Serpa, 2020</u>), and budgeting disorders in the university (<u>Kruse et al., 2020</u>). Educational activities also conform to health protocols, namely maintaining distance, preventing crowds, and reducing physical activity. At present, learning and student activities generally use online media, research activities have decreased in volume, and campus management activities are directed to the online assignment (<u>Batez, 2021</u>; <u>Cameron-Standerford et al., 2020</u>).

Indonesian government also anticipates the impact of the pandemic on higher education. The concept of Independent Campus (Kampus Merdeka) is relevant for dealing with learning activities during a pandemic (Directorate General of Higher Education, 2020). This concept is providing the higher education institutions with freedom and autonomy, i.e. freedom of bureaucratization as the lectures are freed from bureaucracy and students are free to choose their preferred field (Prahani et al., 2020). The government is also supporting the digital platform system for interuniversity online learning by providing more than 3000 modules for students and lecturers. Institutional grants for curriculum development, scholarships for students, mobile package assistance, and other facilities are provided to strengthen higher education and protect it from the impact of the pandemic.

By the same token, the ongoing coronavirus pandemic has created an unprecedented crisis in Ethiopian higher education institutions. Following this, the Ministry of Education of Ethiopia developed a 'Concept Note for Education Sector COVID-19 Preparedness and Response Plan' on 3 April 2020 (Ethiopia Ministry of Education, 2020). The objective of the response plan is to ensure the continuity of general education which was disrupted by the COVID-19 pandemic and to contribute to the effort of containing the spread of the virus. With relatively little precaution, higher education institutions abandoned face-to-face instruction starting from March 2020 and shifted rapidly to online learning. However, the most serious challenge affecting online or e-learning were insufficient internet connectivity, limited information and communication technology skills, lack of incentives, and insufficient time for online interaction. In addition, downloading the assignments requires internet access and that is not always easy for higher education students. The data connection offered by the internet provider on mobile phones is often expensive, very slow, and expired before the students finish the homework. Also taken into consideration the limited access to devices availability especially in the rural agrarian communities, economically disadvantaged segments of the society, as well as persons with disabilities and students with non-literate families as major constraints in mitigating the negative impact of COVID-19 on quality education.

Under conditions of high uncertainty, an individual has no time to analyze all the information and has to find ways to reduce the complexity of the environment (Gigerenzer, 2008). Students face a situation when they have to not only develop new skills but also correctly apply the existing ones. Usually, we assume that students analyze and select the best fitting leadership technique to the situation. COVID-19, however, made several skills obsolete while some skills became more demanded. For instance, live communication allowed for a better analysis of facial expressions. Being able to recognize true and fake smiles allows an individual to adopt the way of communication to the channel of communication with a high or low psychological distance (Bogodistov & Dost, 2017). Due to home-office and blended learning both lecturers and students among each other do not see facial expressions or see them in low quality. This does not allow to indicate the facial muscle movements (Ekman & Rosenberg, 2005) and, thus, increases the issues of communication.

In a pandemic situation, higher education is obliged to carry out the necessary measures of adaptation, innovation, and change management, which are promoted by leaders at various levels. They work by relying on speed, flexibility, and leadership who are committed to making transformative changes to meet the most critical needs of students (Baer & Duin, 2020). The education sector is rapidly transforming itself from conventional to remote forms of work, and regards virtual skills, autonomous work, and effective communication as the most important skills for the workforce during and post-pandemic (Al-Youbi et al., 2020). The decision to use online classes and their various implications are the main points that must be mapped. This requires strong, decisive, and courageous leadership to manage higher education and respective problems (Marshall et al., 2020).

This article describes the actual issues of leadership in higher education in a pandemic situation. Leadership is expected to be able to use all resources in the organization, even in limited conditions due to pandemic impacts. However, it is hoped that this will be able to produce quality decisions by complying with the operational standards of higher education through a transformed learning process according to the situation. All stakeholders in higher education must move in the same rhythm for a better future of higher education.

ISSUES RELATED TO LEADERSHIP

Higher education service activities have been dealing with student education services, management financing, research development, increased marketing, student admission, and continued globalization. The higher education leadership paradigm requires a competency framework to assist leadership development, and leadership capabilities to carry out quality management of higher education (Black, 2015).

Leadership in the context of higher education is principally universal regardless of the condition of the nation or organization. Leadership challenges come from the effectiveness and style of leadership. Leadership effectiveness is a factor that depends on how well the follower relates to the leader. Meanwhile, leadership is influenced by how leadership style is translated into leadership effectiveness (<u>Hassan et al.,</u> <u>2018</u>).

Higher education leadership has categories at the institution, faculty, and students. Institutional leadership needs to strengthen itself so that it becomes more adaptive and increases leadership capacity. At the faculty level, leadership develops support system strengthening efforts to minimize gaps and limitations among stakeholders. Leadership at the student level is directed at fostering stronger student learning outcomes through the use of the IT platform (Colpitts et al., 2020).

Higher education institutions (HEIs) are complex systems. During a pandemic, higher education is more vulnerable to external environmental factors that can convert organizational workflows. This vulnerability occurs at various levels of the system, how organizational members perform tasks, how processes and power structures are related, and what operational structures are designed to support work. Pandemics also lead to dilemmas and conflicts regarding policy and institutional changes and reduced and limited resources. At the same time, leadership must ensure fair access and distribution of resources to students, faculty, and staff. They must adhere to a public ethical procedure that promotes social justice and equality in any part of the university (Kruse et al., 2020). Justice is a sensitive issue because the impact of the pandemic has increased inequality (Directorate General of Higher Education, 2020; Marshall et al., 2020).

Effective higher education leadership will be instrumental in transforming systems, but policymakers, development partners, and civil society organizations, among others, will need to support and empower them to effect meaningful change and create more equitable, resilient, and responsive systems for our future when these kinds of disaster risk and uncertainty occur.

HEI leadership is facing a more serious problem during a pandemic. Pandemics have a systematic impact on the activity of teaching and learning, research and innovation, decision-making structures, and barriers to delivering visions to the academic community (<u>Samoilovich, 2020</u>). <u>Colpitts et al. (2020</u>) revealed the inability of the Japanese higher education system to adapt to widespread unexpected disruptions at the beginning of the pandemic.

<u>UNESCO-IESALC (2020)</u> reported that many chancellors and presidents of higher education acknowledge that the pandemic creates an unexpected crisis circumstance. Results of the survey conducted at the start of the pandemic showed that 9 out of 10 institutions paid immediate primary attention to the health and socio-emotional well-being of students and workers, and lecturers. At the same time, only 2 in 10 institutions immediately implemented specific measures in online teaching with adequate pedagogical support and resources. Leaders also expressed concern about retaining students to take online courses. This is likely to cause the loss of students who no longer return to the class.

In Indonesia, online learning faces inequality in terms of infrastructure or online platforms as well as in the ability of students who access them. Lecturers are also not ready for online learning and are urgently required to take initiative and quickly make adaptations. In Indonesia, private HEIs are the most affected during the pandemic. This problem is due to the financial difficulties of most students' families in the midst of a pandemic, while private HEIs depend on a large part of the income from the student body (Directorate General of Higher Education, 2020). Meanwhile, <u>UNESCO-IESALC (2020)</u> revealed that non-teaching staff is the most vulnerable in terms of the possible reduction in the number of jobs in private universities due to possible financial downturns caused by fee cancellation or reduction in student enrollment. This is believed to be happening in many developing countries with more limited resources and technology, particularly information technology infrastructure. In general, this problem can be said to be related to leadership performance (<u>Hassan et al., 2018</u>).

MANAGE UNCERTAINTY

Times have changed fast. The adjustment of higher education activities during the pandemic has led to various innovations. The innovation aims to make higher education's mission fulfill its goals. However, the demand for innovation is an absolute necessity during a pandemic (Baer & Duin, 2020; Samoilovich, 2020), because innovation can fill gaps and become potential and solutions to problems that arise during a pandemic in university life itself, as well as economic activity and society.

Leadership also works in conjunction with a learning process that transforms according to conditions at the higher education institution. This also pledges that learning activities can be done anywhere and can use a variety of methods and approaches. In Indonesia, the policy of Independent Learning: Independent Campus (*Merdeka Belajar: Kampus Merdeka*) provides student learning solutions during the COVID-19 pandemic (Directorate General of Higher Education, 2020). Various grants or facilities from the Merdeka Belajar program can be accessed by higher education institutions, lecturers, and students. Thus, it provides benefits to develop learning autonomy.

The management and leadership are now able to adapt and transform the university activities during the pandemic. Higher education institutions' (HEI's) socioeconomic life and online pedagogy are already underway with various situations following measurable health protocols. HEIs make adjustments to the curriculum and academic calendar, with the support of technology infrastructure, as guided by UNESCO (<u>UNESCO-IESALC, 2020</u>). They subsidize cell phone prepaid packages for students and lecturers to access online learning. Students can access webinars or online activities once a week outside the curriculum. HEIs allocate their resources according to needs, by taking turns employing 50 percent of their staff employees, to prevent transmission of the virus. Financial assistance and necessities are provided to personnel who have confirmed the transmission of the virus. Most recently, HEI managements also implement a vaccine program for all lecturers and staff.

However, uncertain condition in pandemic or postpandemic will probably continue to arise (Directorate General of Higher Education, 2020; Kruse et al., 2020). Pandemics always trigger new medical findings that are constantly being anticipated. As long-term economic, social, and academic effects manifest around the world, there is a need to anticipate significant changes in higher education (Cameron-Standerford et al., 2020). The dynamics of this epidemic need to be closely watched by the leadership and management of those institutions. Therefore, the crisis condition during this pandemic should be the main approach to implementing higher education leadership, as described below.

Develop Communication

Any leader needs to develop a climate and culture of communication, especially during a pandemic. Effective multi-directional communication will function to mediate and respond to actual needs and changes, especially involving parties impacted or affected by policy changes (<u>Odegard-Koester et al., 2020</u>). This is also to ensure that their rights are not reduced or negotiable without downgrading the standard of educational services, such as for students or education staff. This effort is to ensure the right to higher education for all within a framework of equal opportunities and non-discrimination (<u>UNESCO-</u> IESALC, 2020).

Sensitive matters that have financial or welfare implications need to be communicated with all university parties. Various parties need to understand the fiscal decline in the campus and that adjustments will be made by taking into account the priorities and needs of the university organization. Each leader has the responsibility of disseminating the adjustment policy and strives to deliver messages regularly to faculty and staff regarding the ongoing fiscal process. Leaders at the faculty level communicate with students and lecturers about online learning formats and coordinate the provision of instructional materials for faculty with various implications (Kruse et al., 2020)

Truthful communication among people within a higher education institution can be used to map the impact of a pandemic. Communication is also important for leaders to carry out job analysis and measure the extent to which HR is working. The leader by the level of the structure can conduct analysis, measure the potential of resources, capabilities, and human resource commitment, to formulate choices or alternative solutions to problems. The capacity of leaders to understand the scope of the impact of a pandemic will enrich decision-making choices and help make quality decisions (Hassan et al., 2018).. According to Marshall et al. (2020), communication is also a way in which leaders acquire support for their vision and the direction that the organization has set, especially in crisis situations.

Develop A Network

The Covid pandemic drives HEIs to innovate and optimize resources to work in organizations. They cannot work alone, and it is necessary to network with all related interests to formulate the best solution. A strong rhythm of cooperation will mutually support one another to form a productive and beneficial cooperation network. As a result of the imposition of physical distancing rules, it has even prompted certain leaders to be more determined to collaborate with various parties more efficiently and effectively (Marshall et al., 2020). Leaders in departments or faculties can collaborate with alumni, practitioners, or experts to give online seminars, lectures, or workshops.

Leaders in career development have a greater responsibility during a pandemic. They must be more active and creative in carrying out activities offering apprenticeships, job placements or tracer studies in the midst of the situation where the economy and the job market are likely to decline. This effort is expected to not only maintain a sustainable relationship between HEIs and the job market but also to be able to minimize the impact of the pandemic on the economy (Al-Youbi et al., 2020). This also needs to be done by the HEI unit that manages new student registration, including the admission of foreign students, to maintain sustainability and international recognition. Research and publication collaboration can also be carried out by researchers by utilizing resources, competencies, and laboratories without having to physically visit.

Most HEIs have a special COVID-19 task force to carry out planning, promotion, prevention, and caring of Covid-infected patients. This new assignment was quickly recognized by the HEI personnel. This new unit is encouraged to network with local COVID-19 offices to coordinate and execute necessary actions, including patient treatment and vaccinations. The institutions through the COVID-19 task force unit can also provide financial subsidies for cases of virus infection.

Develop Empathy

Inequality and justice are sensitive issues, and their incidence tends to increase during pandemic periods. The decrease in the institutions' budget is something that cannot be prevented and it has an impact on reducing or losing welfare rights, especially for lecturers and staff. Students were also found to have problems with online learning or decreasing financial condition. A leader needs to show empathy for the conditions that are happening in their work unit of the organization. Empathy is then expressed by making correct and non-discriminatory decisions accompanied by periodic socialization to lecturers, employees, and students to adjust to the development of the pandemic. Budgeting policies are implemented transparently by paying more attention to those affected during the pandemic. This has a positive impact on building commitment and satisfaction of human resources in the organization (Khan et al., 2021; Hassan et al., 2018).

Empathy will emerge through genuine collaborative activities between leaders and members, working to support each other, channels to express mutual concerns, and feelings of friendship to discuss unknown things together. Leaders encourage the work environment, to increase productivity and combine efforts to promote health on their personal and professional sides (Odegard-Koester et al., 2020). To ensure the physical and mental well-being of students and faculty, it is necessary to maintain a sense of togetherness and common purpose. In the community, the leader lets the individual feel at home. The leader encourages that the community is protecting, preserving, and respecting each individual. It takes into account people's needs, including emotional needs. The foundation of a caring culture is how people share common and unified goals (Samoilovich, 2020).

Nugroho et al., Higher education leadership and uncertainty...

Propose Simple Rules

In the situation, the uncertainty is growing – leaders receive less information and need to "guess" what kind of emotions are experienced and what parts of the crucial information is communicated but not received by the recipient. Coping with this level of environmental complexity might become an issue (Gigerenzer, 1991).

To overcome this issue, lecturers at higher educations have to emphasize tools for coping with uncertainty, such as heuristics (<u>Gigerenzer, 1991</u>, <u>2008</u>, <u>2010</u>). Proposing to students a set of simple rules (<u>Bingham & Eisenhardt</u>, 2014; <u>Eisenhardt & Martin, 2000</u>) as well as explaining how to understand their intuition (<u>Hodgkinson et al., 2008</u>, <u>2009</u>; <u>Sadler-Smith & Shefy</u>, <u>2004</u>) might help them in their attempts to become good leaders.

We have to keep in mind that there are two levels of heuristics: universal heuristics, e.g. fluency heuristic one-clever-clue heuristic, and idiosyncratic or heuristics, e.g. individual rules such as "If you have a bad feeling after a conversation with your employee, although there are no logical explanations for this, arrange an individual zoom-call and clarify" (Bogodistov & Moormann, 2019). Including topics on heuristics and why they work (Gigerenzer, 2008) as well as developing an own set of heuristics for leadership classes is a challenge that lecturers in the field of leadership have to face. Here, technology might help (Bogodistov & Moormann, 2020); yet, the main work has to be performed in class and is, thus, the "new normal" for those who teach leadership.

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Assessing the social factors of place dependence and changes in land use in sustainable agriculture: Case of Pandaan District, Pasuruan Regency, Indonesia

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ABSTRACT

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JEL Classification R11; R52; Q15 Times have led to changes in land functions and changes in environmental psychology's social, economic, and environmental aspects. Within Pandaan subdistrict, there is a main road linking Surabaya and Malang to the road hierarchy as a national arterial road, and the Gempol-Pandaan toll road has changed the function of agricultural land, particularly in Durensewu and Plintah Village. This study aims to determine the land conversion that occurs in the Pandaan District by knowing the place dependence and the relationship between the place dependence and the relationship between the place dependence and the relationship between the analytical method used is the analysis of land-use change, the analysis of place change. Based on the results of the analysis, it is known that there is an indirect and positive relationship between place dependence and land-use change in the Pandaan District and that one of the dimensions of place dependence is environmental quality. The decision to change the land is connected to sustainable agriculture.

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INTRODUCTION

The growing demand for land along with a rise in population affect land use (<u>Siciliano, 2012</u>). Pandaan District had a population of 117,556 in 2019, higher than the previous year's 106,368, or an increase of 11,118 people (<u>BPS, 2020</u>). This led to the increasing demand for land in the Pandaan District due to population growth. Apart from it, land demands have increased due to economic and social developments, as well as rising needs for settlements and infrastructure to reduce the disparity (<u>Nugraha et al., 2020</u>). It would lead to changes in land use (<u>Siciliano, 2012</u>), government land-use policy,

economic condition and urbanization (Lambin & Meyfroidt, 2010; Long & Qu, 2018; Wang et al., 2018), food need (Foley et al., 2005), natural resources management (Purnomo et al., 2018) and relationship rural-urban (Romagosa et al., 2013). Besides, Boron et al. (2016) and Zeho et al. (2020) developed strategies to balance agricultural expansion with the conservation of biodiversity, rural growth; and rural development

Pasuruan Regency, which is situated in the province of East Java, is one of the regions where the land is predominantly used for agriculture, comprising 60 percent of the whole area of Pasuruan

Regency. However, this figure continues to decline due to the transfer of land functions from the agricultural to the non-agricultural land use. The District of Pandaan is part of one of the districts with changed agricultural land's purpose (Pravitno et al., 2020). The decision of landowners to adjust their land's function reached 34% (Prayitno et al., 2019). Areas with modified land functions in Pasuruan Regency are Durensewu Village and Plintah Village (Bappeda Kabupaten Pasuruan, 2010). Preliminary study showed that the people of those villages agreed to sell the land because of the high offer price, allowing the land to be used for the construction of formal housing. The decision to change land is a factor that influences changes in land use (Prayitno et al., 2018).

Times have led to changes in land function, which are related to changes in environmental psychology's social, economic, and environmental aspects. One of the theories in environmental psychology is place attachment. There are four dimensions that are part of the mechanism of creating place attachment, i.e. place identification, place dependency, place discovered, and place inherited (Verburg et al., 2015; Walker & Ryan, 2008). Place dependence is a fastgrowing dimension dependent on these four dimensions (Trabka, 2019). It is also a practical commitment to a place that meets people's services and needs (Anton & Lawrence, 2016). Dependence of place can be defined when people feel secure living and working in a place (Trabka, 2019). In achieving its objectives, the population is affected by five factors, namely land ownership, environmental quality, jobs, accessibility, and career development (Baldwin et al., 2017; Haryani et al., 2019; Lai & Kreuter, 2012; Prayitno et al., 2019, 2020; Trabka, 2019).

The Pandaan District is crossed by a main road connecting Surabaya and Malang with the hierarchy as a national arterial road as well as the Gempol-Pandaan Toll Road launched in 2014. This main road section in the Pandaan District was expected make it easier for the population to support their activities and meet their daily needs (<u>Trabka, 2019</u>). The preliminary survey in 2019 showed that Pandaan District people meet their regular needs by purchasing finished or raw materials. Based on the research by <u>Rusmi (2019</u>), the average of population expenditure on fulfilling their needs does not surpass the income received. The expense of residents is 0.5

- 1.5 million rupiah, with revenue from 1.0 million - 2.0 million rupiahs. This shows that the income of the residents of the Pandaan District is enough to meet their daily needs in order to exhibit the importance of Place Dependence (<u>Trabka, 2019</u>).

Based on the explanation above, it is shown that changes in land use arise due to changes in social, economic, and environmental conditions. The status of the population often changes along with the change in land use, where there is a connection between the population's social status and the change in land use. The population dependency that affects the social conditions of the population towards change can be explained through the place dependence of the people of the Pandaan District (Verburg et al., 2015). Based on this description, the research is required to analyze the relationship between Place Dependence and land-use change in the Pandaan District of Pasuruan Regency in relation to sustainable agriculture.

RESEARCH METHOD

This study was carried out in the Pandaan District of Pasuruan Regency for five months from June to October 2020. The data were collected from primary sample using such instruments as observation, interviews, and questionnaires to respondents. There were 500 respondents of undeveloped landowners, both farmers and non-farmers. A secondary survey was also performed to find data from relevant agencies.

Several analyses were conducted. They were analyses on the change in land use in relation to time series land overlay and place dependence, the relevant variables, and the relation of land dependency to change in land use.

Land-use change or spatial analysis in time series overlays is derived from satellite image digitalization vector data as raster data (Figure 1). The raster data used are satellite image data in the base year of 2010 and the new land use in 2020. Year 2010 was used as the base year since the Malang-Pandaan toll road was not yet constructed in that year. In 2020, the year of current land use, there were already several changes in land use or land transfer in the area being used for the construction of a toll road crossing the Pandaan District from Surabaya to Malang.



Figure 1. The Flow of land-use change analysis

The spatial analysis used a descriptive procedure, which generated a transition matrix for land-use change. Descriptive approach was used to explain the results of the interpreted data set. Description or clarification of the effects of spatial analysis is known as a spatial descriptive, and the product of measurement is called the quantitative descriptive transition matrix. In this research, the spatial analysis utilized the Geographic Information Systems (GIS) tool, namely Google Earth Pro and Arcmap 10.5. The steps for spatial analysis (overlay) of changes in land use were (i) the compilation of satellite imagery data during the period of 2010-2018 to ensure the visibility of differences and growth of the Malang-Pandaan road network; (ii) the translation of satellite imagery into a vector file of land use (built / not built) using the ArcMap program (i.e. ArcMap 10.5 version); (iii) the spatial analysis process to connect the interpretations showing shifts in land use, followed by the extension image analysis using the 2010 and 2020 images. The findings of perception differed or overlapped. The effects of differences in land use trends were entered into a 2010-2018 matrix or land-use transition chart.

The place dependency analysis (X) used the part of the place attachment index analysis. Place dependency analysis used the descriptive analysis techniques to conclude with the mode value. The survey used a Likert scale of 33 statements based on five variables. The variables included land ownership (X1), the quality of the environment (X2), income (X3), accessibility (X4), and career development(X5) (Table 1). A questionnaire was given to respondents living in the Pandaan District to analyze the place dependence measurement (X), as Salimah mentioned (2018).

Questionnaire data to assess position dependence (X) were in the form of data on place dependence (x) for names, jobs, addresses, and 10 other statements. The items were distributed into nine statements regarding land ownership (X1), six statements about environmental quality (X2), five statements on income (X3), eight statements about accessibility (X4), and five statements on career (X5).

Table 1. Variables Used in the Model

Endogenous Variables	Exogenous Variables	Source
Place Dependence	Place of origin	<u>Trabka (2019)</u>
-	Length of stay	<u>Trabka (2019)</u>
	Land ownership	<u>Baldwin et al. (2017); Aulia (2019);</u>
	Environmental Quality	Haryani (2019); Lai et al. 2012;
	Income	<u>Aulia (2019); Trabka (2019);</u>
	Accessibility	Haryani (2019); Trabka (2019)
	Career Development	(Lai & Kreuter, 2012; Suroso et al., 2014; Trabka,
		2019) and adapted from Hadidya et al. (2018)
	Attitude to protect the land	Lokocz, Ryan, & Sadler, 2011
Attitudes towards land development		Adapted from Aulia (2019)
The decision to sell land		(Prayitno et al., 2018)
All indicators presented in Ap	endix	

The items were divided into five answer levels, from "strongly agreed" (equal to 5 points) for the most positive response to "strongly disagree" = (equal to 1 point) for the most negative answer. The evaluation of the respondent was given to the 33 statements.

The relationship between place dependence and land-use transition was found using the Partial Least Square (PLS) analysis using the Smart-PLS 3.2 program. The PLS technology based on <u>Hartanto</u> (2018) explicitly evaluated latent variables, indicator variables, and measurement errors. The unobserved variables representing a latent variable were calculated based on the content of the analysis. In this research, the partial least square analysis aims to assess the relationship between change in land use and place dependence. The degree of latent variables consists of latent high-order variables that affect a single degree and latent first-order variables affecting the observed variables.

RESULT AND DISCUSSION

Respondent Characteristics

The distribution of 500 respondents with productive age of 15 to 65 years is 98.4%. Based on their primary occupations, it is estimated that 68 percent of the respondents work in agriculture, and the remaining 32 percent work in the non-agriculture sector (Table 2). In addition to the primary employment, there are secondary occupations done by the respondents, with the proportion of being farmers up to 30%, and being non-farmer workers as many as 70%, (e.g. laborers and village officials).

The income of the respondents is classified into primary and secondary income. As many as 47 percent of the respondents mentioned that their main range of revenue was 1 million to 2 million rupiahs, while 68 percent said that their secondary revenue accounts had a nominal value of less than 1 million rupiahs. As for the length of stay, it is known that 47.6 percent of the population have lived for 41-50 years in the Pandaan District.

Forty-four percent of respondents live within a 400-600 m distance from the land, and 68 percent of the land possessed by 68 percent of interviewees having an area of 0.5-29 ha. They dominate the domestic distance, affecting the production and productivity of farmers.

Change of Land Function

In the last ten years (2010-2020), land use in Pandaan district has changed. The maps showing change of the land use in 2010 and 2020 in Pandaan District are shown in Figure 2. In almost all villages in Pandaan District, there are more residential areas and land-use changes due to the toll road's development. Figure 2 indicates that many villages and districts, including Wedoro Village and Karangjati Village, already have highways and toll roads in the center of Pandaan. The southern part of the toll road passes through the central part of the Pandaan District through Kutorejo district and Jogosari district. The northern section of the road is Nogosari Village and Kebonwaris Village.



Figure 2. Land use map of Pandaan District, 2010 (top) and 2020 (bottom)

Variable	Percentage	Number of
	%	
Primary occupation		
– agriculture	68.0	342
 non-agriculture 	32.0	158
Side Job		
– farmer	30.0	152
 non-farmer 	70.0	348
Income per month		
<1.0 million rp	4.0	21
1.0 - 2.0 million rp	47.0	234
2.0 - 3.0 million rp	28.0	139
3.0 - 4.0 million rp	16.0	79
>4.0 million rp	5.0	27
Length of stay		
10 - 16 years	1.2	6
17 - 23 years	0.1	1
24 - 30 years	2.8	14
31 - 37 years	11.2	56
38 - 44 years	26.2	131
45 - 51 years	30.0	150
52 - 5 8 years	19.2	96
59 - 65 years	8.2	41
66 - 72 years	0.6	3
73 - 79 years	0.0	0
/9 - 85 years	0.4	2
Distance to the land	26.0	174
10 - 210 m	26.8	134
220 - 420 m	28.2	141
430 - 030 m	32.0	103
950 1050 m	5.0	15
1060 1260 m	5.2	20
1000 - 1200 m	0.0	3
1480 - 1680 m	1.0	5
1690 - 1890 m	0.0	0
1900 - 2100 m	2.6	13
Land size	2.0	15
0.1 - 0.59 ha	47.4	237
0.6 - 1.09 ha	30.2	151
1.1 - 1.59 ha	5.4	27
1.6 - 2.09 ha	8.2	41
2.1 - 2.59 ha	0.2	1
2.6 - 3.09 ha	2.4	12
3.1 - 3.59 ha	0.0	0
3.6 - 4.09 ha	3.2	16
4.1 - 4.59 ha	0.0	0
4.6 - 5.09 ha	3.0	15

Table 2. Characteristics of Respondent in Pandaan District

Table 3 and Table 4 present land-use change data from 2010 to 2020, divided into five dominant land use categories in the Pandaan District. In general, land conversion from wetland agricultural areas in the form of ricefields into residential areas in all villages/wards of the district of Pandaan amounts to 213.69 ha.

Place Dependence

Place Dependence of the Pandaan District was evaluated through respondents' assessments of Pandaan District capacity statements to achieve population objectives, including residence ownership, environmental quality, needs-friendly income, accessibility, and career development.

Table 3. Land Use Area of Pandaan District in 2010 and 2020

Land Use	2010	2020	2020 Change in Area Size	
		hectare		%
Industry	254.0	333.9	79.9	1.834
Settlement	810.6	959.1	148.5	3.405
Green open space	166.4	165.6	-0.8	-0.019
Rice fields/wetlands	2789.2	2568.5	-220.7	-5.064
Dryland/moor	337.8	331.0	-6.8	-0.156
Total area	4358.1	4358.1		

Table 4. Land Use Change for Each Village in Pandaan District, 2010-2018

Village	Industry	Settle- ment	Green Open Space	Paddy Land	Dry Land
			hectare		
Banjarkejen	0.27	4.67	0.00	-2.26	-2.69
Banjarsari	0.00	0.76	0.00	-1.22	0.45
Durensewu	1.20	15.15	0.00	-16.94	0.59
Karangjati	23.90	19.22	0.00	-44.99	1.88
Kebonwaris	2.06	5.48	0.00	-7.53	0.00
Kemirisewu	4.83	6.75	-1.03	-4.92	-5.63
Nogosari	28.38	14.07	0.00	-41.65	-0.81
Plintahan	0.00	13.27	0.00	-11.08	-2.19
Sebani	0.00	5.67	0.00	-5.67	0.00
Sumberejo	0.13	4.46	0.00	-0.99	-3.59
Sumbergedang	0.00	15.30	0.00	-18.12	2.82
Tawangrejo	9.12	8.79	0.00	-17.94	0.04
Tunggulwulung	0.21	7.08	0.59	-3.42	-4.46
Wedoro	0.08	6.76	0.00	-8.94	2.11
Jogosari	0.15	11.33	0.00	-11.48	0.00
Kutorejo	0.00	2.73	0.00	-4.56	1.83
Pandaan	4.84	1.25	0.00	-8.43	2.34
Petungasri	0.78	1.82	0.00	-3.54	0.94
Total Area	75.93	144.56	-0.44	-213.69	-6.37

Based on the comments made by respondents on the Likert scale questionnaire, the population agreed that they have adequate workload in their occupations; the average working time is 8 hours. They also felt comfortable with their access to the workplaces. The happiness of the people of Pandaan District was linked with where they live.

Pandaan District's people accepted that the quality of the area where they live is good, although some people believed there is a lack of

environmental quality. The majority of the population decided that the environmental quality was fine, so the population was linked to their place dependence.

Residents believed that their income is adequate to satisfy human physiological needs. The revenues of 1 to 2 million rupiahs per month were considered enough by the majority of people. This means that the residents of Pandaan District are not pressured from the financial point of view. Earnings that can satisfy their needs are connected with their residence.

The results of the analysis indicate that access to the place is easy and inexpensive for the community. People enter these locations using their private vehicles, including cars and motorcycles. Costs are paid for transportation costs to access these locations. The fuel expense of people is 45 to 100 thousand rupiahs on average. The realization of these factors gives the population an impression of where they live.

The people accept that the workload of their occupation is adequate, with the average working time as long as 8 hours. People also feel comfortable with the access to their workplaces. The sense of satisfaction of Pandaan District people displays a connection to where they live.

Relationship between Place Dependence and Shift of Land Functions

The assessment of measuring the outer model is done to define the validity and reliability of the model in loading value (see Appendix). The converging and unequal validity of the manifest variables forming latent variables, as well as the composite reliability and alpha Cronbach were evaluated (Ghozali & Hengky, 2015). The loading factor value of each research indicator indicates that all latent variables are discriminatory and reliable (Table 5). The AVE value for each variable reaches the value limit of 0.5. The variables in this analysis are accurate, and the indicators are suited to measuring the build or latent variable.

Based on the reliability test results, the value of Cronbach alpha and composite reliability exceeds the minimum limit of 0.7, respectively. All indicators identified by the researcher are reliable when the latent variables are clarified.

The assessment of a structural model or an assessment of the inner model attempts to predict the relationship between latent variables (<u>Ghozali &</u>

<u>Hengky, 2015</u>). The latent variables concerning the relationship are place dependence, construction attitude, and the decision to change property. The relation among these latent variables is seen when the R-square, path, and indirect effect are tested.

Table 5. Reliability and Validity of Research Variables

Variable	Cronbach Alpha	Composite Reliability	Average Variance Extracted
Accessibility	0.861	0.891	0.508
Place of origin	1.000	1.000	1.000
Residence ownership	0.878	0.903	0.509
Decision to change land	1.000	1.000	1.000
Environmental quality	0.814	0.866	0.520
Length of stay	1.000	1.000	1.000
Career development	0.864	0.902	0.649
Income that meets needs	0.897	0.924	0.707
Attitudes towards land development	0.807	0.862	0.517

The R-square values (Table 6) for each endogenous (latent) variable of place dependence is 0.994 or 99.4 percent. This indicates that the latent variables used for calculating the place dependence value (duration of stay, place of origin, consideration of land choice, environmental quality, income to meet needs, accessibility, and the creation of careers) are high. Meanwhile, the endogenous variables of land transition and land-building attitudes have R-square values of 0.37 or 37% and 0.123 or 12.3%, respectively, and are categorized as weak.

Table 6. R-Square Value of Endogen Variables

Latent Variable	R-square
Place dependence	0.994
Attitude toward development	0.123
Decision to change the land	0.037

Two coefficients are used in the discussion of the relation: path coefficient and effect size. The path coefficient is used to see the form of relation and how each factor contributes to the place dependence. The impact size (IS) then explores the effect degree of each variable in relation to the place dependence. Kock (2015) noted that the IS is very weak (less than 0.02), the IS is weak (less than 0.02-0.15), the IS is moderate (0.16-0.35), the IS value is high. Table 7 describes the connection between each variable and place dependence.

The latent variable of the length stay has a direct relationship to the place dependence. Creating

functional attachments takes time, but not much because it is easy (<u>Trabka, 2019</u>). The relationship between variables is negative, which means if the population stays longer, it decreases its commitment to Pandaan District. The majority of respondents have spent 45-51 years in the Pandaan District. This should be noted as the length of stay in the Pandaan District has a mild impact on place dependence.

Table 7. Estimate Variable Affecting Place Dependence

Variable	Path Coefficient	Impact size
Accessbillity	0.211	0.020
Place of origin	0.177	0.014
Residence ownership	0.091	0.010
Enviromental quality	0.787	0.040
Length of stay	-0.165	0.016
Income	-0.051	0.011
Career development	0.231	0.030

The income variable is directly linked to place dependence. Getting an income enough to live in a position would give a feeling of tension or a sense of comfort (Sina, 2012; Trabka, 2019). The relationship between these two variables is negative, which means if the population's income continues to rise, it will reduce the place dependence in Pandaan District more than required. The majority of respondents' revenue is as many as 1.0 to 2.0 million rupiahs, which they say is sufficient for standard requirements, although their income has a poor place-dependent relationship in Pandaan District.

Meanwhile, the latent variable of accessibility has a clear relationship with place dependence. Hummon in Haryani et al. (2019) and Trabka (2019) clarified that having easy and inexpensive access to the locations will give the people a sense of comfort. The relationship between these two variables has a lively character. If the population feels relaxed accessing locations (public facilities, nature, workplaces, and hobbies), the importance of the population's location dependence on the Pandaan District will increase. Respondents find it convenient to access these places. After all, they have private vehicles, such as cars and motorbikes, to provide comfort and make travel costs more effective because they use selfpurchased fuel for personal use. The average cost of fuel is between 45 thousand and 100 thousand rupiahs. Accessibility has a mild relationship to affect place dependence in the Pandaan District.

The latent variable of origin has a direct relationship to the place dependence. Whether their new residence far away or close to its area of origin is not a problem for the people because they believe they suit their requirements (<u>Trabka, 2019</u>). The relationship between these two variables has a dynamic character, meaning that people who have lived and were born in the Pandaan District are more reliant. As many as 94% of respondents are people who were born and are residing in Pandaan District.

The latent variable of residence ownership has a direct relationship to dependence on location. Property ownership can provide a sense of comfort following the needs of the population that causes dependence (Baldwin et al., 2017; Sina, 2012). The relation between these two variables is excellent so that a place to live that can still respond to the population's requirements and provide a high degree of dependence.

Environmental quality variables are directly linked to place dependence. Hummon in <u>Haryani et al.</u> (2019) and <u>Lai & Kreuter (2012)</u> demonstrated that having a fair environmental assessment of the people would offer a feeling of comfort and lead to place dependence.

<u>Trabka (2019)</u> explained that fulfilling work is accomplished through a workload that keeps with one's skills and that provides comfort to keep them engaged.

Career development is also correlated with place dependence. The relationship between the two variables is positive and able to increase the reliance on the place if the career development is more satisfactory. The majority of respondents agreed that they are happy with their jobs. The career development is significant because the impact of the Pandaan District people on place dependence is classified as moderate.

Table 8. Coefficient Relationship with Decision to Change Land

Variable Size		Direct relationship		Indirect relationship	
Valiable	Effect	t value	p value	t value	p value
Place dependence	0.10	0.464	0.185	3.182	0.002



Figure 3. Relationship (total effect) of place dependence and land change decisions

Furthermore, this research shows direct and indirect relationships between place dependence and land-use change. The place dependence has an indirect relationship to the population's decision to change the land (Table 8). This relationship shows the role of mediator variable of the population's attitude towards growth. The mediator variable is a variable that affects the values of the interrelated endogenous variables and exogenous variables (Hair et al., 2014). The study results show that the higher the population's place dependence in the district of Pandaan, the more community continues to avoid physical changes in their environment so that the population makes a decision not to alter their own.

Besides, the indirect relationship of place dependence between people and land use changes is affected significantly by environmental quality (Table 8 and Figure 3). This illustrates how vital the ecosystem where people live is to be preserved. Environmental factors that sustain their quality are the conservation of harmonious neighborly relations, healthy neighborhoods, preservation of dense houses in the environment, maintenance of infrastructural conditions, the state of residential facilities, and health facilities. That is significant because it reduces the population's decision to change land and reduces the magnitude of the action of land conversion in Pandaan District.

Table 9. Total Ef	fect of Place Depe	endence o	n
Decision	n to Change The L	and	
Variable	Total Effect	t value	p١

Variable	Total Effect	t value	p value
Accessbillity	0.024	0.092	0.143
Place of origin	0.020	1.202	0.105
Residence Ownership	0.100	0.890	0.309
Enviromental Quality	0.090	2.128	0.006
Length of stay	-0.019	1.100	0.125
Income	-0.006	0.581	0.383
Career Development	0.026	0.839	0.085

Based on the path analysis, social factors (place dependence) are related to the community's decision to transfer land functions (Table 9). The total effect of length of stay (-0.019) and income (-0.006) are negative, meaning that the longer they stay and the greater the income, the lower the decision to change the land function. Whereas, place dependence will affect attitudes towards development, which will also affect the decision to transfer land functions.

The decision to change the land function demonstrates changes in people's attitudes about

land development. The respondents' decision to change land function is also the last statement regarding efforts to conserve its uncultivated land or the outcome of that land. Respondents answered either "Yes" or "No" to the query of whether respondents would change the land function. The results of the survey revealed that 69% of respondents do not intend to make land improvements and 31% intend to do so.

Research Implication

Surveys from urban areas, such as the villages of Pandaan, Kutorejo, Jogosari, and Petungasri, indicate that their people favor changing their land function. The majority of the city area has been developed, and there is good access to surrounding areas. People in the villages believe that building trade/service centers in previously undeveloped regions is more profitable than developing agricultural areas. Meanwhile, in rural areas, most people said they would not alter their land use pattern. However, some villages, such as Sumberejo, Nogosari, Kemirisewu, Plintah, and Kebonwaris, have a higher percentage of people that favor "yes" votes than the neighboring villages.

Based on the path chart analysis, it is known that there is a negative relationship between the length of stay and income. This means that the length of stay affects the decision to change the functions of the land. The longer the people live in the village, they will tend to decide not to change the functions of the land. Meanwhile, the higher the income from the agricultural sector that is being cultivated, it will reduce the population's decision to change the function of the land. The decision to change the land is the response of the people to the developments in Pandaan District. The development of Pandaan District will cause a physical change in the region. This change is then interpreted economically by the population as an opportunity to make a greater profit (Lokocz et al., 2011)

Based on this research, the government must pay attention to the structure of the community in terms of land tenure where the longer the population lives, the lower the decision to change land functions. How to increase people's income from the agricultural sector is another challenge. Input subsidies (fertilizers, medicines, agricultural equipment), as well as infrastructure improvements of roads and irrigation, can be applied to increase farmers' incomes to reduce the decision to change land functions. If it is possible to decide to change the function of the land, it will facilitate the implementation of sustainable agriculture.

CONCLUSION AND SUGGESTION

The land-use transition took place in Pandaan District, as shown by land-use changes. Changes in land use and significant changes in the area arise in wetlands or rice fields. While the area is shifting, 69% of respondents still want to defend their territories. The respondents wish to retain their current environment because the current landscape supports people's activities. The main activity of people in Pandaan District is agriculture, so their people do not want to repurpose their land.

The people of Pandaan District feel attached to their home. The respondents thought that their hope of living and working comfortably in the Pandaan District is fulfilled. The factor that has a significant effect on the population's place dependence is environmental quality. In general, Pandaan's environmental conditions are decent and have satisfied people with a sense of comfort.

Dependence on locations and land-use changes in the district of Pandaan are closely related. They have indirect and constructive relations. The more people are attached to their homes, the more they want to preserve the same landscape conditions to ensure that they do not alter their land. Moreover, because of environmental quality, the relationship between place dependence and land conversion decisions arises. Good environmental conditions will provide people with a feeling of security that will contribute to the place attachment so that people make decisions to change the land.

The findings of this study are the basis for the development of regulatory tools to promote sustainable agriculture. Sustainable agricultural land policies can help safeguarding the subsidies provision for agricultural inputs as well as improving agricultural infrastructure (roads, irrigation) to increase farmers' incomes, which then can reduce the decision to change land functions. In the meantime, the length of stay related to the sustainability of land tenure by future generations (farmers' descendants) also needs to be considered. A good environment that can provide sufficient

income will encourage people to protect the land, which in turn will support sustainable agriculture.

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Endogenous	Exogenous	Indicator	Loading
Place Dependence	Origin of the	Origin of resident area (X1)	1.000
	population		
	Length of stay	How many years did the population live in the Pandaan District (X2)	1.000
	Land ownership	I chose the land here because my food and drinking needs were met (X31)	0.641
	(X3)	I chose the land here because my clothing needs are met (X32)	0.755
		I chose the land here because my rest needs were met (X33)	0.614
		I chose the land here because my sexual needs are being met (X34)	0.709
		I chose the land here because my security needs were met (X35)	0.771
		I chose the land here because my love needs are met (X36)	0.738
		I chose the land here because they need to be respected was met (X37)	0.764
		I chose the land here because they need to channel my talents and abilities was met (X38)	0.734
		The consideration of choosing a place to live because of my talents and	0.676
		abilities has been channeled (X39)	
	Environmental	I have good neighbors (X41)	0.770
	Quality (X4)	Safety in my neighborhood is good (X42)	0.690
		The house population in my neighborhood is not dense (X43)	0.781
		The infrastructure in my neighborhood is good (X44)	0.686
		Health facilities in my neighborhood are good (X45)	0.738
		I think the neighborhood I live in has health facilities that are not problematic (X46)	0.651
	Income (X5)	My income is sufficient to buy my food and drink needs (X51)	0.825
		My income is sufficient to buy my clothing needs (X52)	0.821
		My income is sufficient to buy my rest needs (X53)	0.863
		My income is sufficient to buy my living needs (X54)	0.840
		My income is sufficient to buy my sexual needs (X55)	0.856
	Accessibility (X6)	I have access to commuting to work (X61)	0.680
		I have access to travel to my hobby (X62)	0.719
		I have access to travel to natural areas (X63)	0.565
		I have access to travel to public facilities (X64)	0.667
		Cost of access to affordable workplaces (X65)	0.734
		Affordable cost of access to hobbies (X66)	0.768
		Affordable cost of access to natural areas (X67)	0.768
		Affordable cost of access to public facilities (X68)	0.773
	Career Development	I feel capable of doing my work assignments to the best of my physical abilities (X71)	0.730
	(X7)	I feel less depressed because of mental activities to concentrate, detect	0.804
		problems, and deal with unexpected events while working (X/2)	0.024
		I can do my job according to the target within a particular time (X/3)	0.824
		In my job, I can solve problems (X/4)	0.833
		a m in a position to complete my work assignments within the time stipulated (X75)	0.833
Attitudes towards	Attitude to	Protect natural resources (Y11)	0,662
land development	protect the land	Limiting development to open land and agricultural areas (Y12)	0,816
	(Y1)	I am setting aside land for public recreation (Y13)	0,825
		Maintain urban service costs for new developments (Y14)	0,793
		Maintain the development of low-density settlements in areas outside urban areas (Y15)	0,632
		Keep the majority of development close to urban areas (Y16)	0,534
The decision to sell land		I am willing to sell part or all of my land (Y2)	1.000

Appendix. Variable and Indicator Used in Model, and Loading Value of Analysis



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The reduction of human development gap in origin and new regency in Eastern Indonesia

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ABSTRACT

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Keywords

economic growth; decentralization; human development; poverty; regional status

JEL Classification H30; I32; O15 Inequality still becomes a popular issue in the establishment of developing countries. Aside from income inequality, human development inequality is considered as an interesting topic for further study, in terms of resuming the solution. The purpose of this study is to identify the human development gap between origin and new regencies in Eastern Indonesia as well as the determinant. This study uses a positivist perspective with a deductive approach. Secondary data with cross-section types are used in this study, covering regencies and cities in Eastern Indonesia. This study uses the econometrics methodology and regression analysis with a dummy variable. The results showed that there were differences in human development index between origin and new regencies in Eastern Indonesia. The human development index in the new regency is lower than in the origin regency. The results support the Myrdal's Theory, which explains the gap in human development disparities among regions due to the significant backwash effects. Fiscal decentralization has a role in reducing the gap in human development in origin and new regencies, yet insignificant for the economic growth. Poverty lowers the impact on increasing human development in the origin regencies but does not occur in the new regencies.

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INTRODUCTION

Many measurement alternatives are applied to achieve better development. One of them is the human development index, which has been studied in depth by the United Nations Development Program since 1990 and is published regularly. Human development index is able to demonstrate the increasing quality of better human resources in human development. Increased human development index shows the indication of increased prosperity. Increased human development index represents the increasing number of population who can access development in obtaining basic needs, including income, health, education and so on evenly (Arisman, 2018; Fretes, 2017; Grubaugh, 2015; Panjawa, Samudro, & Soesilo, 2018; Sulistyowati, Sinaga, & Novindra, 2017; Vikash, 2019; Yuliani & Saragih, 2014). Equity, especially the issue of inequality, is still one of the priorities in development. Uneven development will cause disparities. The gap of social and economy affects the ability of humans and is undesirable from the standpoint of welfare (Ghosh, 2019).

The problem of development disparities faced by Indonesia is very complicated (Bappenas, 2008; Elia, Yulianto, Tiawon, Sustiyah, & Indrajaya, 2020; Salgaura, Mulyo, & Darwanto, 2019; Siburian, 2020; Soejoto, Fitrayati, Rachmawati, & Sholikah, 2016). The complexity is considered to be diversity reflected in geographical, social, and economic differences. Complex issues are reduced by managing regional finances more efficiently. Elia et al. (2020) showed that research in new proliferation areas are mainly concerned with regional finances that are managed more efficiently by focusing on community economic activities. It can create investment opportunities and jobs based on the prominent regional product. Investment can increase employment and indirectly reduce poverty.

According Siburian (2020), to fiscal decentralization reduces regional income inequality. Autonomy encourages local governments in designing development programmes that match unique characteristics of a particular region and distributing more balanced resources within the region. Decentralization also encourages local governments to efficiently provide necessary public services. Ultimately, decentralization motivates local politicians to effectively allocate local public goods and services. Liu et al. (2017) added that effects of fiscal decentralization on regional inequality tend to be meaningful when they are measured from the expenditure side. At same the time, fiscal equalization efforts by sub-region government are shown by implementing equalization programs.

There are several development indicators that need to be considered to measure welfare. <u>Soejoto</u> <u>et al. (2016)</u> identified four indicators of regional development namely economic growth, fiscal decentralization, income inequality, and educational inequality. These indicators well describe the real conditions of public welfare. It means more attention is highly needed for fiscal decentralization, income inequality and inequality of education to see the success of economic development, not only the economic growth.

On the other hand, contradictions appear and complicate the development problem. <u>Qiao et al.</u> (2008) argued that fiscal decentralization leads to economic growth as well as significant increases in regional inequality. This is interpreted as trade-off between economic growth and regional equity in the design of fiscal decentralization policy.

Panjawa and Samudro, The reduction of human development...

There is increasing concern that the focus of activities development and growth is dominated by the Western and is compared to Eastern Indonesia (Hutajulu, Panjawa, Islami, & Sugiharti, 2020; Nugraha, Wicaksono, & Wijaya, 2017; Panjawa et al., 2018; Riphat, Setiawan, & Damayanty, 2016). Based on the report about Evaluation of The Proliferation of Administrative Region in Indonesia by Bappenas (2008), the origin regions and the control regions consistently showed better results in all areas of focus (such as economic growth, regional fiscal public management, services and regional government personnel) compared to the new autonomous regions.

According to <u>Tun (2008</u>), Indonesia still has gaps in the human development dimensions over the past 15 years. <u>Central Bureau of Statistics (2017</u>) stated, in addition to the income gap, the gap in human development is also experienced by the Western and Eastern regions of Indonesia. The gap in human development is indicated by the index of human development that represents the quality of human resources. For five years, the low quality of human development in the Eastern Indonesia's provinces is still more significant compared to that in the Western Indonesia's provinces. It is even the lowest nationally.

Differences in the quality of human resources reflect the gap of human development. In Indonesia, the human development gap is shown by the significant difference in the value of the human development index between the West and East Regions. The problem of human development is one indicator of the emergence of a government policy called regional autonomy, as the implementation of Law No. 23 of 2014 replaces Law No. 32 of 2004, which previously replaced Law No. 22 of 1999.

The regional autonomy policy is expected to be able to improve the welfare of the people in an area (Moonti, 2019; Prabowo, Supriyono, Noor, & Muluk, 2020). The policy of regional autonomy in Indonesia leads to regional proliferation. Regional proliferation means that the euphoria that has arisen since the implementation of regional autonomy has had a variety of impacts on society and the government. One of them is the demand for the formation of new regional governments (new regencies) from existing local governments. The readiness of an area is also crucial in dealing with regional autonomy policies and leading the regions that already have advanced economic structures (relatively rich regions) to be more capable and have high economic growth so that it impacts the welfare of the community. In contrast, the readiness of developing regions or relatively disadvantaged areas is considered low, and this leads to low economic growth.

The main focus of the new regency is the impact of decentralization policy directed at creating the level of regency/city government with new autonomy. The purpose of decentralization implies the benefits to promote more autonomous incomes. In other words, regencies/cities are a valid form of autonomy (<u>Hariwan & Swaningrum, 2015; Mcwilliam,</u> <u>2011; Seymour & Turner, 2002</u>). The encouragement of regions to proliferate regions is expected to minimize disparities and improve social welfare (<u>Jamal, 2017</u>).

The implementation of regional autonomy in question is fiscal decentralization, which is the hope for regional governments. Fiscal decentralization refers to the transfer of authority and responsibilities from the central government to sub-national or regional governments. It is expected that the fiscal decentralization capacity of the region in terms of the fiscal capacity to be managed better, optimized and to be potentially and efficiently allocated under available resources. It leads each region to understand more on local preferences. With the ability of the region to be more independent in financial development, community welfare will increase, as measured by the achievement of the human development index (Madhu & A.K., 2014; Mehmood, Sadig, & Khalid, 2010; Nursini, 2012; Pramartha & Dwirandra, 2018).

Fiscal decentralization has led to economic growth and significant increase of inequality among regions (Oiao et al., 2008). The influence of decentralization becomes the attraction of discussion on inequality. Several previous studies related to growth, poverty and inequality with various results of relationship's contradiction among growth, poverty, and inequality are those by Benjamin et al. (2017), Breunig & Majeed (2020), Hassan et al. (2015), Marrero & Serven (2018), and Ngozi et al. (2020). According to Breunig & Majeed (2020), the policy of poverty reduction is unable to reduce the inequality, but is able to promote economic growth. Ngozi et al. (2020) stated that the existence of a inequality could detain sustainable growth. According to Brida et al. (2020), positive or negative relation between economic growth and inequality depends on the status of a region. In developed countries, the increase of economic growth could support the equal distributed income (convergency), while the increase of economic growth in poor and developing countries leads to the increase of income's consentration (divergency). On the other hand, according to Hassan et al. (2015) and Marrero & Serven (2018), growth, proverty, and inequality have negative correlation with one another.

Human development has always been an essential issue in sustainable development planning and strategies (Sušnik & van der Zaaq, 2017). Hence, in human development, the improvement of the quality of human resources is needed. Human development is about the freedom to realize the full potential of every human life, not just for a few or the most, but from all lives in every corner of the world — now and in the future. Human development is for everyone, and that universalism is the core of the concept and framework of human development (Jahan, 2019; McNeill, 2007; Sharmila, 2013). Besides, improving the quality of human resources is a part of the efforts to build competent individuals. In the context of a nation, improving the quality of human resources includes human development both as individual beings and as resources for the nation's development. Both aspects are the primary concern of improving the quality of human resources to create welfare.

The low potential and quality of human resources are due to a large number of remote and developing areas with low education, infrastructure, health, and income, especially in Eastern Indonesia when compared to Western Indonesia. It is suspected that those factors lead to the findings of the most number of proliferation areas in Eastern Indonesia.

The abovementioned gaps motivate the researchers to empirically examine the effect development indicators, such as decentralization, economic growth, and poverty, on human development, as well as the comparison between origin and new (expanded) regions.

RESEARCH METHOD

This study uses a positivist perspective with a deductive approach. In the positivist perspective, researchers start their research from a causal relationship that logically refers to theory. In general,

the positivism perspective uses a deductive approach. The development and affirmation of a theory that begin with abstract concepts and theoretical relationships and lead to more concrete empirical evidence are called the deductive approach (Neuman, 2011).

Secondary data with cross-section type are used in this research, including 232 regencies and cities in Eastern Indonesia in 2017. The data source in this study is from publication reports of Central Bureau of Statistics Indonesia, i.e. human development index report, Regency/City Gross Regional Domestic Product in Indonesia, Regency Government Statistics Book 2 (Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, Papua) and Regency/City Poverty Data and Information. This quantitative research uses econometrics methodology and regression analytical tool. According to Gujarati and Porter (2009), regression is a statistical analysis tool designed to measure the direction and magnitude of the influence of one or more variables on one or more dependent variables. The regression used in this study is the multiple linear regression. The model of the multiple linear regression equation, as follows:

$$HDI_{i} = \beta_{0} + \beta_{1}FDPAD_{i} + \beta_{2}POVR_{i} + \beta_{3}EG_{i} + \varepsilon_{i}$$
(1)

where: i is region; β is a parameter (constants and coefficients); HDI is human development index; EG is economic growth showing the development of activities in an economy where the production of goods and services has increased and is used for assessing welfare; FDPAD is Fiscal Decentralization which shows the ratio of original regional revenue to total revenue; and POVR is level of poverty.

The use of dummy variables aims to determine differences in inequality between regions and the magnitude of the influence of each independent variable, specifically in the regression model in the origin and new regencies. In other words, the study empirically examines the relationship between human development inequality and development indicators, as well as the comparison on regions, i.e. between origin and new (expanded) regencies using regression with dummy variables as an analysis tool. According to Gujarati and Porter (2009), dummy variables are a tool for classifying data by dividing samples into various subgroups based on guality or attributes and explicitly making it possible to operate individual regressions for each subgroup (dummy variable techniques are flexible). To avoid the trap of dummy variables, the number of dummy variables is k-1 = 2-1 = 1 (one dummy variable). The application of dummy variables in the regression equation (1) is as follows.

$$HDI_i = \beta_0 + \beta_1 D1_i + \beta_2 FDPAD_i + \beta_3 POVR_i + \beta_4 EG_i + \beta_5 D1^* FDPAD_i + \beta_6 D1^* POVR_i + \beta_7 D1^* EG_i + \mu_i$$
(2)

where: D1 is a dummy variable, has a value of 0 for the origin regency, and 1 for the other regions/ new regency (the area of post division of Law No. 22 of 1999, Law No. 32 of 2004 Law and No. 23 of 2014). It should be noted that the mapping regarding the new regency is indicated by regional laws based on the formation of autonomous regions in Indonesia from the publication of the Directorate General of Regional Autonomy of the Ministry of Home Affairs of the Republic of Indonesia. Besides Goodness of Fit, other underlying assumptions to support the analysis tools in this study include the normality test, heteroscedasticity test, and model specifications.

RESULT AND DISCUSSION

Human Development Gap

The inequality among regions and among socioeconomic groups in Indonesia is still is one of the important challenges in national development. At present, the gap among regions in Indonesia is considered relatively high, in particular gaps in human development between Western Indonesia and Eastern Indonesia. Furthermore, human development gaps also occur within the Eastern Indonesia regions.

Table 1 and 2 show the data of development indicators in the Eastern area of Indonesia in 2017. Several indicators are referred from human development, economic growth, decentralization and poverty. The data are arranged based on regions for the category of human development index.

Extremely high and high categories for development index were still dominated by cities (when compared with regency areas). The highest human development index was occupied by the city of Kendari with a score of 81.81. There were 53 regions classified as having extremely high and high development index, 3 regions categorized as having extremely high human development index (with the average of 81.98), and 50 regions grouped in the category of high (with the average of 73.92 for human development index).

by %	City/Regency	HDI	EG	FD	PR	City/Regency	HDI	EG	FD	PR
Bontang City 77.8 9.6 8.1 17.4 West Halmahera 67.0 3.4 6.3 5.5 Sorong City 78.1 5.5 6.8 8.9 Parigi Moutong 6.7 13.5 5.0 5.6 Sorong City 63.1 3.4 1.1 8.8 Waropen 60.7 7.1 6.4 1.0 Gerotatio City 67.1 8.8 6.9 2.10 Bangali Kepulauan 70.1 16.5 5.0 2.8 Bau-Bau City 6.5 4.2 6.7 7.1 Central Halmahera 6.3 1.3 5.6 1.2 5.5 1.4 2.7 Marita 70.2 6.2 6.0 7.8 Potuvato 6.4 2.8 1.2 5.1 5.4 2.7 1.4 2.7 1.4 2.7 Katamabaju City 7.8 1.4 2.7 2.7 North Jennahama 6.7 1.8 1.3 1.3 1.4 2.7 2.7 2.7 North Jennaha 1.6			%	%	%			%	%	%
Ternster City 78.1 5.5 6.8 19.9 Parign Moutong 64.7 13.5 5.0 5.6 Palopo City 63.0 32.1 6.1 13.4 Waropen 60.7 7.1 6.4 10.0 2.0 Corontalo City 63.1 8.6 20.0 Bangai Kepulauan 70.1 16.0 -19.0 2.0 Tomohon City 64.4 11.1 6.8 8.4 South Bolang Mongondow 63.1 2.6 7.3 6.8 Bau-Bau City 65.5 4.2 6.7 7.1 Central Halmahera 63.9 13.5 6.4 2.5 19.2 7.4 2.7 1.5 6.1 Central Marnupu 65.5 10.3 Kotamobagu City 7.8 4.5 6.0 13.0 North Grontalo 67.6 13.4 6.0 13.5 13.7 Kotamobagu City 7.9 8.4 15.3 5.7 13.2 Lembata 5.9 16.5 5.1 5.7 13.7 North Frengiam Paser <	Bontang City	77.8	9.6	8.1	17.4	West Halmahera	67.0	3.4	6.3	3.6
Sorong City 78.3 4.7 70 175 Banggai Laut 74.4 93 6.8 2.8 Gorontalo City 67.1 8.0 6.9 21.0 Banggai Kepulauan 70.1 6.4 10.0 Gorontalo City 67.4 8.8 7.2 3.9 Mamasa 69.2 3.5 6.1 2.5 Bang City 76.7 8.8 7.2 3.9 Mamasa 69.2 3.5 6.1 2.5 Minika 70.2 6.2 8.0 7.8 Pohuwato 64.2 8.7 1.5 5.4 6.7 1.5 Schangai Mattinia 7.0 7.8 6.7 6.1 7.4 1.5 6.2 6.3 North Gorontalo 67.6 7.4 6.0 1.0 5.1 8.7 7.9 7.4 7.3 2.4 7.4 7.0 5.8 6.6 1.5 Luw Titmur 64.3 8.3 6.3 Central Hamatina 6.0 1.0.3 7.0 5.5 8.3 5.3	Ternate City	78.1	5 5	6.8	89	Parigi Moutong	64 7	13.5	5.0	5.6
Palago City 63.0 92.1 6.1 19.4 Warngen 60.7 7.1 6.4 1.0 2.0 Gronnbal City 68.4 11.1 6.8 84.4 South Bolaang Mongondow 63.1 16.0 2.0 Bame City 66.5 4.2 6.7 7.1 Central Halmahera 63.9 2.35 6.1 2.55 5.4 Bau-Bau City 66.5 4.2 6.7 7.1 6.61 Central Halmahera 63.9 1.8 Annoth 64.2 8.7 5.4 5.4 North Grontalo 67.6 17.4 5.2 6.3 North Grontalo 67.6 1.7 6.0 3.6 Lowal Timur 64.4 18.3 6.3 16.3 West Muna 7.0 5.8 6.5 1.0 Kolaka 70.6 7.2 6.0 7.7 North Lombok 67.2 5.8 1.5 3.7 Kolaka 67.5 9.2 6.3 1.1 1.4 2.3 6.0	Sorong City	78.3	47	7.0	175	Banggai Laut	74.4	03	6.8	2.8
Convertion CF1 Res Dir. Promotion Cippulation CF1 Promotion Tormotion City 66.4 11.1 6.8 2.9 Mumasia 63.1 2.6 5.0 3.6 Bima City 66.5 4.2 9.9 Mumasia 63.2 3.5 5.1 2.4 Mumika 70.2 6.2 8.0 7.8 Pohuwato 64.2 3.1 5.4 Mumika 70.2 6.2 8.0 7.8 Pohuwato 64.2 5.1 5.4 Statisticat 70.2 7.4 5.0 3.0 Konave Island 7.6 7.4 6.7 9.9 Mainau 65.5 9.2 7.4 3.2 Lembata 5.8 5.1 3.7 5.5 1.3 3.1 South Buton 6.6 1.5 5.1 3.7 5.6 3.0 Motinau 6.6 1.5 5.1 3.7 5.6 3.0 Motinau 6.6 3.0 Motinau 6.6	Palana City	62.0	22.1	6.1	12.4	Waropon	60.7	7 1	6.0	1.0
Sub Grand 6.1 6.3 6.4 11.0 6.5 6.4 11.1 6.5 6.4 South Bolang 6.7 3.6 7.8 2.8 7.7 North Corontalo 6.7 7.8 7.8 7.7 North Lombok 6.7 8.8 1.5 7.7 5.8 5.1 3.7 7.8 7.8 7.8 5.8 5.1 3.7 7.8 7.8 7.5 5.6 7.9 5.8 5.3 7.7 5.8 5.1 3.7 7.8	Corontalo City	67.1	0 0	6.0	21.0	Ranggai Kapulayan	70.1	16.0	10.7	2.0
Index (Lip) 68.4 South Bolizang Mongoniou 63.1 2.5. 3.0 2.8. Branz Chy 66.5 4.2 6.7 7.1 Central Halmahera 63.9 1.3. 6.1. 2.5. Bau-Bau Chy 66.5 4.2 6.7 7.1 Central Halmahera 63.9 1.8. 5.4 North Minahasa 7.21 6.2 6.3 6.1 Central Mamuju 63.5 1.6. 1.6. 3.6 Kolanobagu Chy 7.9.8 4.5 6.2 6.3 North Gorontalo 67.6 1.7.4 5.0 1.6. 1.6. 1.6. 3.6 1.6.3		07.1	0.0	0.9	21.0		/0.1	10.0	-19.0	2.0
Barn Bour Sau City 66.5 4.2 3.9 Pinamash Paur Sau City 65.5 4.2 6.7 7.1 Central Haimahera 63.9 13.5 6.1 2.5 Mimika 70.2 6.2 8.0 7.8 Pohuwato 64.2 8.7 5.1 5.4 Kotamobagu City 79.8 4.5 6.2 6.1 Central Mamigu 63.5 19.2 7.4 2.7 4.2 7 Kotamobagu City 79.8 4.5 6.0 3.0 Konawe Island 70.0 5.8 6.7 7.9 Kolaka 70.6 7.2 7.4 3.2 Lembata 5.9 7.4 8.6 7.5 5.6 7.5 5.6 7.5 7.8 8.1 5.3 5.0 7.4 8.6 7.5 5.6 3.0 Netri Menajame and City 7.1 5.7 7.2 8.8 3.1 5.3 Central Buton 6.6 1.0.3 7.0 7.5 7.8 3.0 Notti Maimahea 6.7 7	Tomonon City	68.4	11.1	6.8	8.4	South Bolaang Mongondow	63.1	26.5	5.0	2.8
Bau-Bau City 66.5 4.2 6.7 7.1 Central Halmahera 63.9 8.3 6.1 2.5 North Minahasa 7.2. 6.2 8.0 7.8 Pohuwato 63.2 8.7 5.1 5.4 North Minahasa 7.2. 6.2 6.3 North Controlalo 67.6 17.4 6.0 3.6 Luwu Timur 64.4 18.3 6.3 16.3 West Munah 7.0 5.8 6.9 1.0 Kolaka 70.6 7.2 6.0 7.0 South Buton 65.3 1.6.3 1.5.1 3.7 North Pengjam Paser 7.1.4 1.3.2 1.1 2.2 1.3.5 5.0.1.1 5.7 North Lombok 67.2 2.8 1.5.3 5.1 3.7 North Manhasa 6.1.7 1.5.4 8.3 1.4.4 7.3 2.3.5 5.4 1.5.7 5.6 3.0 Kota Singlawang 6.3.1 1.4.2 5.1 3.7 North Minahasa 6.7	Bima City	/6./	8.8	7.2	3.9	Mamasa	69.2	3.5	6./	3.6
Mimika 70.2 6.2 8.0 7.8 Pohuwato 64.2 8.7 7.4 7.5 7.5 7.5 7.5 7.5 7.4 <	Bau-Bau City	66.5	4.2	6./	/.1	Central Halmahera	63.9	13.5	6.1	2.5
North Minahasa 72.1 4.5 6.9 6.1 Central Mamuju 63.5 19.2 7.4 2.7 Kotamobagu City 79.8 4.5 6.2 6.3 North Grontalo 67.6 17.4 6.0 3.6 Luwu Timur 64.4 18.3 6.3 16.3 West Muna 7.0 5.8 6.9 1.0 Kolaka 70.6 7.2 6.0 7.0 South Buton 65.7 7.4 8.5 1.5 1.5 North Penajam Paser 71.4 13.2 6.9 7.7 North Lombok 67.2 5.6 0.0 1.5 Kotas Singkawang 63.1 14.2 5.2 5.3 South Buru 64.3 2.6 0.0 1.5 Kotas Singkawang 63.1 7.4 5.4 5.3 C.6 7.4 3.4 Buruhana 66.7 1.6 0.0 1.5 Kotas Singkawang 63.1 7.8 7.4 5.2 South Minahasa 65.0 0.2	Mimika	70.2	6.2	8.0	7.8	Pohuwato	64.2	8.7	5.1	5.4
Kotamobagu City 79.2 11.5 6.0 3.0 North Gorontalo 6.7.6 17.4 6.0 3.6 Luwu Timur 64.4 18.3 6.3 16.3 West Muna 70.0 5.8 6.9 1.0 Malinau 65.5 9.2 6.4 3.2 Lembata 58.9 1.5 5.1 3.7 Morth Pengiam Paser 71.4 13.2 6.9 7.7 North Lomboko 66.0 10.3 7.0 1.5 Kota Singkawang 63.1 14.2 5.2 1.5 South Hamahera 62.7 15.4 3.1 3.2 4.3 South Minahasa 63.3 7.4 3.4 Toju Lona-Una 7.1 2.5 7.4 3.4 Gaunan Mas 64.2 10.3 5.8 Raja Ampat 64.2 10.3 2.4 4.3 South Minahasa 63.1 7.6 5.2 3.6 Sarmi 64.2 10.3 5.4 0.9 Tanah Bumbu 62.2	North Minahasa	72.1	4.5	6.9	6.1	Central Mamuju	63.5	19.2	7.4	2.7
East Kutai 79.2 11.5 6.0 3.0 Konawe Island 67.6 5.8 6.6 1.5 Kolaka 70.6 7.2 6.0 7.0 South Buton 67.7 7.4 8.6 7.0 North Penajam Paser 7.1 13.2 6.9 7.7 North Lombok 67.2 5.9 5.8 15.3 Barito Timur 7.08 1.3 8.11.1 Sekadau 66.3 2.60 1.0 7.5 Kota Singkawang 6.1.7 1.5.4 5.3 1.6.3 Central Buton 66.0 1.0.3 7.0 7.5 7.8 3.6 0.0 1.5 Kota Singkawang 6.1.7 1.8.9 5.1 3.7 South Humahasa 62.7 1.7.2 5.6 3.0 Gounung Mas 6.50 2.0.6 6.8 4.4 Binumu Binuhu 62.2 1.9 1.1 Aru Island 63.6 7.0 7.4 3.4 5.0 3.0 3.0 3.0 5.0 5.1 3.7	Kotamobagu City	79.8	4.5	6.2	6.3	North Gorontalo	67.6	17.4	6.0	3.6
Luwu Timur 64,4 18.3 6.3 West Muna 70.0 5.8 6.9 1.0 Malinau 65.5 9.2 7.4 3.2 Lembata 5.9 5.8 15.3 Barito Timur 70.8 6.1 3.8 1.1 Sekadau 6.0 3.2 7.5 5.8 15.3 Morowali 6.2.7 15.4 8.3 1.1.3 Sekadau 6.0.3 2.40 2.5 7.5 6.3 Kota Singkawang 6.1.7 18.9 5.1 3.7 South Hamahera 6.7.7 7.2 5.7 2.8 South Mianbaa 6.4 15.3 6.4 6.3 X.4 Topic Juba-Una 7.9 3.3 2.2 4.3 Guunng Mas 6.5 0.2.6 5.4 3.4 Bintuni Bay 6.1.7 1.2.2 Juba 4 5.0 3.8 3.3 4.3 5.0 Lumandau 6.5.2 7.1 7.1 Vau Ishn 6.3 6.3 1.3 5.4	East Kutai	79.2	11.5	6.0	3.0	Konawe Island	67.6	5.8	6.6	1.5
Kolaka 70.6 7.2 6.0 7.0 South Buton 5.7 4.8 6.7 0.67 1.8 1.65 5.1 3.7 North Penajam Paser 71.4 13.2 6.9 7.7 North Lombok 6.3 5.5 5.5 8.5 1.5 South Manna 6.3 8.1 1.4 5.2 1.5 South Haunohok 6.3 8.1 1.4 5.2 1.5 South Haunohok 6.7 1.2 5.2 6.3 0.0 1.9 9.3 3.2 4.3 3.0 3.0 1.3 South Haunohara 6.1 1.7 2.5 5.0 1.0 3.3 4.4 3.0 3.2 4.3 3.0 1.0 3.0 4.5 3.0 3.0 4.3 3.0 1.0 3.0 4.5 3.0 3.0 4.5 3.0 3.0 4.5 1.0 3.0 4.5 1.0 3.0 4.5 5.0 1.0 3.0 4.5 5.0 1.0 1.0 1.0	Luwu Timur	64.4	18.3	6.3	16.3	West Muna	70.0	5.8	6.9	1.0
Malinau65.59.27.43.2LembataSeha16.59.518.315.3Barito Timur70.86.13.811.1Sekadau66.02.43.55.05.61.5Morowali62.715.48.316.3Central Buton66.010.37.01.5Mers Kutai61.415.25.213.5South Buru61.712.75.63.0West Kutai61.711.25.13.7South Halmahera62.712.75.63.0South Minahasa75.36.37.43.4Tojo Una-Una71.99.33.24.3Gunung Mas65.02.06.88.4Bintuni Bay64.76.25.72.4Tidore Island City67.84.45.05.8Raja Ampat64.210.84.60.5Jamandau66.27.45.25.11.1West Sumba64.210.85.53.5Southeast Minahasa66.117.87.12.1Aru Island64.316.63.95.3Southeast Minahasa65.115.86.51.17.07.54.13.44.09.53.5Mortal Sand6.61.64.63.6North Konawe64.113.35.41.7North Kayong62.43.41.23.13.1Jalaud Island7.513.81.46.46.55.95	Kolaka	70.6	7.2	6.0	7.0	South Buton	65.7	4.8	6.7	0.9
North Penajam Paser 7,4 1.3.2 6.9 7.7 North Lombok 6.7.2 5.9 5.8 15.3 Barito Timur 70.8 6.1 3.8 11.1 Sekadau 66.0 10.3 7.0 1.5 Kota Singkawang 6.1 14.2 5.2 13.5 South Halmahra 66.7 12.7 5.6 3.0 West Kutai 61.4 15.3 6.4 6.3 Kaimana 66.7 12.7 5.6 3.0 South Mianhaba 75.3 6.3 7.4 5.2 3.6 Raja Ampat 64.2 9.3 3.2 4.3 Gunung Mas 65.0 20.6 6.8 3.4 Bintuni Bay 64.7 6.2 5.7 2.4 Tadore Island City 6.78 4.4 5.0 S.8 Raja Ampat 64.2 9.5 3.5 4.0 South Mianhasa 61.1 7.8 7.1 2.1 Aru Island 64.1 5.6 5.1 5.2 <td< td=""><td>Malinau</td><td>65.5</td><td>9.2</td><td>7.4</td><td>3.2</td><td>Lembata</td><td>58.9</td><td>16.5</td><td>5.1</td><td>3.7</td></td<>	Malinau	65.5	9.2	7.4	3.2	Lembata	58.9	16.5	5.1	3.7
Barito Tinur 70.8 6.1 3.8 1.1 Sekadau 66.3 24.0 5.7 5.6 Morowali 62.7 15.4 8.3 16.3 Central Buton 66.3 24.0 5.7 5.6 Kota Singkawang 63.1 14.2 5.2 3.5 South Buru 64.3 23.6 6.0 1.9 West Surbawa 61.7 12.7 5.6 3.0 7.4 3.4 Tojou Halmahera 62.7 1.2 5.7 2.4 Gunung Mas 65.0 2.0.0 6.8 3.4 Bintuni Bay 64.7 2.2 7.2 2.4 Lamandau 66.2 7.4 5.4 5.3 6.5 3.7 5.6 5.3 1.6 0.0 1.4 0.6 3.7 2.5 7.4 0.7 1.2 1.1 Nuthias 64.2 1.0 3.8 1.4 1.6 0.5 1.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	North Penaiam Paser	71.4	13.2	6.9	7.7	North Lombok	67.2	5.9	5.8	15.3
More and any and any and any and any	Barito Timur	70.8	6.1	3.8	11.1	Sekadau	66.3	24.0	5.7	5.6
Northmain 63.1 1.2.2 5.2 1.3.5 South Buru 6.3.3 2.3.6 1.3.5 South Buru 6.3.3 2.3.6 1.3.5 West Sumbava 6.1.7 1.5.3 5.4 6.3.7 South Halmahera 6.2.7 1.7.2 5.7 2.8 South Minahasa 75.3 6.3 7.4 3.4 Tojo Una-Una 7.1.9 9.3 3.2 4.3 South Minahasa 75.3 6.3 7.4 3.4 Tojo Una-Una 7.1.7 9.3 3.2 4.3 Gunung Mas 65.0 6.0 6.8 4.4 5.0 5.8 Raja Ampat 64.2 10.3 8.4 5.0 Lamandau 68.2 7.1 2.1 Aru Island 63.3 6.5 1.5 2.0 Sarmi 64.6 1.6 3.6 7.0 5.7 2.5 Southasat Manabasa 68.1 1.7.8 7.1 2.1 Aru Island 63.3 1.6 1.5 5.0 7.2	Morowali	62.7	15.4	83	16.3	Central Buton	66.0	10.3	7.0	1 5
North Singarmeng 61.1 Fr.2 52.2 12.3 South Minham 61.5 12.7 50.6 12.7 50.6 13.0 West Kutal 61.7 18.9 5.1 3.7 South Minhama 62.7 17.2 5.7 2.8 South Minhamsa 65.0 20.6 6.8 3.4 Bintuni Bay 64.7 62.2 5.7 2.4 Gunung Mas 65.0 20.6 6.8 3.4 Bintuni Bay 64.2 10.3 4.5 0 Lamandau 68.2 7.4 5.0 S.8 Raja Ampat 64.2 10.5 5.4 6.0 8.1 Southeast Minahasa 68.1 17.8 1.7 1.1 Aru Island 63.6 6.5 5.5 5.2 North Konawe 64.1 13.3 5.4 1.7 North Koyong 62.4 3.43 1.2 3.1 North Konawe 64.8 5.9 3.5 Morch Kayong 62.4 3.43 1.2 3.1	Kota Singkawang	63.1	14.7	5.2	13.5	South Buru	64.3	23.6	6.0	1.0
West Sumbava 61.7 12.9 61.7 61.3 Namerica 60.7 12.7 51.0 50.7 25.0 South Minahasa 75.3 6.3 7.4 3.4 Tojo Una-Una 71.9 9.3 3.2 4.3 Gouning Mas 65.0 20.6 6.8 3.4 Tojo Una-Una 71.9 9.3 3.2 4.3 Tidore Island City 67.8 4.4 5.0 5.8 Raja Ampat 64.2 9.5 5.4 0.9 Tanah Bumbu 62.2 21.9 5.1 11.7 West Sumba 64.1 16.2 6.6 8.1 Southes Minhabasa 68.1 17.8 7.1 2.1 Anu Island 61.6 5.0 9.1 2.0 8.6 5.0 9.1 2.0 1.0 1.8 3.1 2.0 3.0 1.2 3.1 2.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Wost Kutai	64.4	15.2	5.Z	6.3	Kaimana	66.7	12.0	5.6	2.0
Wreis Sullidwa 01.7 10.9 5.1 5.1 5.4 3.4 South Minahaled 02.7 17.2 5.7 2.0 Gunung Mas 65.0 20.6 6.8 3.4 Bintuni Bay 64.7 6.2 17.2 3.2 4.3 Gunung Mas 65.0 20.6 6.8 3.4 Bintuni Bay 64.2 10.3 8.4 5.0 Lamandau 68.2 7.4 5.2 3.6 Sarmi 64.2 10.3 8.4 5.0 Southeast Minahasa 68.1 17.8 7.1 Yurest Sumba 64.1 16.6 8.1 5.3 5.3 5.3 5.3 5.3 5.3 5.3 5.3 5.0 5.7 7.5 7.7 7.5	West Sumbaura	61.7	10.0	0.4	0.5	Ndillidid Cauth Ualmahara	62.7	17.7	5.0	2.0
South Minimates 7.3 0.3 7.4 3.4 Topo Une-Une 7.19 9.3 3.2 2.4 4.3 Tidore Island City 67.8 4.4 5.0 5.8 Raja Ampat 64.2 10.3 8.4 5.0 Tanah Bumbu 62.2 21.9 5.1 11.7 West Sumba 64.1 16.2 6.6 8.1 Southeast Minahasa 68.1 17.8 7.1 2.1 Aru Island 66.3 6.6 3.9 5.3 Bone Bolango 65.0 15.1 6.0 8.2 Vest Manggarai 63.0 17.4 6.0 15.1 6.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 34.3 1.2 3.1 2.0 North Morowali 68.0 4.6 4.6 3.6 Soupiori 66.4 15.6 6.3 2.0 South Konawe 67.8 5.8 6.1 4.3 Rothada	West Sumbawa	75.2	10.9	5.1	/ ⊃.4		71.0	17.2	5./	2.0
Gunung Mas bb.0 20.6 6.8 3.4 Bintuni Bay bb.7 bb.2 5.7 2.4 Lamandau 68.2 7.4 5.2 3.6 Sarmi 64.2 10.3 84 5.0 Lamandau 68.2 7.4 5.2 3.6 Sarmi 64.2 10.3 8.4 5.0 Southeast Minahasa 68.1 17.8 7.1 2.1 Aru Island 66.3 1.6 6.6 8.1 Wakatobi 65.0 15.1 6.0 8.2 West Maluk Tenggara 63.0 1.2 6.0 9.1 Talaud Island 71.5 13.8 1.0.4 4.6 West Maluk Tenggara 6.0 8.0 9.1 7.5 4.1 7.0 North Kayong 6.4 15.6 6.3 2.6 6.3 2.6 6.3 2.6 6.3 2.6 6.4 15.6 6.3 2.6 6.4 15.6 6.3 2.4 7.4 4.0 3.3 Rote Ndao 6.0	South Minanasa	/5.3	6.3	7.4	3.4	Tojo Una-Una	/1.9	9.3	3.2	4.3
Idore Island City 67.8 7.4 5.2 3.6 Sarmi 64.2 10.3 8.4 5.4 0.9 Tanah Bumbu 62.2 21.9 5.1 11.7 West Sumbaa 64.1 16.2 6.6 8.1 5.3 Bone Bolango 69.0 14.0 6.8 8.1 East Seram 64.6 15.6 5.1 5.2 Wakatobi 65.4 13.9 6.5 3.6 Sula Island 63.6 6.0 9.1 7.4 6.0 8.2 West Manggarai 63.9 14.2 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Maluku Tenggara 62.4 3.4 1.2 3.1 Buru 68.0 4.6 4.6 3.6 Suplori 66.4 15.6 6.3 2.6 North Morawe 67.8 5.1 South Sorong 64.1 15.6 6.3 2.6 South Konawe 67.8 5.8 5.1 South Sorong	Gunung Mas	65.0	20.6	6.8	3.4	Bintuni Bay	64./	6.2	5./	2.4
Lamandau 68.2 7.4 5.2 3.6 Sarmi 64.2 9.5 5.4 0.9 Tanah Bumbu 62.2 21.9 5.1 11.7 West Sumba 64.1 15.2 6.6 8.1 Southesat Minahasa 68.1 17.8 7.1 2.1 Aru Island 63.6 6.6 3.9 5.3 Bone Bolango 69.0 14.0 6.8 8.1 East Seram 64.6 15.6 5.1 5.2 Wakatobi 65.0 15.1 6.0 8.2 West Manggarai 63.9 14.2 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Manggarai 62.0 8.6 5.0 4.9 North Konawe 64.1 15.3 10.4 4.6 West Manggarai 62.0 8.6 6.4 3.0 North Morowali 69.8 17.2 6.4 3.3 Rote Nalao 60.2 1.6 4.1 South Konawe 67.8 8.0	lidore Island City	67.8	4.4	5.0	5.8	Raja Ampat	64.2	10.3	8.4	5.0
Tanah Bumbu 62.2 21.9 5.1 11.7 West Sumbas 64.1 16.2 6.6 8.9 5.3 Southeast Minahasa 68.1 17.8 7.1 2.1 Aru Island 63.3 64.6 15.6 5.1 5.2 Wakatobi 65.4 13.9 6.5 3.6 Sule Island 63.0 61.0 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Maluku Tenggara 62.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 3.3 1.2 3.1 Buru 68.0 4.6 4.6 3.6 Supiori 66.4 15.6 6.3 2.6 South Storong 64.1 15.9 5.3 Morth Kayong 60.2 17.7 7.4 Balagan 48.5 27.2 5.8 5.1 South Sorong 64.1 1.5 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 South Manokuu 65.6 8.9 7.3 <td>Lamandau</td> <td>68.2</td> <td>7.4</td> <td>5.2</td> <td>3.6</td> <td>Sarmi</td> <td>64.2</td> <td>9.5</td> <td>5.4</td> <td>0.9</td>	Lamandau	68.2	7.4	5.2	3.6	Sarmi	64.2	9.5	5.4	0.9
Southeast Minahasa 68.1 17.8 7.1 2.1 Aru Island 66.3 66.3 6.6 3.9 5.3 Bone Bolango 69.0 14.0 6.8 8.1 East Seram 64.6 15.6 5.1 5.2 Wakatobi 65.0 15.1 6.0 8.2 West Manggarai 63.9 14.2 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Mangkarai 63.9 14.2 6.0 9.1 North Konawe 64.1 5.3 5.9 3.5 Morotai Island 68.9 14.1 6.4 3.6 North Morowali 69.8 17.2 6.4 3.3 Rote Ndao 60.2 19.7 7.5 4.1 Balangan 48.5 2.7.2 5.8 5.1 South Morowali 61.8 6.1 18.9 2.2 7.7 3.1 Bulang Pisau 67.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 5.7	Tanah Bumbu	62.2	21.9	5.1	11.7	West Sumba	64.1	16.2	6.6	8.1
Bone Bolango 69.0 14.0 6.8 8.1 East Seram 64.6 15.6 5.1 5.2 Wakatobi 65.4 13.9 6.5 3.6 Sula Island 63.6 7.0 5.7 2.5 North Toraja 65.0 15.1 6.0 8.2 West Malukt Tenggara 62.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 4.3 1.2 3.1 Buru 68.0 4.6 4.6 3.6 Supiori 66.4 15.6 6.3 2.6 Katingan 64.0 5.5 5.9 3.5 Morotai Island 60.2 1.7.2 4.1 Balangan 48.5 2.7.2 5.8 5.1 South Koroaw 61.1 1.3 2.4 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Sukamara 71.2 9.3	Southeast Minahasa	68.1	17.8	7.1	2.1	Aru Island	66.3	6.6	3.9	5.3
Wakatobi 65.4 13.9 6.5 3.6 Sula Island 63.6 7.0 5.7 2.5 North Toraja 65.0 15.1 6.0 8.2 West Manggarai 63.9 14.2 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Maluku Tenggara 62.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 3.4.3 1.2 3.1 Buru 68.0 4.6 3.6 Supiri 66.4 15.6 6.3 2.6 Katingan 69.8 17.2 6.4 3.3 Rote Ndao 60.2 19.7 7.5 4.1 Balangan 48.5 27.2 5.8 5.1 South Konawe 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 6.8 1.8 1.8 Sigi 65.9 8.6 5.1 3.2 Malka 67.7 13.9 6.0 3.3 Buol	Bone Bolango	69.0	14.0	6.8	8.1	East Seram	64.6	15.6	5.1	5.2
North Toraja 65.0 15.1 6.0 8.2 West Mangarai 63.9 14.2 6.0 9.1 Talaud Island 71.5 13.8 10.4 4.6 West Maluku Tenggara 62.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 34.3 1.2 3.1 Buru 68.0 4.6 4.6 3.6 Supiori 66.4 15.6 6.3 2.6 Katingan 69.8 17.2 6.4 3.3 Rote Ndao 60.2 19.7 7.5 4.1 Balangan 48.5 27.2 5.8 5.1 South Konawe 61.8 6.1 4.1 South Konawe 63.8 9.2 7.2 4.0 Central Sumba 50.0 7.2 5.7 3.7 Sukamara 71.2 9.3 1.1 4.1 Tataku Island 65.7 8.8 6.1 4.1 Tataku Island 65.7 8.8 5.1 3	Wakatobi	65.4	13.9	6.5	3.6	Sula Island	63.6	7.0	5.7	2.5
Talaud Island 71.5 13.8 10.4 4.6 West Maluku Tenggara 62.0 8.6 5.0 4.9 North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 34.3 1.2 3.1 Buru 68.0 4.6 4.6 3.6 Supiori 66.4 15.6 3.2 North Morowali 69.8 17.2 6.4 3.3 Rote Ndao 60.2 19.7 7.5 4.1 Balangan 48.5 27.2 5.8 5.1 South Sorong 61.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 50.0 7.2 5.7 3.7 Skamara 71.2 9.3 1.1 4.1 Taliabu Island 65.6 8.9 6.3 1.8 Sigi 50 8.6 5.1 3.2 Malaka 67.7 13.9 60.0 3.3	North Toraja	65.0	15.1	6.0	8.2	West Manggarai	63.9	14.2	6.0	9.1
North Konawe 64.1 13.3 5.4 1.7 North Kayong 62.4 34.3 1.2 3.1 Buru 68.0 4.6 3.6 Supiori 66.4 15.6 6.3 2.6 Katingan 64.0 5.9 5.9 3.5 Morotai Island 68.9 14.1 6.4 3.9 North Morowali 69.8 17.2 6.4 3.3 Rote Ndao 60.2 19.7 7.5 4.1 Balangan 48.5 27.2 5.8 5.1 South Konawe 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 3.7.4 4.0 5.0 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 3.7 0.6 <td< td=""><td>Talaud Island</td><td>71.5</td><td>13.8</td><td>10.4</td><td>4.6</td><td>West Maluku Tenggara</td><td>62.0</td><td>8.6</td><td>5.0</td><td>4.9</td></td<>	Talaud Island	71.5	13.8	10.4	4.6	West Maluku Tenggara	62.0	8.6	5.0	4.9
Buru 68.0 4.6 4.6 3.6 Supiori 66.4 15.6 6.3 2.6 Katingan 64.0 5.9 5.9 3.5 Morotai Island 68.9 14.1 6.4 3.9 North Morowali 69.8 17.2 5.8 5.1 South Sorong 64.1 15.9 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 South Maluku 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 5.7 3.7 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 1.3.9 6.0 3.3 Buol 7.4 6.7 5.6 5.7 1.3.0 Wondama Bay 57.1 25.8 7.3 2.1 North Halmahera 41.	North Konawe	64.1	13.3	5.4	1.7	North Kayong	62.4	34.3	1.2	3.1
Barlo 64.0 5.9 5.0 5.0 5.0 5.9 5.9 5.0 5.0 5.0 5.9 5.9 5.0 5.0 5.9 5.9 5.9 5.0 5.2 0.0 3.3 5.0 5.0 5.2 0.4 5.0 5.2 0.4 5.0 5.2 0.4 1.1 5.0 5.2 0.4 1.1 5.1 <t< td=""><td>Buru</td><td>68.0</td><td>4.6</td><td>4.6</td><td>3.6</td><td>Suniori</td><td>66.4</td><td>15.6</td><td>63</td><td>2.6</td></t<>	Buru	68.0	4.6	4.6	3.6	Suniori	66.4	15.6	63	2.6
North Morowali 618 1.7. 6.4 3.3 Rote Ndao 60.2 11.7 6.4 1.3 Balangan 48.5 27.2 5.8 5.1 South Sorong 64.1 15.9 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 South Sorong 64.1 15.9 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 South West Maluku 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 6.2.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 5.7 3.7 Sukamara 71.2 9.3 1.1 4.1 Taliaka 6.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 37.4 4.0 5.0 North Halmahera 41.1<	Katingan	64.0	5 9	5 9	35	Morotai Island	68.9	14 1	6.4	3 0
North Holowan 67.3 17.2 5.4 5.7 3.7 Note Nabo 60.2 15.7 7.5 4.1 Balangan 48.5 27.2 5.8 5.1 South Sorong 64.1 15.9 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 Southwest Maluku 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 7.3 3.3 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 3.7 4.0 5.0 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 3.7 0.6 Kub Raya 64.1 17.6 5.6 8.7 Maypi 63.4 18.1 71	North Morowali	60.8	17.2	6.4	3.3	Pote Ndao	60.2	10.7	75	
Dataingeri 76.3 27.2 3.6 3.1 South Storing 67.1 13.9 6.3 2.0 South Konawe 67.8 5.8 6.1 4.1 Southwest Maluku 66.1 11.3 4.2 4.4 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 5.7 3.7 Sukamara 71.2 9.3 1.1 4.1 1.1 4.1 7.1 6.3 1.8 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Mangarai 54.9 37.4 4.0 5.0 North Halmahera 41.1 37.5 5.6 8.7 Maybrat 46.2 35.0 5.2 0.4 Tana Tidung 63.4 32.9 3.4 2.8 Mapbrat 46.2 39.6 5.4 10.7	Balangan	19.0	27.2	50	5.5	South Sorong	64.1	15.0	63	2.0
Solut Notawe 67.3 5.6 6.1 4.1 Solumest Matuku 66.1 11.3 4.2 4.7 Murung Raya 70.2 8.7 3.6 3.2 Boven Digoel 62.8 16.8 6.1 1.8 Pulang Pisau 65.8 9.2 7.2 4.0 Central Sumba 59.0 7.2 5.7 3.7 Sukamara 71.2 9.3 1.1 4.1 Taliabu Island 65.6 8.9 6.3 1.8 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 3.7.4 4.0 5.0 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 5.2 0.4 Tana Tidung 63.4 32.9 3.4 2.8 Mappi 63.4 18.1 7.1 1.5 Tual City 56.0 38.6 5.5 3.2 Sabu Raijua 46.5 39.6 5.4 10.7	South Konowo	40.J	Z/.Z	5.0	J.1 / 1	Southwast Maluku	66 1	11.5	4.2	2.0
Murung Kaya70.28.73.63.2Boden Digden62.816.86.11.6Pulang Pisau65.89.27.24.0Central Sumba59.07.25.73.7Sukamara71.29.31.14.1Taliabu Island65.68.96.31.8Sigi65.98.65.13.2Malaka67.713.96.03.3Buol74.67.96.16.4East Manggarai54.937.44.05.0North Halmahera41.137.56.713.0Wondama Bay57.125.87.32.1North Buton69.34.45.52.1South Manokwari46.636.03.70.6Kubu Raya64.117.65.68.7Maybrat46.539.65.410.7Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.	Mumma Dava	07.0	5.0	0.1	4.1	Southwest Maluku	60.1	11.5	4.2	1.4
Pulang Pisau65.89.27.24.0Central Sumba59.07.25.73.7Sukamara71.29.31.14.1Taliabu Island65.68.96.31.8Sigi65.98.65.13.2Malaka67.713.96.03.3Buol74.67.96.16.4East Manggarai54.937.44.05.0North Halmahera41.137.56.713.0Wondama Bay57.125.87.32.1North Buton69.34.45.52.1South Manokwari46.636.03.70.6Kubu Raya64.117.65.68.7Maybrat46.235.05.20.4Tana Tidung63.432.93.42.8Mappi63.418.17.11.5Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.112.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3Sat Tagulandang Biaro65.711.07.23.3Mamberano Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.9 <t< td=""><td></td><td>70.2</td><td>8.7</td><td>3.6</td><td>3.2</td><td>Boven Digoel</td><td>62.8</td><td>10.8</td><td>6.1</td><td>1.8</td></t<>		70.2	8.7	3.6	3.2	Boven Digoel	62.8	10.8	6.1	1.8
Sukamara /1.2 9.3 1.1 4.1 Taliabu Island 65.6 8.9 6.3 1.8 Sigi 65.9 8.6 5.1 3.2 Malaka 67.7 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 37.4 4.0 5.0 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 3.7 0.6 Kubu Raya 64.1 17.6 5.6 8.7 Maybrat 46.2 35.0 5.2 0.4 Tana Tidung 63.4 32.9 3.4 2.8 Mappi 63.4 18.1 7.1 1.5 Tual City 56.0 38.6 5.5 3.2 Sabu Raijua 46.5 39.6 5.4 10.7 Seruyan 65.1 6.2 6.8 4.7 Paniai 43.2 30.6 6.0 1.6 Siau Tagulandang Biaro 65.7 11.0 7.2 3.3 Mamberamo Raya 63.2 16.0 7.0 0.6	Pulang Pisau	65.8	9.2	7.2	4.0	Central Sumba	59.0	7.2	5./	3./
Sigi 65.9 8.6 5.1 3.2 Malaka 67./ 13.9 6.0 3.3 Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 37.4 4.0 5.0 North Halmahera 41.1 37.5 6.7 13.0 Wondama Bay 57.1 25.8 7.3 2.1 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 3.7 0.6 Kubu Raya 64.1 17.6 5.6 8.7 Maybrat 46.2 35.0 5.2 0.4 Tana Tidung 63.4 32.9 3.4 2.8 Mappi 63.4 18.1 7.1 1.5 Seruyan 65.5 16.2 6.8 4.7 Paniai 43.2 30.6 6.0 1.6 Mahakam Ulu 66.5 12.8 4.9 1.9 Arfak Mountains 63.4 16.2 5.3 0.4 Siau Tagulandang Biaro 65.7 11.0 7.2 3.3 Mamberamo Raya 63.2 10.3 1.4 39.3<	Sukamara	/1.2	9.3	1.1	4.1	I aliabu Island	65.6	8.9	6.3	1.8
Buol 74.6 7.9 6.1 6.4 East Manggarai 54.9 37.4 4.0 5.0 North Halmahera 41.1 37.5 6.7 13.0 Wondama Bay 57.1 25.8 7.3 2.1 North Buton 69.3 4.4 5.5 2.1 South Manokwari 46.6 36.0 3.7 0.6 Kubu Raya 64.1 17.6 5.6 8.7 Maybrat 46.2 35.0 5.2 0.4 Tana Tidung 63.4 32.9 3.4 2.8 Mappi 63.4 18.1 7.1 1.5 Seruyan 65.1 6.2 6.8 4.7 Paniai 43.2 30.6 6.4 10.7 Seruyan 65.2 10.2 5.3 3.2 Dogiyai 64.1 30.8 7.7 0.3 East Halmahera 70.7 24.3 7.6 5.7 Tambrauw 62.3 13.8 7.0 0.6 North Mamuju 65.7 11.0 7.2 3.3 Mamberamo Raya 63.2 16.0 7.0 0.6	Sigi	65.9	8.6	5.1	3.2	Malaka	6/./	13.9	6.0	3.3
North Halmahera41.137.56.713.0Wondama Bay57.125.87.32.1North Buton69.34.45.52.1South Manokwari46.636.03.70.6Kubu Raya64.117.65.68.7Maybrat46.235.05.20.4Tana Tidung63.432.93.42.8Mappi63.418.17.11.5Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw63.216.07.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo61.129.45.44.0Lanny Jaya57.234.9<	Buol	/4.6	/.9	6.1	6.4	East Manggarai	54.9	37.4	4.0	5.0
North Buton69.34.45.52.1South Manokwari46.636.03.70.6Kubu Raya64.117.65.68.7Maybrat46.235.05.20.4Tana Tidung63.432.93.42.8Mappi63.418.17.11.5Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw63.216.07.00.6North Manuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Gorontalo61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo61.129.45.44.0Lanny Jaya57.234.96.61.2Landak66.17.55.25.5Puncak Jaya50.329.9	North Halmahera	41.1	37.5	6.7	13.0	Wondama Bay	57.1	25.8	7.3	2.1
Kubu Raya64.117.65.68.7Maybrat46.235.05.20.4Tana Tidung63.432.93.42.8Mappi63.418.17.11.5Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.93.77.36.4Gorontalo66.127.56.02.1Yahukimo58.134.04.30.8Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23	North Buton	69.3	4.4	5.5	2.1	South Manokwari	46.6	36.0	3.7	0.6
Tana Tidung63.432.93.42.8Mappi63.418.17.11.5Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.74.2.23.71.5Bagekeo61.129.45.44.0Lanny Jaya57.234.9 <t< td=""><td>Kubu Raya</td><td>64.1</td><td>17.6</td><td>5.6</td><td>8.7</td><td>Maybrat</td><td>46.2</td><td>35.0</td><td>5.2</td><td>0.4</td></t<>	Kubu Raya	64.1	17.6	5.6	8.7	Maybrat	46.2	35.0	5.2	0.4
Tual City56.038.65.53.2Sabu Raijua46.539.65.410.7Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Bombana64.95.15.84.8Central Mamberamo47.932.7<	Tana Tidung	63.4	32.9	3.4	2.8	Mappi	63.4	18.1	7.1	1.5
Seruyan65.16.26.84.7Paniai43.230.66.01.6Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.4<	Tual City	56.0	38.6	5.5	3.2	Sabu Raijua	46.5	39.6	5.4	10.7
Mahakam Ulu66.512.84.91.9Arfak Mountains63.416.25.30.4Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.13.4.04.30.8Gorontalo66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5Bagkeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.1 <td>Seruyan</td> <td>65.1</td> <td>6.2</td> <td>6.8</td> <td>4.7</td> <td>Paniai</td> <td>43.2</td> <td>30.6</td> <td>6.0</td> <td>1.6</td>	Seruyan	65.1	6.2	6.8	4.7	Paniai	43.2	30.6	6.0	1.6
Siau Tagulandang Biaro65.210.25.33.2Dogiyai64.130.87.70.3East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.7<	Mahakam Ulu	66.5	12.8	4.9	1.9	Arfak Mountains	63.4	16.2	5.3	0.4
East Halmahera70.724.37.65.7Tambrauw62.313.87.00.6North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Siau Tagulandang Biaro	65.2	10.2	5.3	3.2	Dogivai	64.1	30.8	7.7	0.3
North Mamuju65.711.07.23.3Mamberamo Raya63.216.07.00.6North Bolaang Mongondow67.35.72.91.7Deiyai48.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Fast Halmahera	70.7	24.3	7.6	5.7	Tambrauw	62.3	13.8	7.0	0.6
North Bolaang Mongondow67.35.72.91.7Deiyai68.039.36.90.3Nunukan58.526.85.15.6Asmat27.937.37.36.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	North Mamuiu	65.7	11.0	7.2	33	Mamberamo Rava	63.2	16.0	7.0	0.6
Nunukan58.526.85.15.6Asmat27.937.37.36.3Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	North Bolaang Mongondow	67.3	5 7	2 9	17	Deivai	48.0	20.2	6.9	0.0
Name50.520.65.15.6Ashiat27.957.3750.4Keerom61.627.56.02.1Yahukimo58.134.04.30.8Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Nunukan	58 5	26.8	5 1	5.6	Asmat	27.0	373	73	6.4
Recommendation61.027.36.027.1Faitking50.150.150.361.04.30.3Gorontalo66.124.05.09.0Tolikara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Koorom	61.6	20.0	5.1	2.0	Vabukimo	50 1	34.0	/.5	0.7
Gorontalo66.124.05.09.010lkara51.036.06.30.4Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Carantala	01.0	27.5	0.0	2.1		50.1	26.0	т.5 С Э	0.0
Landak66.17.55.25.5Puncak Jaya50.329.96.51.5Nagekeo61.129.45.44.0Lanny Jaya57.234.96.61.2East Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	Gorontalo	66.1	24.0	5.0	9.0	Tolikara	51.0	36.0	6.3	0.4
Nagekeo 61.1 29.4 5.4 4.0 Lanny Jaya 5.2 34.9 6.6 1.2 East Bolaang Mongondow 67.7 9.8 5.1 2.9 Yalimo 45.7 42.2 3.7 1.5 East Kolaka 61.5 30.1 5.5 2.7 Intan Jaya 54.4 39.2 5.1 0.4 Bombana 64.9 5.1 5.8 4.8 Central Mamberamo 47.9 32.7 4.7 0.1 Melawi 62.6 18.2 6.3 3.2 Bintang Mountains 49.1 43.6 4.7 1.2 East Seram 67.2 11.1 6.7 3.2 Puncak 54.0 30.4 5.9 6.1 Boalemo 60.5 28.8 5.5 4.5 Nduga 45.5 36.4 5.7 0.7	Landak	66.1	7.5	5.2	5.5	Puncak Jaya	50.3	29.9	6.5	1.5
Last Bolaang Mongondow67.79.85.12.9Yalimo45.742.23.71.5East Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	мадекео	61.1	29.4	5.4	4.0	Lanny Jaya	5/.2	34.9	6.6	1.2
Last Kolaka61.530.15.52.7Intan Jaya54.439.25.10.4Bombana64.95.15.84.8Central Mamberamo47.932.74.70.1Melawi62.618.26.33.2Bintang Mountains49.143.64.71.2East Seram67.211.16.73.2Puncak54.030.45.96.1Boalemo60.528.85.54.5Nduga45.536.45.70.7	East Bolaang Mongondow	67.7	9.8	5.1	2.9	Yalimo	45.7	42.2	3.7	1.5
Bombana 64.9 5.1 5.8 4.8 Central Mamberamo 47.9 32.7 4.7 0.1 Melawi 62.6 18.2 6.3 3.2 Bintang Mountains 49.1 43.6 4.7 1.2 East Seram 67.2 11.1 6.7 3.2 Puncak 54.0 30.4 5.9 6.1 Boalemo 60.5 28.8 5.5 4.5 Nduga 45.5 36.4 5.7 0.7	East Kolaka	61.5	30.1	5.5	2.7	Intan Jaya	54.4	39.2	5.1	0.4
Melawi 62.6 18.2 6.3 3.2 Bintang Mountains 49.1 43.6 4.7 1.2 East Seram 67.2 11.1 6.7 3.2 Puncak 54.0 30.4 5.9 6.1 Boalemo 60.5 28.8 5.5 4.5 Nduga 45.5 36.4 5.7 0.7	Bombana	64.9	5.1	5.8	4.8	Central Mamberamo	47.9	32.7	4.7	0.1
East Seram 67.2 11.1 6.7 3.2 Puncak 54.0 30.4 5.9 6.1 Boalemo 60.5 28.8 5.5 4.5 Nduga 45.5 36.4 5.7 0.7	Melawi	62.6	18.2	6.3	3.2	Bintang Mountains	49.1	43.6	4.7	1.2
Boalemo 60.5 28.8 5.5 4.5 Nduga 45.5 36.4 5.7 0.7	East Seram	67.2	11.1	6.7	3.2	Puncak	54.0	30.4	5.9	6.1
	Boalemo	60.5	28.8	5.5	4.5	Nduga	45.5	36.4	5.7	0.7

Table 1. Development Indicators in New Regions in Eastern Indonesia, 2017

HDI: Human Development Index; FD: Fiscal Decentralization; EG: Economic Growth; PR: Poverty Rate

City/Regency	HDI	EG	FD	PR	City/Regency	HDI	EG	FD	PR
		%	%	%			%	%	%
Kendari City	62.4	16.1	7.3	28.2	Kapuas	64.2	31.0	5.1	5.2
Makassar City	81.1	4.6	8.2	34.9	Tanah Laut	66.1	26.8	4.5	6.8
Palu City	79.0	2.8	3.8	21.6	South Hulu Sungai	66.3	13.4	6.8	6.3
Ambon City	81.8	5.0	6.4	11.6	Kota Baru	66.7	8.3	8.3	8.6
Palangka Rava City	77.9	5.3	5.1	11.4	Hulu Sungai Tengah	74.1	8.4	6.9	7.5
Samarinda City	80.2	6.7	5.9	21.6	Baniar	66.3	6.9	7.4	9.1
Javapura City	79.5	4.8	3.6	11.6	North Kolaka	69.0	9.2	8.2	4.6
Balikpapan City	76.1	5.7	7.4	31.9	Muna	71.0	13.0	7.0	5.3
Baniar Baru City	76.5	4.2	6.4	16.2	Bantaeng	66.7	16.7	4.4	10.7
Kupang City	76.7	17.8	8.4	14.5	Pangkaiene And Islands	70.7	9.9	5.1	12.2
Manado City	79.5	5.2	0.7	19.6	Nabire	61.4	16.0	5.8	4.3
Pontianak City	71.5	7.7	3.1	26.9	Bulukumba	72.0	5.9	6.8	14.3
Mataram City	70.4	14.6	14.4	21.8	Tana Toraia	65.4	13.3	7.6	10.4
Pare-Pare City	66.4	16.5	6.6	13.5	Soppena	72.2	7.5	6.5	7.2
Banjarmasin City	78.3	9.8	6.8	18.3	Ngada	68.6	10.8	7.5	5.4
Tarakan City	70.3	5.4	5.4	9.0	West Lombok	69.3	5.5	6.1	14.8
Minahasa	76.7	5.7	7.0	6.2	Dompu	65.8	15.3	7.4	7.2
Berau	71.6	25.4	-4.6	10.7	Mamuju	63.0	6 5	59	71
Bitung City	72.9	6.6	6.2	12.4	Ende	64.9	12.2	5.2	49
Kutai Kartanegara	67.3	16.2	6.6	10.6	Fakfak	63.9	21.3	6.8	5.0
West Kotawaringin	69.1	5.0	4 1	11.8	Bolaang Mongondow	64.6	4 5	45	4 0
Biak Numfor	79.7	3.6	70	12.4	Yanen Island	67.6	14.9	5.0	73
Enrekang	67 3	97	73	10.0	Bengkayang	62 1	27.1	59	4.6
Pasir	73.6	54	3.0	6.2	Sambas	69 1	5.2	6.0	6.2
lavanura	55.2	31.1	5.1	6.9	Sumbawa	62 1	23.6	33	83
Tabalong	72.8	7.6	14	97	Siniai	68.0	53	7.6	6.3
Bulungan	66.8	12.6	75	6.4	Ketapang	59.6	21.7	49	5 1
Manokwari	68.3	8.4	7.2	5 1	Takalar	68.7	3.8	5 1	10.7
Konawe	64 7	18.2	5.0	77	Majene	66 1	26.0	71	72
Fast Kotawaringin	64.2	6.7	5.8	12.0	Kenulauan Selavar	62.4	20.0	0.0	6.2
Central Maluku	67.8	3.0	47	4 1	Sintang	62.9	10.8	5.2	53
Pinrang	78 5	27	7.6	89	Bima	64.9	23.9	59	7.2
Sidenreng Rappang	69.9	85	7.0	8.8	Southeast Maluku	64 5	12.4	65	5.0
Poso	69.8	53	71	65	Barito Kuala	67.8	16.2	6.0	44
Barru	69.6	97	65	8.8	Donggala	66.0	7 5	57	93
South Barito	66.3	53	6.6	59	Sanggala	64.2	21.9	67	54
Kepulauan Sangihe	75 3	65	89	4 2	Buton	60.2	30.2	6 1	2.2
North Barito	65.8	15.3	6.8	53	Fast Lombok	67.1	25.4	6.4	11.2
	67.9	14.4	8.2	75	Central Lombok	69 1	11.8	55	9.2
Banggai	62.3	29.3	5.0	7.0	Hulu Sungai Utara	62.0	23 5	51	9.2
Tanin	72.4	14.9	5.7	5 1	Fast Sumba	70 1	21.2	5.8	73
Merauke	62.8	22.9	5 1	61	Kapuas Hulu	67.0	5.2	59	2.8
Maros	68.4	14 3	7.6	14 1	Bone	66 1	8.0	67	2.8
North Luwu	70.2	15.7	5.2	7.8	Toli-Toli	59.4	36.0	49	6.9
Gowa	70.6	7.6	23	10.1	Sorong	70 1	9.8	6.5	5.6
Waio	67.8	6.1	57	8.6	Sikka	67.4	15.7	75	9.4
North Central Timor	61 2	37.4	4.0	4 1	Fast Flores	71 2	8 1	6.0	5.0
Southwest Sumba	64 5	13 5	49	45	Kupang	64.4	12 5	4.8	7.8
Belu	65.0	16.7	49	63	leneponto	61 5	9.9	5.4	95
South Central Timor	58 1	36.4	5 2	4.6	Polewali Mandar	64 1	14.2	63	99.6
Alor	60.1	19.9	43	5.1	Manggarai	62.6	4 1	16.2	84
lavawijava	62.8	18.4	6.4	5.6	Pontianak/Mempawah Regency	68.0	16.2	6.0	6.8
HDI: Human Development Index: FD	: Fiscal	Decentra	alization:	EG: Eco	pnomic growth: PR: Poverty Rate	5015	1012	0.0	0.0

Table 2. Development Indicators in Origin Regions in Eastern Indonesia, 2017

Furthermore, in terms of status, in the extremely high and high categories, there were 31 origin regencies (with the average of human development index 75.26) and 22 new regencies (with the average of 73.01). There are 151 regencies grouped in medium category for human development index (with average of 65.32). While it can be indicated

that smaller numbers of origin area are calculated, there were as many as 71 regions (with human development index of 66.03) if being compared with new regencies with 80 regions (with average of human development index of 64.69). Moreover, the human development index for the low category was dominated by 28 regencies (with average of human development index of 51.53). Nduga regency was categorized as the region with the lowest category with index score of 27.87. In detail, there were two origin regions that are categorized as having the lowest human development index (with the average of 57.80) and 26 new regions (with average of 50.86). This condition was also experienced by origin and new regencies, in terms of status. For Statusbased comparison towards entire categories of human development, the human development index in new regencies was smaller than origin regencies. This shows the existence of Human Development Index (HDI) gap in Eastern Indonesia. In other words, human development in Eastern Indonesia is considered unequal.

Besides, the level of human development is not the determining factor for economic growth, fiscal decentralization and poverty. As displayed in Table 2, the region with the highest human development score did not always mean it had high economic growth and decentralization and lower poverty rate, and so did the regions with low human development index. In other words, a region has various levels of economic growth, fiscal decentralization and poverty certain human development rate in index. Nevertheless, regions with better human development index is aligned with high fiscal decentralization.

Factors Affecting Human Development

In addition to the popularity of the income gap problem, the problem of human development inequality also requires more attention in its development. Even after the era of the Millennium Development Goals (MDGs), the era of Sustainable Development Goals (SDGs) still raise the problem of inequality and human development. SDGs show that human development has always been an important issue in development planning and strategies. Dummy variable regression is one of the right approaches to answer the purpose of this study, which specifically discusses the identification of differences in the gap of human development in the origin region and expansion in Eastern Indonesia and the determinants of human development. The following is the results of dummy variable regression.

The goodness of fit test results based on Table 3 for simultaneous tests can conclude that the model used exists. It means that simultaneously independent variables in the study have turned away and have been influenced significantly by the human development index. These results based on p-value of F statistic of 0.0000 was smaller than 1%. Moreover, the interpretation of the determinant coefficient (R2) showed a value of 0.6406, which means that the variance variable independently in this study can explain the variables of human development index of 64.06%, while the remaining 35.94% explained by other factors was not included in the model.

Table 3. Estimate Variable Affecting Human Development

Variable	Coefficient	p value
Constant (C)	73.8736	0.0000
Dummy (D1)	-3.7924	0.0931
Fiscal Decentralization (FDPAD)	0.1109	0.0062
Poverty (POVR)	-0.3096	0.0000
Economic growth (EG)	0.4485	0.2207
D1*FDPAD	-0.0940	0.0001
D1*POVR	0.1426	0.1686
D1*EG	-0.3096	0.6169
Goodness of Fit		

 $D_{2} = 0.641$; E statistic = E

R2= 0.641; F statistic=56.788 Adjustment R2=0.629; p value=0.000 <u>Diagnostics Test</u> Normality Test: Jarque-Bera=4.2695; p value=0.118

Heteroskedasticity Test: Harvey=14.5117, p value=0.043

It is worth noting that the number of observations in this study covers all regencies and cities in Eastern Indonesia except Nduga regency. It was not included in the observation because it was estimated to be biased. By not including outlier data, it is expected that the normal distribution would follow the regression analysis assumption. Therefore, the diagnostic test in the research requires fulfilling the normal residual distribution, homoscedasticity, and exact model specifications.

As displayed in Table 3, the regression results show the findings regarding the existence of a gap in human development between the origin regency and the new regency in Eastern Indonesia. The gap in human development between the two regions explains the differences in the quality of human resources. A significant human development gap between origin regency and new regency is reflected as the level of significance partially for p-value of tstatistic was 0.0931, smaller than 10%, and the coefficient on the dummy variable (D1). The p-value of t-statistic 0.0931 was smaller than 10%, and the coefficient value was -3.7924. The condition of the quality of human resources in the new regency was 3.7924 lower than in the origin regency. This was caused by two factors, namely the condition where the development of underdeveloped regions was hampered by regions that have advanced or are backward (backwash effects) and the condition where the development of underdeveloped regions was driven by regions that were more advanced first. Therefore, because of the exacerbation of interregional social-economic development gaps, the effect of spread effects was smaller than backwash effects.

There are three indications of backwash effects that occurred in eastern Indonesia. First, excessive exploitation of natural resources from remote and developing areas. Second, the low potential and quality of human resources due to a large number of remote and developing areas with low education, infrastructure, health, and income. In other words, the quality of human resources in the origin regency tends to be better than the new regency. Third, the readiness of development in origin regions that have been arranged earlier and running well in terms of institutional, social, economic, political, and others in autonomy, while a new regency needs relatively more time to be autonomous. It is hoped that in the long run, the formation of new regions would be able to overcome gaps in various aspects.

This finding is in agreement with <u>Bappenas</u> (2008) findings which showed that the economic performance of new autonomous regions is lagging in comparison to origin regions and other regions. This is generally due to limited human resources and inadequate government support for the economy through public investment.

In Table 3, the regression results show findings that support regional autonomy for equity and welfare in origin and new regencies in Eastern Indonesia. Partially fiscal decentralization has a significant positive effect on human development index in origin and new regencies. This was indicated by the p-value of fiscal decentralization of origin regencies by 0.0062 and new regencies by 0.0001 smaller than 1%. The enactment of regional autonomy through the instrument of fiscal decentralization turned out to have a positive impact on regional development, particularly in improving the quality of human resources in origin and new regencies. The implication is that origin and new regencies will better understand local preferences with fiscal decentralization policies and be able to increase the ability of regions to manage fiscal capacity wisely, optimizing and allocating the potential of their resources efficiently. Besides, through the measurement of fiscal decentralization with the ratio of regional own-source revenues to total revenues that have a significant positive impact, this becomes evidence for regions to become more independent. Fretes (2017) added that increasing Regional Development Budget (APBD) input through the potential of Locally-generated Revenue (PAD) will make the region's ability to finance capital expenditures larger so that it can increase outcomes in the form of increasing the human development index. Efforts to increase PAD must also look at regional resources and capabilities so that there is no trade-off where the passionate desire to boost PAD becomes a disincentive that kills regional economic (investment) potential.

The quality improvement of local government apparatus and services to the public and private sector in having greater benefits is a logical consequence of wise budgeting management. Properly-managed budget allocation provides opportunity and assurance to improve production in the private sector. Private sector is expected for providing contribution to local government in terms of the expansion of job opportunities that will become one of the sources of PAD (Putu, Maryunani, Fajri, & Budi, 2019). Therefore, the increase of PAD can be followed with the adjustment of regional expenditures, designated for the improvement of human resource development in the field of education, health and per capita income, to meet the equal human development in the entire region.

Table 3 shows that poverty reduction does not significantly influence the increase in the human development index in the new regency. Although it does not have a substantial impact, poverty alleviation indicates a positive thing in increasing the human development index, and ultimately the government continues to strive to improve the welfare of the community. Different things happen in the origin regency, where reducing poverty can improve the quality of human resources. Therefore, it can be concluded that poverty reduction has a significant adverse effect on the human development index in the origin regency. Pro-poor government programs and policies are expected to improve the quality of human resources. Provision of stimulants, assistance, and facilities through programs of basic needs, such as education, health, and economy, is expected to improve community welfare. This, of course, also must be supported by institutional improvement (good governance). Sulistyowati et al. (2017) said that picking up part of government and household computer schemes has an impact on the human development index. Increased employment opportunities, increased community capacity, and poverty alleviation are goals in human development. Economic and human development goals can be achieved by increasing the capacity of education, health, and community income simultaneously. Schemes can be offered by increasing education spending to increase the workforce and improve physical models through improving health and infrastructure spending. With an increase in physical capital and labour expected to increase Gross Domestic Product (GDP), per capita income, and human development index.

On the other hand, an increase in GDP is expected to increase people's income and encourage people to increase household spending on education, health, and other expenses. Government expenditure and household expenditure are expected to reduce poverty. Decreasing the number of poor people will increase the index of human development.

The last discussion shows that the statistical problem of economic growth in the origin and new regions were 0.2207 and 0.6169, which was higher than any significance level. The conclusion for the test results shows that economic growth had no significant effect on the human development index both in origin and new regencies. The result becomes a new finding that sustainable economic growth needs to be done in origin and new regencies in Eastern Indonesia, so the sustainable economic growth is not only oriented to the high value of economic growth through resource exploitation and consumption alone. This research also indicates that economic growth does not affect the guality improvement of human resources due to the low economic activity in Eastern Indonesia and concentrated economic activity in Western Indonesia. The results of this study are not in line with research conducted by Fretes (2017) in which economic growth should be able to influence an increase in output capital expenditure as a whole, not only from government spending but also investment from the private sector. Economic growth will increase the revenue budget obtained by the government, followed by the addition of capital expenditure allocations. Increased output of capital expenditure from the government and the private sector is the result of increased economic growth and also influence the increase in the human development index.

Research Implication

The findings provide some support for the reduction of human development gap in origin and new regencies in Eastern Indonesia. This study provides the implications as follows.

First, development programs should reconsider the alleviation of poverty and economic growth that has insignificant impacts in the area of origin and expansion. This is particularly in terms of the quality improvement in development trough efforts to meet equal human development in every region. Hence, the economic growth will be qualified and sustained. The specific purpose is to distribute the growth evenly, particularly for qualified human development, without only exploiting the resources.

Secondly, the government should improve the management quality for regencies and cities of origin and expansion in terms of fiscal decentralization and regional autonomy policy. Budgeting management takes firm budgeting structure, since good budgeting governance in decentralization is probably not aligned with proper budgeting structure. The combination of fiscal decentralization between budgeting governance and structure should be balanced with the efforts of enhancing the revenue from internal sources (Original Local Government Revenue) and expenditures. Aside from reducing the dependency on development funding from the central government, increased local revenue can be aligned with the local expenditures, particularly on human resources quality improvement, in the field of education, health and per capita income, to meet equal human development in every region.

According to <u>Elia et al. (2020)</u>, regional finances that are managed more efficiently by focusing on community economic activities can create investment opportunities and create jobs based on the prominent regional product. This is supported by the opinion of <u>Siburian (2020)</u> that autonomy encourages the local governments in designing development programs that match unique characteristics of a particular region and distributing more balanced resources within it. Decentralization also encourages a local government to efficiently provide public services in need. Ultimately, decentralization motivates local politicians to effectively allocate local public goods and services. Liu et al. (2017) added that effects of fiscal decentralization on inequality tend to be significant when it is measured from the expenditure side. These findings may help us to understand that not only government expenditure can reduce inequality. Results of the studies provide further support for measure of fiscal decentralization from government revenue side in reducing inequality. Fiscal Decentralization shows the ratio of original regional revenue to total revenue.

Thirdly, according to Bappenas (2008) it is necessary for a preparatory period for transfer of personnel and for local economic and governance infrastructure to be established before proceeding with administrative division so that the new autonomous regions have better development performance. One indisputable prerequisite is the equitable division of economic potential for new autonomous regions to develop on par with the parent regions. In the short-term, changes in the pattern of personnel and development expenditure are necessary to stimulate local demand for goods and services. Full support must be provided for the development of agriculture as an economic base for new autonomous regions. Moving forward, there is an urgent need for fundamental changes in the law governing the division and establishment of new autonomous regions.

CONCLUSION AND SUGGESTION

Measurements that use the human development index can show improvements in the quality of human resources better in human development. Increased human development index shows the indication of increased prosperity. Results indicate that there is a difference in the human development index between origin and new regencies in eastern Indonesia. The human development index in the new regency is lower than in the origin regency. Thus, according to Myrdal Theory, the worsening disparities in human development between regions is due to the tremendous impact of backwash effects that occur in Eastern Indonesia. In origin and new regencies, fiscal decentralization had a significant positive effect on improving the quality of human development. Different results in origin and new regencies indicate that economic growth does not significantly influence the quality of human development. Poverty reduction occurring in the origin regency had a significant effect on improving the quality of human development, but did not affect the new regency.

From the overall results, the role of government in human quality development is still needed. Many more various studies related to sustainable development are required in order to find the right formula to be applied in various regional conditions. The fiscal decentralization policy by the government should take into account a good combination of budget governance and budget structure in increasing local revenue and expenditure for better and more balanced human development in the origin and new regions.

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How important are health and education in boosting subnational economic growth?

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ABSTRACT

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Recent development of the global economy is marked by increasing attention towards the health sector. This research contributes to how important are health and education for provincial economic growth, and connects it with foreign direct investments and public infrastructure spending. Taking Indonesia as a case study and employing GMM method, the analysis found that improving health and education outcomes is key for sub-national economic growth. However, foreign direct investment, domestic direct investment, and public spending on infrastructure failed to support growth in the sub-national level. The finding is robust against alternative specification. For policy suggestions, in order to dampen the negative effects of the recent global economic downturn and to boost growth at post-downturn period, government at all levels must maintain or even increase public spending in health and education which directly target improvements of health and educational outcomes. To ensure the improvements, public spending must be directed to provide good quality health and educational services, i.e. services which enhance health outcomes and develop students' cognitive skills. In addition, good quality health and educational services must be evenly distributed across sub-nationalities.

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INTRODUCTION

Indonesia is a large country, but the economic development among its regions are not evenly distributed. Based on data from World Development Indicators, Indonesia is the fourth most populated country in the world, the third largest nation in the Asia-Pacific, and the largest country in Southeast Asia in terms of population. According to OECD database, Indonesia is a member of the Organization of Economic Cooperation and Development (OECD). Equitable distribution of regional economic development within a country is an important economic objective for a developing economy like Indonesia. However, economic development among regions in the country has not been evenly distributed (<u>Panjawa, Samudro, & Soesilo, 2018</u>).

Economic development is influenced by developments in the social sector. The social sector includes the health sector (<u>Umar, 2017</u>) and the education sector (<u>Ogundari & Awokuse, 2018</u>). In addition, development is also influenced by the availability of financing (<u>Dawood, Pratama, Masbar, & Effendi, 2019</u>) and public spending (<u>Ambya, 2020</u>; Elia, Yulianto, Tiawon, Sustivah, & Indrajaya, 2020).

There were studies which showed that health outcomes affected a country's economic growth.

Ogundari & Awokuse (2018) found that health outcome was positively related to economic growth in Sub-Saharan African countries. Similarly, Spiteri & Von Brockdorff (2019) found that health outcome had a positive relationship with economic growth in European countries. Biyase & Maleka (2019) found that health outcome (as measured in life expectancy) contributed positively to economic growth in Southern African Development Community countries. Likewise, He & Li (2020) found a positive relationship between health outcome (as measured in life expectancy) and economic growth in a panel study of 65 countries. The health sector is a means of investment to create human capital (Collin & Weil, 2020). Previous studies show that human capital is needed for the acceleration of economic growth (Teixeira & Queirós, 2016a). The presence of high quality human resources can be allocated and utilized to create added value in the economy (Yudawisastra, Garlinia, Manurung, & Husnatarina, 2018).

In addition to health, educational outcome is also essential for economic growth of a country. There was a positive relationship between educational outcome and economic growth in European Union member countries (Pribac & Anghelina, 2015), the OECD countries (Teixeira & Queirós, 2016b), Sub-Saharan African countries (Ogundari & Awokuse, 2018), and Azerbaijan (Ismayilov, Kasumov, & Ahmadova, 2020). On the contrary, Afzal, Faroog, Ahmad, Begum, & Quddus (2010) found a short-run negative relationship between education and growth in Pakistan. In the same light, Adawo (2011) found that secondary and tertiary education actually reduced economic growth in Nigeria. Whereas, Mendy & Widodo (2018) found that the relationship between secondary education and economic growth in Indonesia was negative. Like health, education is an investment channel to create human capital. Likewise, human capital is a key determining factor for economic growth in a country via allocation of the human capital to economic sectors to create added value (Teixeira & Queirós, 2016a).

In addition, bank credit is also important for growth. Such studies discovered in many countries as Nigeria (Judith, Ugwuegbe, & Ugwuoke, 2014), India (Sehrawat & Giri, 2015a), and United States (Hartarska, Nadolnyak, & Shen, 2015) showed that bank credit had a positive and significant impact on economic growth. The reason that bank credit is pivotal for a country's economic growth is that the

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development of various economic sectors requires financing services (<u>Dawood et al., 2019</u>). Meanwhile, bank credit is the most important source of financing for developing countries (<u>Dawood, 2018</u>). Furthermore, the role of banking in economic growth is very crucial because it is a source of financing for economic activities both in the national scope (<u>Benczúr, Karagiannis, & Kvedaras, 2019</u>) and in the sub-national level (<u>Soedarmono, Hasan, & Arsyad,</u> <u>2017</u>).

A positive relationship between government spending and economic growth has been widely studied. <u>Chu, Hölscher, & McCarthy, 2020; Musa &</u> <u>Jelilov (2016)</u> found a positive relationship between government spending and economic growth. Whereas, <u>Ambya (2020)</u> found that local government spending had a positive effect on the economic growth in these areas. However, <u>Sáez, Álvarez-García, & Rodríguez (2017)</u> found that government expenditures had no significant impact on growth in European Union countries.

Table 1. Government Spending in Indonesia, 2018

Spending	Expenditure Budget			
	trillion rupiah	%		
Government Spending	2,220.7			
Total Regional Government	1,107.6	49.87		
Spending				
Central Government Spending	1,113.1	50.13		
Source: Ministry of Finance of Indonesia (and authors'				
calculations)				

Government spending tends to be followed by growth, while sub-national level governments' spending makes up half of total public spending. Public spending has an important impact on national economic growth (<u>Chu et al., 2020</u>) and also toward sub-national economies (<u>Ambya, 2020</u>). As a note, public spending by sub-national governments is a significant portion of total government spending and accounts for half of nation-wide public spending in Indonesia (Table 1).

Government spending supports a variety of development financing such as infrastructure, investment climate and quality of human resources. This prompts economic growth at the national and sub-national levels. Studies were conducted by researchers (<u>Ansar, Flyvbjerg, Budzier, & Lunn, 2016;</u> Saidi, Shahbaz, & Akhtar, 2018; Shi, Guo, & Sun, 2017) found relationship between road construction spending and economic growth. Meanwhile, other

studies found a positive relationship between Foreign Direct Investment (FDI) and economic growth (Ali & Mna, 2019; <u>Bakari, 2017</u>; <u>Hlavacek & Bal-Domanska,</u> 2016; <u>Bakari, 2017</u>; <u>Ali & Mna, 2019</u>). Research by <u>Lubis (2014)</u> found that the number of workers had positive and significant effect on economic growth in Indonesia. Similarly, <u>Putri (2014)</u> found that the number of workers had positive impact on economic growth in provinces in the island of Java, Indonesia. Likewise, <u>Ahmed, Mahalik, & Shahbaz (2016)</u> found a positive relationship between the number of workers and economic growth in Iran. In addition, a positive relation was found between labor and growth in Malaysia (<u>Ramli, Hashim, & Marikan, 2016</u>).

Current development of the global economy is marked by increasing attention towards the health sector as the result of the Covid-19 pandemic. Like many countries in the world, Indonesia suffers from increasing rates of Covid-19 cases (<u>Nugroho, 2020</u>). Likewise, Indonesia increased its attention to the health sector as shown by the sizeable increase in government spending in this sector (<u>Silalahi &</u> <u>Ginting, 2020</u>). This trend in government spending has important impact on Indonesia's economic development both in the national (<u>Hadiwardoyo,</u> <u>2020</u>) and sub-national level (<u>Maryanti, Netrawati, &</u> <u>Nuada, 2020</u>).

Based on the arguments, apart from existing research which analyzed the effect of health, education and other variables towards economic growth in the national level, there is yet to be a study assessing how important are health and education outcomes, compared to other variables, in boosting economic growth in the sub-national level, particularly for Indonesia. This question has important practical implications, specifically for developing countries like Indonesia. Policy makers both in the central and sub-national levels, in the effort to develop their areas, currently face intricate policy choices due to constrained public budget, especially when confronted with the current Covid-19 pandemic.

This research aims to fill this gap in the literature by analyzing how important are health plus education outcomes, compared to other variables, for subnational economic growth, in the context of Indonesia.

RESEARCH METHOD

The data used in this study is a panel of 33 provinces in Indonesia spanning from 2010 to 2018. As a note, starting from 2012, there are 34 provinces in Indonesia (statistical data since 2013). One addition is North Kalimantan, which previously was a part of East Kalimantan. However, to maintain a balanced panel data set, North Kalimantan was not included in the analysis.

The variables used in the current study were transformed to growth rates to ensure stationarity of the data. The abbreviation for economic growth rate of provinces in Indonesia is gPDRB, growth of bank credit is gCB, growth of FDI is gFDI, growth of provincial government expenditure is gGE, growth of provincial government infrastructure expenditure is gGEin, growth of health outcome (measured by life expectancy) is gHI, growth of education outcome (measured by years of schooling) is gEdu, and growth of labor is gL. γ_1 is defined as constant term, γ_i as the estimated coefficients, $e_{i,t}$ as the error term; *i* as the index for province *i*, and *t* as the year. Following <u>Gujarati & Porter (2009</u>), the empirical model for this study was written as follows.

 $gPDRB_{it} = \gamma_1 + \gamma_2 gCB_{1it} + \gamma_3 gFDII_{2it} + \gamma_4 gGE_{3it}$ $+ \gamma_5 gGEin_{4it} + \gamma_6 gHI_{5it} + \gamma_7 gEdu_{6it}$ $+ \gamma_8 gL_{7it} + a_t \qquad (1)$

The choice of variables was adapted from the previous work (Ambya, 2020) by adding health and education outcomes, bank credit, and investment. The data used were annual data from 33 provinces in Indonesia. Data on PDRB, health outcomes (HI), educational outcome (Edu), government expenditures (GE), and labor (L) were obtained from the Central Statistical Bureau of Indonesia (BPS), data on bank credit (CB) were obtained from The Indonesian Authority of Financial Services (OJK), data on Government spending for infrastructure (GEin) were obtained from The Ministry of Finance of Indonesia, and data on FDI were obtained from The Investment Coordination Agency of Indonesia.

This study applies the panel difference Generalized Method of Moments (GMM) estimates. The reason to apply the panel GMM method is to handle issues of endogeneity. For the panel GMM method, one-period lag of the regressors were used as instruments. The data are stationary in growth form. Table 2 shows the unit root stationarity test using various approaches; LLC, IPS, ADF-Fisher, and PP-Fisher.

Table 2. Panel Unit Root Test

Та	Individual Intercept				
	LLC	IPS	ADF-Fisher	PP-Fisher	
gPDRB	-15.782	-3.374	121.053	128.594	
p-value	0.000	0.000	0.000	0.000	
gCB	-6.237	-0.178	85.536	284.255	
p-value	0.000	0.430	0.053	0.000	
gFDI	-9.200	-2.735	101.905	211.382	
p-value	0.000	0.003	0.001	0.000	
gGE	-23.358	-2.954	108.515	173.794	
p-value	0.000	0.002	0.001	0.000	
gGEin	-10.865	-1.206	88.483	192.870	
p-value	0.000	0.114	0.034	0.000	
gHl	0.577	-0.670	97.441	99.863	
p-value	0.718	0.252	0.007	0.005	
gEdu	-7.646	-1.450	93.156	172.028	
p-value	0.000	0.074	0.016	0.000	
gL	-12.506	-3.676	118.697	307.596	
p-value	0.000	0.000	0.000	0.000	

Values of the statistics and their respective pvalues in Table 2 shows that growth of PDRB (gPDRB), bank credit (gCB), FDI, health (gHI), education (gEdu), government spending (gGE), infrastructure spending (gGEin) and labor (gL) are stationary.

Table 3. Variance Inflation Factor

-		EDU	HI	Gein	FDI	L	GE
CB	R ²	0.17	0.14	0.70	0.55	0.23	0.42
	VIF	1.20	1.16	3.32	2.24	1.31	1.73
EDU	R ²		0.22	0.18	0.05	0.02	0.02
	VIF		1.28	1.21	1.06	1.02	1.02
HI	R ²			0.08	0.13	0.14	0.02
	VIF			1.08	1.14	1.16	1.03
Gein	R ²				0.25	0.03	0.33
	VIF				1.33	1.03	1.49
FDI	R ²					0.35	0.25
	VIF					1.55	1.33
L	R ²						0.15
	VIF						1.18

Table 4. Autocorrelation Test for GMM

Test order	m-	rho	SE(rho)	P-value
	Statistic			
AR(1)	-2.04050	-0.03770	0.01848	0.041
AR(2)	0.89054	0.00480	0.00539	0.373

To test the multicollinearity, Variance Inflation Factor test (VIF) was employed. As displayed in Table 3, the values of VIF is less than 10 in all cases. Thus, the model did not suffer from multicollinearity. Verazulianti et al., How important are health and education...

The panel GMM estimated if the choice of instruments was appropriate and did not suffer from autocorrelation. For the panel difference GMM estimates it was found that the probability value of the Hansen J-statistic is 0.267 (Table 5). Since the p-value of the J-statistic was greater than 0.05, the choice of instruments (one-period lagged regressors) was appropriate. While for autocorrelation, based on the Arellano-Bond serial correlation test, the errors did not suffer from autocorrelation for the autoregressive of order 2 (AR(2)) (Table 4).

RESULT AND DISCUSSION

Health, Education and Economic Growth in Sub-nationalities in Indonesia

Equitable distribution of regional economic development within a country is an important economic objective for a developing economy like Indonesia. However, economic development among regions in the country has not been evenly distributed (Panjawa et al., 2018). This is as indicated by the share of Gross Regional Domestic Product (PDRB) of the provinces, where the national economy are dominated by provinces in the islands of Java and Sumatra. Figure 1 shows that in the first quarter of 2019, the PDRB of provinces in the island of Java% was 59.03% of total Indonesia's Gross Domestic Product. This share is followed by PDRB shares of the provinces on the islands of Sumatra (21.36%), Kalimantan (8.26%); Sulawesi (6.14%), Bali and Nusa Tenggara (3.02%), and lastly Maluku and Papua (2.19%).

Sub-national economic growth tends to follow growth in health outcomes. The health sector is a means of investment to create human capital (Collin & Weil, 2020). Meanwhile, human capital is needed for the acceleration of economic growth (Teixeira & Queirós, 2016a). The presence of high quality human capital can be allocated and utilized to create added value in the economy (Yudawisastra et al., 2018). The trend of PDRB growth and growth in health outcome (measured by life expectancy) in Indonesia is presented in Figure 2. As illustrated in Figure 2, PDRB growth and health outcome growth in Indonesia tend to follow each other. Since 2011, the growth in health outcomes has shown a downward trend. Likewise, PDRB growth rate has shown a downward and stagnant trend since 2012.



Figure 1. Regional contribution to the national GDP of Indonesia in the 1st quarter of 2019 Source: Central Statistical Bureau of Indonesia and authors' calculations.







Figure 3. Economic growth and year of schooling growth, 2010-2018 Source: Central Statistical Bureau of Indonesia and authors' calculations.

Educational outcome tends to grow overtime, however economic growth in the sub-national level did not follow suit. Like health, education is an investment channel to create human capital. Meanwhile, human capital is a key determining factor for economic growth in a country (<u>Teixeira &</u> <u>Queirós, 2016a</u>) and in the sub-national level (<u>Faggian, Modrego, & McCann, 2019</u>). Figure 3 shows the development of PDRB and growth in education outcome (measured by years of schooling) in Indonesia. In this figure, it can be viewed that growth of education outcome has had an increasing trend since 2011. However, unlike education, PDRB growth rate has tended to be stagnant since 2012.

Estimation Results

This section presents estimation results in the study. As shown in Table 5, bank has a positive and significant effect on economic growth (gPDRB) of provinces in Indonesia. This result is in line with the findings in the case of Turkey (<u>Önder & Özyıldırım,</u> 2013), Indian states (<u>Sehrawat & Giri, 2015b</u>) and Cameroon (<u>Belinga, Zhou, Doumbe-Doumbe, Gahe, & Koffi, 2016</u>).

Table 5. The Estimated Findings and Robustness Check

Variable	GMN	11	GMM	12
variable	Coeff	p-value	Coeff	p-value
gPDRB(-1)	0.0721	0.000	0.0765	0.000
gCB	0.0673	0.000	0.0700	0.000
gEdu	0.1992	0.044	0.1867	0.089
gHl	2.7820	0.000	2.6486	0.000
gGEin	-0.0000	0.000	-0.0000	0.000
gFDI	-0.0002	0.529		
gDDI			0.0002	0.260
gL	0.0004	0.005	0.0003	0.000
gGE	0.0002	0.080	0.0001	0.183
J-statistic		16.806		15.415
Prob(J-statistic)	0.267		0.350
AR(1) p-value		0.041		0.050
AR(2) P-value		0.373		0.438

Health sector also has positive impact in spurring the sub-national economy, plus it is highly important for boosting growth. As shown in Table 5 (GMM1), the panel GMM estimates found that health outcome (gHI) has a positive and statistically significant influence on economic growth in the sub-national level (gPDRB). This finding is in line with the conclusion obtained by <u>He & Li (2020)</u> in a crosscountry panel data study, in Southern African Verazulianti et al., How important are health and education...

Development Community member countries (<u>Biyase</u> <u>& Maleka, 2019</u>) and for the provinces in Indonesia's Kalimantan Island (<u>Safira, Djohan, & Nurjanana, 2019</u>). In addition, Table 5 (GMM1) shows that the impact of growth in health outcomes on economic growth in the provinces in Indonesia is approximately 40 times larger than the effect of bank credit on subnational economic growth.

Education has a positive and significant impact on sub-national economic growth. Based on the GMM estimation result, the study finds that the growth of education outcome (measured in years of schooling) (gEdu) has a positive and statistically significant impact on growth in the sub-national level (Table 5, GMM1). This finding is similar to that of <u>Hanushek</u> (2016) in developing countries, <u>Teixeira & Queirós</u> (2016b) in OECD countries, and <u>Ogundari & Awokuse</u> (2018) in Sub-Saharan African countries.

Government spending has contributed positively towards regional economic growth. As shown in Table 5 (GMM1), government expenditures (gGE) have positive and statistically significant impact on sub-national growth. The finding is in line with the results found in OECD countries (<u>Connolly & Li,</u> 2016), in European Union countries (<u>Sáez et al.,</u> 2017), in high-income and low-income countries (<u>Chu et al., 2020</u>) and in Indonesian provinces (<u>Ambya,</u> 2020).

Public spending on infrastructure is still not supportive towards sub-national growth. In contrary to the previous variables, public spending on infrastructure (gGEin) has a negative and significant impact towards growth in the sub-national level. (Table 5, GMM1). This indicates that public infrastructure spending has not yet contributed to sub-national growth. This result is in line with the conclusions by <u>Ansar et al. (2016)</u> in China and <u>Shi et al. (2017)</u> in sub-national areas in China.

Both foreign direct investments (FDI) and domestic investment (DDI) do not have a positive impact on growth in the sub-national areas. The estimates of the effect of FDI (gFDI) on sub-national economic growth are negative but insignificant (Table 5, GMM1). As a robustness check, GMM estimates are performed by replacing FDI with DDI (Table 5, GMM2). The estimates still show that DDI has insignificant impact on sub-national growth (Table 5, GMM2). This result is in accordance with that of <u>Alvarado</u>, <u>Iniquez</u>, <u>& Ponce (2017)</u> in lowermiddle income Latin American countries, <u>Bakari</u> (2018) for Algeria, <u>Hayat (2018)</u> in low and middleincome countries with a large natural resource sector, <u>Asamoah, Mensah, & Bondzie (2019)</u> in Sub-Saharan African Countries, <u>Bakari & Sofien (2019)</u> in Asian developing countries, <u>Sokhanvar (2019)</u> in five European Union member countries, and <u>Faizah,</u> <u>Fasa, Suharto, Rahmanto, & Athief (2019)</u> in Indonesian provinces.

Labor has a positive and significant impact on growth in the sub-national level. The GMM estimates for the effect of labor (gL) on regional economic growth are positive and statistically significant (Table 5). This result is in line with the findings by <u>Abubakar & Bala (2016)</u> in India, <u>Ramli et al. (2016)</u> in Malaysia, and <u>Bakari, Mabroukib, & Othmani (2018)</u> in Nigeria.

Research Implication

The main purpose of this analysis is to examine how important are health and education in boosting economic growth in the sub-national level. This issue is significant for a developing country such as Indonesia which achieved significant economic development, but it is still not evenly distributed among its regions. On the other hand, sub-national level governments' spending makes up half of total public spending in Indonesia.

The estimation results show that bank credit has a positive effect on economic growth in the subnational level. As shown in Table 5, bank has a positive and significant effect on economic growth (gPDRB) of provinces in Indonesia. The reason for this result is that bank credit provides funding for investment, which can increase the amount of capital stock in the economy, and thus increase economic growth (<u>Sehrawat & Giri, 2015b</u>). In addition, banks provide funding for entrepreneurs, which enables them to implement innovative ideas, products and production processes. Ultimately this will increase innovation in the economy and boost economic growth (<u>Belinga et al., 2016</u>).

Health sector has positive impact in spurring the sub-national economy. As shown in Table 5, based on the panel GMM estimates, health outcome (gHI) has a positive and statistically significant influence on economic growth in the sub-national level (gPDRB). The rationale for this result is that improvement in health sector implies extending life expectancy (Leung & Wang, 2010), and extended life expectancy

increases savings as well as physical and human capital formation. In turn, higher physical and human capital stock in the economy implies higher economic growth (Sharma, 2018). Furthermore, better health outcomes increases labor market participation and workers' productivity (Bloom, Canning, Kotschy, Prettner, & Schünemann, 2019).

In addition, it was also found that health sector is highly important for boosting growth in the subnational economy. The panel GMM estimates in Table 5 shows that the impact of growth in health outcomes on economic growth in the provinces in Indonesia is approximately 40 times larger than the effect of bank credit on regional economic growth. This result highlights that public investment in human capital, in particular improving health outcomes is key to boosting sub-national growth. According to McCalman et al. (2018), this objective can be achieved by providing good quality public health services which targets improvements in health outcomes.

Similarly, education was found to have a positive and significant impact on sub-national economic growth. Based on the estimation results, the study found that the growth of education outcome (measured in years of schooling) (gEdu) has a positive and statistically significant impact on growth in the sub-national level (Table 5). A justification for this finding is that education, like health, is an investment channel to create human capital. While, more human capital makes labor is more productive and increases the rate of innovations in the economy, which in turn result in higher economic growth (Teixeira & Queirós, 2016a).

Furthermore, increasing years of schooling, enhancing quality of education services, plus distributing it more equally among areas are important for boosting sub-national growth. As a note, some scholars such as Mendy & Widodo (2018) found conflicting results to the above. The conflicting findings, in one hand, highlight that years of schooling in Indonesia is still relatively low. According to 2018 data from the Central Statistical Bureau of Indonesia (BPS), mean years of schooling by provinces range from 6.5 years in the province of Papua to 11 years in the capital city of Jakarta; while the national average is 8.3 years. Whereas, mean years of schooling in Germany, the US, the UK and OECD countries in 2018 were 14.1 years, 13.4 years, 13 years and 12 years respectively (United Nations Verazulianti et al., How important are health and education...

Development Programme, 2019a; 2019b; 2019c; 2019d). On the other hand, in addition to years of schooling, the quality of education is important for the nexus between education and growth. Hanushek (2013) concluded that enhancing quality of schools is important in order for education to be able to enhance growth in developing countries. In relation to quality schools, the education service needs to be able to increase the cognitive skills of the students so they can contribute to growth (Hanushek, 2016). A revealing World Bank study found that 55% of Indonesian children who completed school are functionally illiterate. Being functionally illiterate means not being equipped with skills to enter the labor market; for example, being able to read but unable to comprehend the content. Whereas, the percentage of functional illiteracy in Vietnam and the OECD are 14% and 20% respectively (World Bank, <u>2018</u>). Moreover, more years of schooling and higher quality education services needs to be distributed more equally among regions (Uddin & Sarntisart, 2019). Thus, in order for education to continue to have a positive impact, or even increase its impact towards sub-national economic growth, years of schooling needs to be increased together with enhancing the quality of school service delivery. In particular, it must be ensured that the schools are able to sufficiently enhance the cognitive skills of the students. In addition, the enhancement of education outcome and educational service quality must be distributed more equally across all sub-national areas.

Government spending also contributes positively towards regional economic growth; however, the impact is small relative to health and education. As shown in Table 5, government expenditures (gGE) have positive and statistically significant impact on sub-national growth. Although the impact of government spending on sub-national growth is positive, its magnitude is miniscule compared to that of health and education. The reason that government spending has small impact on sub-national growth is that it may not have been sufficiently allocated to productive government spending such as providing quality education, increasing health outcome, and building highly needed public infrastructures. If instead this was the case, it would have increased the stock of human capital in the economy and enhance the productivity of existing private capital and would ultimately result in higher growth (Chu et

al., 2020). Thus, in order to boost sub-national growth, public spending needs to be allocated to activities which target enhancement of health and education outcomes by providing quality and equitable public health and educational services.

However, public spending on infrastructure is still not supportive towards sub-national growth. In contrary to the previous variables, public spending on infrastructure (gGEin) has a negative and significant impact towards growth in the sub-national level (Table 5). This finding indicates that public spending in infrastructure has not yet contributed to subnational growth. The argument for the negative relationship is that not only the quantity of infrastructure that matters, but also the quality and its usefulness (Chakamera & Alagidede, 2018). If government spending was directed to build public infrastructures with sufficient quality and appropriate usefulness, this would increase the productivity of private (physical and human) capital, and ultimately would result in higher growth (Chu et al., 2020). Public infrastructure which are useful are those which encourage entrepreneurship and the private sector to thrive (Bennett, 2019), do not crowd-out private investment (Shi et al., 2017; Nguyen & Trinh, 2018), and increase the productivity of private physical and human capital (Chu et al., 2020). Thus, in order for public spending on infrastructure to have positive impact on sub-national growth, it should be provided based on the needs of the private sector, complement private investments, and should be provided in sufficient quality.

It was also found that both Foreign direct investments (FDI) and domestic investment (DDI) do not have a positive impact on growth in the subnational areas. The GMM coefficient estimates of the effect of FDI (gFDI) on sub-national economic growth are negative but insignificant (Table 5). Similarly, the estimates show that DDI has insignificant impact on sub-national growth (Table 5, GMM2). The rationale for this result is that the direction of relationship between investment and growth depends on the country's level of development, and the educational level of its citizens. Economies which are highly developed with high levels of education and human capital, the nexus between FDI and growth is positive. While for low and middle income countries with low levels of education and human capital, the nexus between FDI and growth is negative (Alvarado et al., 2017). It is

known that the larger the amount of human capital that an economy has, the higher is the economy's capacity to absorb new technology from abroad, and to spur economic growth in the domestic economy (Datta & Mohtadi, 2006). Thus, investment would have a positive impact on economic growth only if it is supported by sufficient human capital in the economy. Therefore, to enable investment to have a positive impact towards sub-national growth, increasing human capital is required by increasing health and educational outcomes. This can be achieved by directing more public funds to target increases in health and education outcomes.

Labor has a positive and significant impact on growth in the sub-national level. The estimates for the effect of labor (gL) on regional economic growth is positive and statistically significant, but the magnitude is small compared to health and education (Table 5). The reason for the small magnitude for labor is that it is well known in economics that labor requires complementary factors to enhance its productivity. It is found that human capital enhances labor productivity (Benos & Karagiannis, 2016), which in turn enhances economic growth (Karaalp-Orhan, 2016). Therefore, government policy needs to be directed to increase labor productivity by increasing human capital. This can be achieved by allocating more public spending to activities which target the increase of health and educational outcome by providing quality public health and educational services equitably across all sub-national regions.

CONCLUSION AND SUGGESTION

By using a panel data from 33 provinces in Indonesia over the period from 2010 to 2018, and the GMM model, this study found that health, education, bank credit, government spending, and labor have a positive and significant effect on subnational economic growth. On the contrary, government expenditure on infrastructure was found to have a negative and statistically significant to sub-national economic growth in. Meanwhile, foreign and domestic investments failed to have a significant impact on sub-national economic growth. Furthermore, the estimation results showed that education outcomes significantly health and influenced economic growth in the sub-nationals as compared to other variables. The findings of our estimated model are robust with alternative model specification. The policy suggestions of the results are in order to dampen the negative effects of the current global economic downturn on the subnational economies, and to boost growth postdownturn period, the central and sub-national governments must focus on increasing human capital by maintaining or even increasing government spending aimed at improving health and education outcomes. This can be achieved by providing good quality public health services which enhances life expectancy.

In addition, the quality of public-school service delivery needs to be increased by ensuring that the schools are able to sufficiently enhance the cognitive skills of the students. Furthermore, good quality health and educational services need to be equally distributed across the all sub-national regions. Not only will such policy enhance human capital by increasing health and education outcomes, but it will also make domestic labor more productive, and generate the promised beneficial effect of FDI and DDI in boosting sub-national and national growth. Furthermore, such policy would be aligned with achieving the UN Sustainable Development Goals number 10: reducing inequality within a country.

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Sustainability of corporate based shallot farming business: Evidence from Malang Regency, Indonesia

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ABSTRACT

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Shallot is the strategic horticulture commodity and one of superior national commodities. Ministry of Agriculture initiated a pilot project for the development of a corporate based shallot farming business area in Ngantang dan Pujon Districs, Malang Regency. This research aims to analyze the sustainability of the shallot farming in Ngantang and Pujon Districts, Malang Regency. Multidimensional Scaling (MDS) RAP-Shallot's analysis with five dimensions (ecological, economic, social, institutional, and technological) was used with a total of 49 attributes. The results of the sustainability index analysis show that the institutional, technological, and social dimensions are classified as guite sustainable, but the ecological and economic dimensions are still classified as less sustainable. Some attributes that are sensitive to the sustainability of shallot farming include integrated pest and disease control, marketing access of shallots, conflicts related to farming, the role of the middleman in harvest collecting, and the use of high quality and certified bulb. To improve the sustainability of shallot farming, the supervision and management of each attribute must be carried out optimally and integrated with many stakeholders such as farmers, traders, cooperatives, and the government.

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INTRODUCTION

The agricultural sector significantly contributes and cannot be separated from the development of the Indonesian economy (Bashir et al., 2018). This sector also has a significant impact on reducing the unemployment rate because it can absorb 28.79% of the total workforce in Indonesia and increase foreign exchange through superior export commodities. According to <u>BPS (2020)</u>, from 2016 to 2019 the agricultural sector on average contributed 13.4% to Indonesia's Gross Domestic Product (GDP) following trade and industry sectors. The agricultural sector consists of several sub-sectors which include food, horticultural, plantation, livestock, agricultural services, and hunting. Each of these subsectors plays a role in the economy and agricultural development in Indonesia, and the horticulture sub-sector has good prospects with high potential for commodity diversity (<u>Waryanto et al., 2014</u>).

Agricultural Strategy Plan of The Indonesia Ministry of Agriculture of 2014-2019 states that shallot is the strategic horticulture commodity and one of superior national commodities. Shallot has a high economic value and has been intensively cultivated by farmers. Also, it has an impact on regional and national economic development (Sumarni et al., 2005). The shallot production always increases every year with average national productivity of 9.93 tons/hectare or 3.55% from 2015-2019, but the production has not been able to meet the needs of shallot in Indonesia (Kustiari, 2018). It is due to the increase in the shallot consumption in Indonesia (0.529 ounces/week), considering that shallots are a type of vegetable that cannot be replaced by other commodities in term of utilization (Irawan, 2007). The high level of public consumption is comparable to market price fluctuations. It is due to a gap in the quantity and quality of shallot production, which is still seasonal and has an unsustainable pattern (Kustiari, 2018).

At the producer level, the price is more stable than that at the consumer level, which is more volatile, potentially harming farmers and consumers. Astuti and Mailena (2019) stated that the price gap from the producer and consumer occurs due to the long marketing chain and the large amount of margins received by the middlemen. Apart from the production instability and the price of shallot, another problem is farmers' cultivation pattern which only focuses on increasing production without paying attention to natural resources and the environment. Research results from Lawalata et al. (2017), Moekasan (2012), and Sulistivono, et al. (2008) show that the productivity of shallot can decrease because of the use of pesticides and chemical fertilizers that ignores compatibility and spraying doses, the use of bulb as seeds, the use of monoculture farming systems, and climate change. These conditions encourage the farmers to understand sustainable agriculture more in order to achieve the economic and social needs by using environmentally friendly technology and community empowerment. Consequently, the natural resources and the environment can be preserved.

Malang Regency is one of the most significant contributors to shallot commodity in East Java, and in 2018 it was able to produce around 13.4% or 49,478 tons. It makes shallot a leading commodity in Malang Regency. Based on the Decree of the Ministry of Agriculture No. 46/KPTPS/SR.130/D/6/2018, Malang Regency, especially Ngantang and Pujon Districts, was used as a pilot project location for the development of a corporate based shallot farming business area. According to statistical data of Office for the Food Crops, Horticulture and Plantation of Malang Regency, Ngantang and Pujon Districts have the largest shallot production with 90% of the total district production. The data from DTPHP showed that only 35% of shallot farmers carry out balanced fertilization according to the proper dose and only 35% of farmers carry out integrated pest and disease control. Hence, it is crucial to study the sustainability of shallot farming in Malang Regency.

Previous research related to the sustainability analysis of shallot was carried out by Waryanto (2014) in Nganjuk Regency using an efficiency approach for the economic, environmental and social aspects. Research by Susilawati et al. (2019) was conducted in Brebes Regency, Central Java to see the sustainability on economic, ecological, social, institutional and technological aspects. Susilawati et al. (2019) stated that based on the results of Multidimensional Scaling (MDS) analysis, shallot farming in Brebes Regency is classified as less sustainable with the index of 46.18. From the 45 sustainability attributes, only 17 attributes are classified as sensitive and have an effect on the sustainability of shallot farming. This result contrasts the research results by Mar'atusholikha et al. (2019) which stated that the sustainability index of garlic farming in Tegal Regency is guite sustainable with a value of 65.44. In addition, the results of this study stated that policy intervention by the central and local governments will greatly affect the sustainability of garlic farming.

However, from several previous studies, it is necessary to research the application of the government small-scale farmer corporate concept to increase farmers' trust in the sustainable agriculture concept (Dalimunthe and Kurnia, 2018). Besides, Erbaugh et al. (2019) stated that a local scale sustainability analysis is needed to facilitate monitoring and evaluation as well as measurable environmental and social objectives. In order to obtain a comprehensive assessment result of shallot farming based on farmer corporations in Malang Regency, a sustainability study was conducted based on an analysis of five dimensions, specifically ecology, economy, social, technology, and institutions.

Therefore, the objective of this research is to analyze the sustainability of shallot farming in

Ngantang and Pujon Districts, Malang Regency. The implementation of the concept of sustainable development is expected to be able to describe the sustainability of shallot farming based on farmer corporations in the region.

RESEARCH METHOD

The research location is in Ngantang and Pujon Districts, referring to the Decree of the Ministry of Agriculture No 46/KPTPS/SR. 130/D/6/2018, where these two districts are the pilot project locations for the development of the shallot area based on the farmers corporation. In this study, the respondents were 55 farmers and eight expert respondents (head of district, official worker of local agriculture office, agricultural and environmental experts, and agricultural workers).

Primary data collection was carried out using a questionnaire distributed to farmers and experts to find out information on the sustainability attributes (ecological, economic, social, technological, and institutional). Interviews were conducted to explore data regarding the importance of strategic factors. The required secondary data were the biophysical environment conditions, the area of agricultural land, agro-climate and land condition, economic and socio-cultural situation, institutional and marketing conditions, and policies.

The sustainability analysis was carried out using Multidimensional Scaling (MDS) analysis with the Rap-SHALLOT technique and five dimensions: ecological, economic, social, institution, and technological dimensions (Fauzi and Anna, 2005; Susilawati et al., 2019). The analysis consists of Monte Carlo analysis and leverage analysis to see which attributes are sensitive to other variables. The MDS analysis results can show a sustainability index in each dimension, as shown in Table 1.

Tal	ble	1.	The	value	of	Sustaina	bility	' Ind	ex
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Index Score	Category
0 – 24.99	Unsustainable
25 – 49.99	Less Sustainable
50 – 74.99	Quite Sustainable
75 - 100	Good/Sustainable
Source: Thamrin et al. (2007)	

Source: Thamrin et al. (2007)

The data on sustainability key factors were processed using prospective analysis. The prospective analysis is an attempt to explore future Parmawati et al., Sustainability of corporate based shallot ...

possibilities. The analysis results provide information about the key factors and strategic objectives that play a role in shallot farming according to the needs of the actors involved in the shallot farming (<u>Bourgeois and Jesus, 2004</u>). These key factors will be used to describe the possible future for the development of shallot farming.

RESULT AND DISCUSSION

Respondent Characteristics

Based on the results of the interview conducted to 55 farmer respondents in Ngantang and Pujon Districts, it was found that on average, the respondents in Ngantang and Pujon Districts had elementary school (SD) and junior high school (SMP) education levels. This level of education will greatly affect the ability to receive information obtained and individual awareness, especially related to steps to improve the sustainability of shallot farming in Ngantang and Pujon Districts. This is consistent with the findings of Thamrin et al. (2012) which stated that education will influence farmers in terms of information absorption and the ability to innovate in agriculture. In addition, farmers' awareness is influenced by the level of formal and informal education held by farmers, because farmers who have higher education will have broader insights regarding agricultural productivity.

Table 2. Characteristic of Respo	ondent
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Variable	Total	Proportion
		%
Age		
30 - 39 years	9	16
40 - 49 years	32	58
>50 years	14	25
Sex		
Male	36	65
Female	19	35
Education		
Elementery school	49	89
Junior High Scholl	6	11

Farmers in Ngantang and Pujon Districts tend to plant seasonal vegetables and fruit crops such as shallots, garlic, carrots, radishes, chilies, tomatoes, eggplant, and beans. This is indicated by the area of land owned by farmers in Ngantang District which is dominated by shallot agricultural land. Meanwhile, in Pujon District, it is still dominated by carrot farming, which is followed by *petai* and shallot agricultural land. Because of this, Ngantang and Pujon Districts, according to The Decree of the Ministry of Agriculture No. 46/KPTPS/SR. 130/D/6/2018, are used as pilot project location for the development of the corporate based shallot farming business area.

Forty-four percent of respondents live within a 400-600 m distance from the land, and 68 percent of the land is possessed by 68 percent of interviewees having an area of 0.5-29 ha. They dominate the domestic distance, affecting the production and productivity of farmers.

Sustainability of Farming Business

Multidimensional Scaling (MDS) is divided into five dimensions and several attributes that consist of ecological dimension, economic dimension, social dimension, technology dimension, and institutional dimension. The attributes in each dimension were obtained from the previous analysis and literature study. In this research, there are total of 49 attributes. It is divided in ecological dimensions (10 attributes), economic dimensions (10 attributes), social dimensions (10 attributes), institutional dimensions (10 attributes), and technological dimensions (9 attributes). Each attribute has a power to increase and decrease the sustainability value. The analysis using Rap-Shallot shows the MDS sustainability index for each dimension in Figure 1.



Figure 1. Sustainability index of corporate based shallot farming business

The sustainability index above shows that the technology, institutional, and social dimensions were quite sustainable with their respective values, namely 66.62; 52.90; 60.47. It can be seen that in order to

increase the sustainability of shallot farming in Malang Regency, the three dimensions (technology, institutions, and social dimensions) need to be improved by carrying out several innovations including agro-industrial development, technological innovation, giving special incentives to young farmers, developing modern agriculture, training and empowering young farmers, and introducing agricultural industry development and agricultural innovation to the younger generation from an early age (Susilawati, 2016). Meanwhile, the ecological and economic dimensions were classified as less sustainable with values of 49.20 and 43.96 respectively. Based on the average of these values, shallot farming in Malang Regency is classified as quite sustainable. The sustainability of these dimensions is influenced by several attributes in it. It is necessary to manage and improve several attributes that are considered sensitive to sustainability.

Ecology dimension

Sustainability index of ecological dimensions has the value of 49.20, which is categorized as less sustainable. It needs many improvements to achieve sustainability, especially in sensitive attributes. The attributes that affect corporate-based shallot farming's sustainability on ecological dimension can be seen from the leverage analysis (Table 3).

Table 3.	Leverage	Value of	Ecological	Attributes
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Attributoc	Root Mean
Attributes	Square
Erosion conservation	2.43
Concurrent plants	3.55
Organic additives	5.83
Utilization of agricultural waste	5.83
Agrochemical management of fertilizer use	6.29
Integrated pest management	8.96
Disease intensity	6.10
Pest intensity	4.64
Land ownership	3.24
Land resource management	2.17

The ecological dimension consists of 10 attributes that impact the sustainability of corporate based shallot farming business. The results show that integrated pest and disease management (IPM) (Leverage = 8.96) were the most sensitive attributes to the sustainability of shallot farming. The results of the interview show that shallot farmers only focused on crop productivity and ignored the environmental impacts. The use of pesticides was still considered the most accessible and cheapest step to increase agricultural yields. However, on the one hand, pesticides' impact is hazardous for both human health and the surrounding environment. Thus, Integrated Pest and Disease Management (IPM) is needed. The application of IPM serves as a method to control pests by reducing or eliminating chemical pesticides; it uses a holistic approach between traditional habits and modern technology (<u>Stenberg, 2017; Dara, 2019</u>).

According to Popp et al. (2012), the use of pesticides that is not well regulated in developing countries can cause chemical pesticides to be left behind and locked in the soil. Implementing IPM aims to address all economic, environmental, and social aspects and provide safe and affordable food for consumers and benefits for producers and sellers while maintaining environmental health to achieve environmentally sound and sustainable development (Dara, 2019; Moekasan, 2012). Socialization and education related to IPM to farmers are essential, especially regarding the benefits obtained and benefits in a sustainable manner. It is inseparable from the role and cooperation of the agriculture agency, agricultural extension agents, academics, farmer groups, and the surrounding community (Fangohoi et al., 2018; Prasetyo & Hariani, 2018).

Economic dimension

It is shown that the value of sustainability index of economic dimensions was 43.96, categorized as less sustainable. Hence, it needs many improvements to achieve sustainability, especially in sensitive attributes. The attributes that affect corporate-based shallot farming's sustainability on economic dimension can be seen from the leverage analysis results (Table 4).

Table 4. Leverage Value of Economic Attributes

Attributes	Root Mean Square
Market opportunity	3.22
Shallot market reach	2.96
Access to shallots market	7.56
Acquisition of farmers' business capital	5.32
Compulsory cooperative savings	6.31
Shallots price fluctuation	6.75
Farming income	5.44
Biological control costs	3.36
Labor costs	2.57

There is 9 economic attributes that impact the sustainability of corporate based shallot farming

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business in the Malang Regency. Attributes of the access to shallot marketing (Leverage = 7.65) was classified as sensitive attributes to the sustainability of shallot farming in Malang Regency. Marketing access is an external factor that affects the agribusiness competence of farmers. If the area has a difficult marketing access, the farmers will be less interested in running the farm, which is in line with research by <u>Andriani et al. (2017)</u>. Marketing is a collaborative process of social and administrative, such as exchanging products, services, and values with other people (<u>Al Jaafreh, 2017</u>). Market access to an agricultural product like shallot must be improved by cooperating with government and private agencies (local and regional).

The partnership program is essential in sustainability, especially in the attribute of market access (Puspitaningrum & Gayatri, 2019). Action that can be done to make access is public-private partnership, which is a collaboration between the local government and the private sector utilizing various resources, knowledge, and risks to be able to streamline products and increase the distribution of products and services (Hartwich and Tola, 2007). The functions of public-private partnership include reducing production costs and business risks in each market chain, improving the guality of the products and using technology, and increasing the capacity of human resources involved in each process carried out and increasing product competitiveness marketing accessibility. Therefore, public-private partnership will increase the benefits for both parties who are working together, as well as significantly increase (farmers') income, finance (working capital), and knowledge transfer (Pasaribu, 2015).

Social dimension

The value of sustainability index of social dimensions was 60.47, that is categorized as quite sustainable. But to achieve more sustainability, it needs many especially in sensitive attributes. The attributes that affect corporate-based shallot farming's sustainability on Social dimension can be seen from the leverage analysis results (Table 5).

The social dimension consists of 10 attributes that impact the sustainability of corporate based shallot farming business in the Malang Regency. The attribute that has a high sensitivity value towards sustainability is conflicts related to farming (Leverage = 6.33). Conflict is a problem that has existed in society for a long time. The forms of the conflict vary according to the root of problem, such as the conflict over land tenure, which has occurred since the colonial era to this day. Conflicts that often occur in society are social conflicts, in which there is a dispute between two or more groups that lasts for a particular time and has a broad impact, resulting in insecurity and disrupting national stability (Law Number 7 of 2012; <u>Sauni, 2016</u>).

Table 5. Leverage Value of Social Attributes

	Root Mean
Attributes	Square
Education	2.81
Other business alternatives	3.25
Conflict frequency	3.99
Activity in extension	6.01
Activeness in cooperatives	4.31
Conflicts related to farming enterprises	6.33
Duration of becoming farmer	6.06
Time allocation in farming	3.91
Motivation to become a farmer	4.00
Farming business management pattern	3.70

The sustainability index from the social dimension is classified as quite sustainable. However, increasing or maintaining this sustainability level requires serious attention toward the farming conflict's attributes. Conflicts within a farmer group can be caused by the culture and values that exist in the community, and this conflict will hinder the empowerment of the group from becoming better and more advanced. Steps to take are harmonizing perceptions within the group and creating solidarity to accelerate technology adaptation in conservation to achieve sustainability (Nuryanti and Swastika, 2011). Collaboration and partnerships among farmer groups, government, and agricultural extension agents (public-private partnership) also play an essential role in preventing conflict because optimal collaboration can create effective policies in dealing with farming problems. One such example is the implementation of production cost-based insurance, where the government provides a premium subsidy of 80% of the total premium during the planting season. This insurance model can protect farming and provide incentives for farmers (Pasaribu, 2015).

Institutional dimension

The value of sustainability index of institutional dimensions was 52.90, categorized as quite sustainable. However, to achieve more sustainability, many sensitive attributes are needed. The attributes that affect corporate-based shallot farming's

sustainability on Institutional dimension can be seen from the leverage analysis results (Table 6).

Table 6. Leverage Value of Institutional Attributes

Attributes	Root Mean
Access to product processing	2 41
institutions/groups	2.11
The existence of business financing institutions	2.02
Whether or not there is assistance from the government/private sector related to cultivation	3.45
The existence of agricultural prodi providers	3.62
The role of intermediary traders in collecting harvest	4.91
The existence of management in solving member problems	4.22
The role of the existence of corporations in farming enterprises	4.52
The role of extension officers in assisting farmers	3.85
Frequency of managerial counseling for farmer corporations	4.1
Frequency of shallot cultivation extension	3.7

The institutional dimension consists of 10 attributes that impact the sustainability of corporate based shallot farming business in the Malang Regency. There are two key attributes that need to be considered for this institutional dimension's sustainability. These attributes are the middlemen's role in collecting harvests (Leverage = 4.91) and the corporation's existence in farming (Leverage = 4.52). These two attributes must be enhanced in order to encourage other attributes to develop and achieve sustainability. Between the two attributes above, the middlemen's role in collecting the harvest is the main attribute that must be considered. Middlemen are an essential aspect of the process of trading and distributing commodities. Based on its activities, middlemen are divided into those who carry out the transactions and those who only provide intermediary services. However, middlemen's key role is as the bridge between producers and consumers so that the produced commodities can be sold and consumers get their needs. Some middlemen also participate in the process of determining commodity prices. This action can cause unbalanced prices and decreased consumer demand. The role limitations of the middlemen should be evaluated. Beside that, the corporation's role in farming needs to be increased because it is related to how farmers manage costs or make loans in terms of the farming business.

with technological advances Even and corporations that deal with distribution route problems, farmers still depend on these middlemen. Farmers need training and ease of information regarding the middlemen distribution channel, although it is possible that intermediary traders can become venture capital providers with an agreed agreement. Therefore, middlemen's functions and duties must be clarified to accelerate shallot farming's turnover of funds. Research results from Charina et al. (2012) showed that middlemen can be categorized as semi-social businesses by establishing partnerships with farmers due to the ever-increasing consumer demand for a commodity.

Apart from middlemen's role, a corporation's existence is a crucial matter to note. Agricultural corporations can be an attempt to increase the scale of farmer's business because they can provide support services in the form of banking access, agricultural technology application services, and government policy extension services (Prasetyo & Hariani, 2018; Jhon Wardie & Sintha, 2018). If farmers still use the old, individualistic mindset, this will be an obstacle to shallot farming's sustainability. Farmers' corporation can be a forum for cooperation between farmers, a place to share knowledge and experiences related to agriculture, as an absorber of labor, and, most importantly, a driver of the village economy (Nugroho et al., 2018).

Technology dimension

The sustainability index of technology dimensions was 66.62 and was categorized as quite sustainable. To achieve more sustainability, many sensitive attributes are needed. The attributes that affect corporate-based shallot farming's sustainability on technology dimension can be seen from the leverage analysis results (Table 7).

The technological dimension consists of 9 attributes that impact the sustainability of corporate based shallot farming business in the Malang Regency. Some attributes are considered as sensitive factors for shallot farming's sustainability. These attributes are the use of quality and certified bulb (Leverage = 6.03) and IPM technology (Leverage = 5.75). The two attributes are closely related in influencing the sustainable status of the technological dimension. Its implementation in shallot farming needs to be more considered and appropriately managed to increase this dimension's sustainability index in the future. Bulbs are a vital factor in farming

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production, and a good hatchery system will support increased production. <u>Budhi and Aminah's (2010)</u> research showed that poor quality bulbs can hinder production and reduce farmers' productivity. Besides, shallot production's competitiveness is partly due to the high cost of farming for bulbs, labor, and pesticides, where they use 90% of the funds received by farmers (<u>Aldila et al., 2017</u>), leading to such impact as farmers' small profit.

Table 7. Leverage Value of Technology Attributes

Attributes	Root Mean
Allibutes	Square
Application of agricultural waste treatment	4.55
technology	
Application of harvest according to standards	3.54
Application of ipm technology	5.75
Application of disease pest control	5.13
Application of pesticide doses	4.52
Application of doses of fertilizer	4.79
Organic fertilizer during planting	4.32
Use of quality and certified seeds	6.03
How to cultivate land	5.24

In general, most farmers still use planting material from the previous shallot harvest, buy from other farmers, or use imported bulbs (Basuki, 2010). Some imported bulbs also use consumption tubers to grow into a new bulb even though tuber bulbs have several disadvantages, e.g. bulbs cannot be stored for a long time, the transportation cost is expensive, and sometimes the tubers carry infectious plant diseases (Rosliani et al., 2016). To reduce this risk, farmers can use TSS (True Bulb Shallot) technology to produce quality bulbs. TSS is a botanical bulb produced by old shallot flowers and reprocessed into a bulb. This bulb also has some advantages, i.e. it can be stored for a long time, it does not require a large storage area, it has high productivity, and it is disease- and virus-resistant (Rosliani et al., 2016). Apart from using quality bulb, the implementation of the IPM program is highly recommended. Excessive use of pesticides is not considered efficient for shallot productivity (Nurjati et al., 2018). Although pesticides are a preventive measure, if the doses are not used correctly, the pests will become resistant. Failure to control pests can cause decreasing production and farmers' income. IPM is highly recommended to be used as it increases the sustainability of the technological dimension; it can also impact the ecological dimension.

Research Implication

The results of research related to the sustainability of shallot farming in Malang Regency have implications for the formulation of policies in determining the right strategy to improve the sustainability of shallot farming which will involve various parties: farmers, cooperatives, traders, farm management, and government. In addition, this strategy must later be emphasized to control HPT of shallots, overcome price fluctuations, and facilitate access in the marketing of shallots.

Pests can reduce the productivity of shallot agricultural areas. Based on <u>Sutardi and</u> Porwoningsih's (2018) research results, there are several pests in shallot plants, including Diptera, Thysanoptera, Hymenoptera, Hemiptera, Coleoptera, Lepidoptera, and Acarina. The method often used by farmers to overcome the threat from these pests is to use chemical pesticides. It was found that pesticides contain organochlorines, organophosphates, carbamates, and pyrethroidscontaminates, which pollute the ecosystem and accumulate in a fixed food chain, as well as endanger the health of other living things (Blasco et al., 2003). To overcome this problem, farmers need to handle pests in an environmentally friendly manner by implementing Integrated Pest and Disease Management (IPM). The IPM application is based on modern technology and the community's local wisdom (Stenberg, 2017; Dara, 2019). As for the benefits of implementing IPM, Dinakaran et al. (2013) showed that compared to the use of chemical pesticides, the application of IPM in Tamil Nadu can reduce production costs up to 2.60%, increase tuber production by 19.28%, and increase profits up to 23.89%. The role of agricultural extension agents and the existence of facilities and infrastructure are essential in socializing and applying the concept of the IPM to farmers. It is because the different mindsets among farmers have an impact on their ability to invest. Thus, socializing and implementing the IPM do not involve just one party, but they require synergy from the local governments, local communities, and academics.

Shallots are categorized as commodities that cannot be replaced, so the demand tends to increase every time. Shallots are also a commodity that is not too affected by price fluctuations because it has an elasticity value classified as inelastic (-0.68) (Soedjana, 2013). However, the high demand is not followed by sufficient production in Indonesia, so there are frequent price fluctuations. Those fluctuations can be due to the increase in planting costs, weather conditions, reduced stocks, transportation costs, or imported shallots. The main responsible party for these problems is the government, either local or national.

The government must be able to make appropriate policies and take appropriate actions when the price fluctuation of this shallot occurs. They must also ensure that the stock of shallots is still sufficient for market demand. Also, the government needs to initiate the policies to facilitate transportation for the access to public facilities or infrastructure, as well as respond to middlemen's existence by building marketing facilities from producers to consumers and creating areas for shallot production centers in areas considered to have adequate topography support. Central and local government's policies and actions in terms of production, distribution, and marketing side are their primary responsibility. In its implementation, the government must also consider farmers' opinions because they are the very individuals who understand better the real field conditions. It is necessary to have a forum that can bridge the thoughts of farmers and the government to produce policies that are right on target and more optimal.

The industrial revolution 4.0 era is one of the driving forces to providing easy access for farmers or producers to market their goods. It cannot be separated from agricultural products such as shallots. Shallot marketing currently still has a long market chain, with many middlemen involved, whose existence can harm the price of the shallot commodity. The role of the middlemen itself is still dominant in many markets and agricultural locations. Limited access to technology and information is the reason farmers are forced to sell their products to the middlemen. According to the farmers, this step is efficient because they feel confident that their goods will be sold and paid accordingly. However, in fact, the payments received are often far below the selling price on the market.

There are at least two possible steps to provide direct access to farmers, namely (i) creating a digital platform with a collaboration among government, academics, and farmers to facilitate marketing, and (ii) implementing a public-private partnership program. Creating a digital platform requires continuous collaboration of agricultural extension agents, government, academics, and farmers (Fangohoi et al., 2018). Due to gaps in educational background, the implementation of this digital platform may be hampered. However, if the collaboration is sustainable, the digital platform marketing method's results will increase farmer's economy. Also, the implementation of public-private partnership will increase the benefits received by all involved parties, as well as significantly increase (farmers') income, finance (working capital), and knowledge transfer (Pasaribu, 2015). This kind of cooperation is expected to support food selfsufficiency and improve the welfare of farmers.

CONCLUSION AND SUGGESTION

The sustainability of corporate-based shallot farming business in the Malang Regency is classified as quite sustainable. It is shown by the sustainability index on technology, institutional, and social dimensions with their respective index, namely 66.62; 52.90; and 60.47. However, two dimensions are still categorized as less sustainable from the five dimensions: the ecological and economic dimensions with the values of 49.20 and 43.96, respectively.

The research finds several sensitive attributes that significantly determine the sustainability of shallot farming. The attributes are integrated pest and disease control, access to marketed shallots, conflicts related to farming, the role of middlemen in collecting harvests, and the use of quality and certified bulb. They need to be appropriately managed in order to increase the sustainability of each of the existing dimensions.

To improve the sustainability of shallot farming in the Malang Regency, all stakeholders (farmers, cooperatives, traders, administrators, and the government) must be involved. The step that can be taken is formulating policies that produce sustainable agricultural management strategies and positively impact producers and consumers. The policy strategy needs to pay more attention to factors related to disease intensity in shallots in Malang Regency, price fluctuations, and access to shallot marketing.

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Gender preference on the quality of landscape aesthetic of urban agriculture

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ABSTRACT

► Research Article

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JEL Classification C00; O13; Q19 In addition to providing food benefits, urban agriculture also has aesthetic benefits. Therefore, a visual assessment of the urban agricultural landscape can be used to measure this aesthetic value. Gender preference is also carried out to see differences in visual assessment. This research was conducted in Makassar City using primary data with 129 respondents consisting of 53 people who had never been to Makassar and 76 people who had been/lived in Makassar. The aesthetic assessment of agricultural landscapes in Makassar City used the Scenic Beauty Estimation (SBE) method with a perceptual dimension. The results showed that the most beautiful urban agricultural landscapes had a high level of preference, namely in various plant gardens and verticultural hydroponic systems. Furthermore, the highest SBE score as a potential attraction was shown by male respondent who had never been to Makassar. Possible urban agricultural landscape resources should receive special attention by arranging them neatly and cleanly so that they have high artistic value to provide beauty and comfort for visitors.

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INTRODUCTION

A person's preferences and satisfaction with aesthetics are very complicated and have high diversity (<u>Palmer et al., 2013; Redies, 2014</u>) because of culture (<u>Bonsdorff, 2005; Frank et al., 2013;</u> <u>Jacobsen, 2010</u>), human activities with their environment (<u>Brady, 2006; Hidayat, 2009; Hill & Daniel, 2007</u>), and aspects of well-being (<u>Hedblom et al., 2020</u>). <u>Daniel & Boster (1976</u>) revealed that aesthetic judgments are partly determined by environmental characteristics and depend on human judgment which sometimes has a halo effect (Hartmann et al., 2008). Therefore, a method for

calculating the value of a landscape's beauty based on perceptions and preferences is represented by evaluative judgments and perceptions of the scenic beauty of a landscape. The higher the assessment, the higher the aesthetic value (<u>Child, 1964</u>; <u>Daniel & Boster, 1976</u>; <u>Frank et al., 2013</u>).

Assessment of the quality of landscape beauty includes two approaches. They are the one based on experts and perceptions (<u>Sowińska-Świerkosz &</u> <u>Chmielewski, 2016</u>) and the one based on the interaction between the biophysical features of the landscape and human process perception/experience (<u>Daniel, 2001; Peng & Han, 2018</u>). Such evaluation

results from subjective assessment (Lothian, 1999), which considers certain landscape elements and the of stimuli characteristics causing relevant psychological responses in the form of sensory perceptions and perceptions that arise from cognition (Peng & Han, 2018). Perception of this landscape is strongly influenced by the characteristics of the landscape as a whole (Molnárová et al., 2017; Svobodova et al., 2014) as well as the sociodemographic characteristics (Dearden, 1984; López-Martínez, 2017; Skřivanová et al., 2014). Expert-based approaches are more efficient in terms of cost and time than perception-based ones. However, it is more comfortable to verify the reliability and validity of the perception-based approach than those of the expertbased approach when using statistical methods (Molnárová et al., 2017; Peng & Han, 2018).

Changes in socioeconomic conditions, such as increased income and leisure time (Li et al., 2020a) and pandemics (Chenarides et al., 2021; Geng et al., 2020; Khan et al., 2020; Xie et al., 2020), have increased the number of visitors to green open spaces such as parks and urban agriculture as a form of recreation to reduce stress (Khan et al., 2020). It means that the aim of meeting urban food needs to lead to sustainable agriculture. Therefore, it is necessary to evaluate the existence of green open space landscape, especially urban agriculture. The estimation method of SBE is deemed sufficient (Mo et al., 2021). It is widely used to evaluate landscape quality with a more valid and reliable psychophysical approach (Peng & Han, 2018) when compared to subjective evaluation (Li et al., 2020a). Thus, aesthetic evaluation using the SBE method can estimate more objectively the aesthetic value of a landscape.

Research on the beauty preference of various research objects with the application of SBE has been widely carried out in various countries as a driving factor for visual landscape preferences in the Czechosklavian landscape area (Skřivanová et al., 2014). Likewise, the aesthetic quality assessment is conducted to soil and water (Peng & Han, 2018) and city parks (Shi et al., 2020) in Taiwan, as well as the beauty of tree colours (Wang et al., 2020) and urban park landscapes (Li et al., 2020a) during autumn in China. It has also been researched in Indonesia, such as on coastal tourism area landscape planning (Budiyono et al., 2013) and cultural-based landscape evaluation (Nurfaida et al., 2019). However, research on the assessment of gender preference on the

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aesthetic quality of urban agricultural landscapes using the SBE method has not been conducted.

RESEARCH METHOD

This study involved 129 respondents consisting of 53 people who had never been to Makassar (16 men and 37 women) and 76 people who had been/lived in Makassar (46 men and 30 women). All respondents filled out questionnaires online through the Google Form application due to the COVID-19 pandemic, and this was done randomly. Overall, respondents rated twenty landscapes depicting the agricultural state of Makassar City.

The aesthetic assessment of the agricultural landscape of Makassar City used the Scenic Beauty Estimation (SBE) method with perceptual dimensions. This method features several agricultural landscapes of Makassar City, which are given a rating of between 1 and 10 where the score of 1 is for the most disliked landscape and the score of 10 is for the most favored landscape. This assessment was used to estimate aesthetic value by first converting it to a standard z score (Daniel & Boster, 1976) as follows.

$$z_{ij} = \frac{R_{ij} - \bar{R}_{ij}}{s_j} \tag{1}$$

where z_{ij} is the standard z-value for the ith assessment of the jth observation, R_{ij} is the ith value of the jth observation, \bar{R}_{ij} is the average of all jth observational assessments, and s_j is standard deviation of all jth observations.

Furthermore, the z value is used to determine the SBE value with the equation:

$$SBE_x = (z_{yx} - z_{y0}) \times 100$$
 (2)

where SBE_x is estimation of the xth agricultural aesthetics, z_{yx} is z-average value of the xth agricultural landscape, and z_{y0} is the average z value of a standard agricultural landscape approaching 0 (zero). The SBE value obtained will be used to classify aesthetics into three categories: low, medium, and high aesthetics.

To determine the difference in visual perception of the two gender groups, we used the t-test as follows.

$$t\text{-count} = \frac{\overline{x_m} - \overline{x_f}}{s\sqrt{\frac{1}{n_m} - \frac{1}{n_f}}}$$
(3)

then $\overline{x_m}$ is the average SBE value of male respondents, $\overline{x_f}$ is the average SBE value of female respondents, *s*

is pool standard deviation, n_m is number of male samples, and n_f is number of female samples. The hypothesis testing was stated by measuring t-count.

The t-count value obtained was then compared with the t-table value. If the value of t-count is greater than the value of the t-table, the alternative hypothesis will be accepted. It means that there are differences in the assessment of visual perceptions between men and women, and vice versa.

RESULT AND DISCUSSION

Respondent Characteristics

Table 1 shows that there are 48.83% of respondents aged 41-50 years. The number of both male and female respondents in this age group is the largest compared to that in other age groups. The age group less than or equal to 20 years is the smallest number of respondents in each respondent group. The average age of the respondents was 38 years, ten months, and 20 days. Meawhile, the average male respondents were younger than female respondents, namely 38 years seven months 28 days compared to 39 years and one month and six days.

Table 1. Characteristic of Respondents

Variable	Male	Female	Total
		people	
Age			
≤ 20 years	2	1	3
21 – 30 years	14	17	31
31 – 40 years	15	6	21
41 – 50 years	27	36	63
≥ 51 years	4	8	12
Average (years)	38.7	39.1	38.9
Education level			
Senior high school	4	10	14
Associate Degree	1	0	1
Bachelor	15	28	43
Master	28	23	51
Doctoral	13	7	20
Kind of education			
Mathematics and natural science	e 1	7	8
education			
Engineering and planning	5	2	7
Social and economic sciences	31	21	52
Agriculture	8	32	40
Health Sciences	3	2	5
Others	13	4	17
Profession			
State Civil Apparatus	7	5	12
Educator	34	27	61
Employees of state public	1	8	9
General employees	2	6	8
Entrepreneur	6	1	7
Others	11	21	32

The respondents' highest formal education level is at the masters' degree, amounting to 39.53%. This value is supported by the male respondent group of 21.70%. Meanwhile, only 10.85% of respondents did not receive higher education.

Furthermore, based on the type of education pursued by the most respondents in the agricultural sector and female respondents contributed 25.58%. It is different from male respondents who mostly had a background in social and economic science education. Meanwhile, only one male respondent with a background in Mathematics and Natural Sciences Education and one female respondent in Engineering and Planning.

Respondents' occupations varied, where the work as an educator, both as teacher and lecturer, formed the largest number, namely 34 male respondents and 27 female respondents. In comparison, the smallest number of respondents' employment was as entrepreneurs in agriculture and design. Other occupations consisted of homemakers, researchers, and students.

Visual Perception on Urban Agriculture

Visual perception was given to the twenty agricultural landscapes of Makassar City, spread over several locations (Table 2).

The landscapes used to assess visual perception were spread in over five districts. Nine landscapes were owned individually, namely landscapes 1, 2, 3, 13, 14, 15, 17, 18, and 20. The rest were managed collectively by groups of women farmers and the gardening community. Those landscapes consisted of two food crop landscapes (landscapes 1 and 2), three ornamental plant landscapes (landscapes 13, 17, and 18), and 15 vegetable landscapes. There were six landscapes managed by men (landscapes 1, 2, 3, 13, 14, and 19) and 14 landscapes managed by women, both individually and in communities.

The agricultural landscape of Makassar City had potential attractiveness to be developed based on the SBE results (Figure 1). The visual perception seen from the highest SBE score was in the 9th landscape and was given by male respondents who had never been to Makassar. Furthermore, the agricultural landscape in the 15th landscape was chosen by the man who had been/lived in Makassar. The agricultural landscapes in the 19th landscape was chosen by women who had been/lived in Makassar and the 8th landscape was by female respondents who had never been to Makassar. Meanwhile, the lowest SBE value or zero SBE is shown to be in the second landscape, given

by the three respondents, except for the female respondents who had been/lived in Makassar.

Table 2. Description of Agricultural Landscapes in Makassar City

No	Lanscape type	Description	Area
1	Paddy field	Paddy fields of farmers in the Suka Maju's farmer group.	Manggala
2	Cassava field	Individual cassava fields behind the sports stadium.	Biringkanaya
3	Chili field	Rainfed paddy fields are planted with chilies after the paddy growing season	Tamalate
		and managed by farm laborers.	
4	Vegetable garden	A vegetable garden managed by Az-Zahra's women farmer group on idle land.	Tamalanrea
5	Vegetable garden	A vegetable garden managed by Az-Zahra's women farmer group on idle land.	Tamalanrea
6	Vegetable garden	A vegetable garden managed by Citra's women farmer group on a vacant lot by the Tallo River.	Panakkukang
7	Vegetable garden	A vegetable garden managed by Citra's women farmer group on a vacant lot by the Tallo River.	Panakkukang
8	Vegetable garden	A vegetable garden managed by Dewi Sari's women farmer group on unused residential land.	Tamalanrea
9	Vegetable garden	A vegetable garden managed by Dewi Sari's women farmer group on unused residential land.	Tamalanrea
10	Vegetable garden	A vegetable garden managed by Melati's women farmer group on unused land.	Manggala
11	Vegetable garden	A vegetable garden managed by Nasa's women farmer group on unused land.	Biringkanaya
12	Vegetable garden	A vegetable garden managed by Selasih's women farmer group on unused residential land.	Manggala
13	Ornamental plant land	Ornamental plant land on vacant land beside the Jene'berang River	Tamalate
14	Vegetable garden	a vegetable garden on a vacant lot beside the Jene'berang River	Tamalate
15	Vegetables in the alley	Vegetables along the alley use barrels and used planks on member of the Dewi Sari's women farmer group	Tamalanrea
16	Chili in the allev	Chili plants use polybags in the alley managed by Selasih's women farmer	Manggala
		aroup.	. iai iggala
17	Ornamental plant	Ornamental plants along the alleyways managed by member of the Perintis's women farmer group.	Tamalanrea
18	Ornamental plant	Ornamental plants using pots and verticulture techniques in the yard on	Tamalate
	•	member of the Asoka's women farmer group.	
19	Hidroponic verticulture	Planting vegetables using hydroponic verticulture techniques in private	Tamalate
		farming communities	
20	Aquaponic	Planting vegetables using the aquaponics system on members of the Citra's	Panakkukang
		women farmer group.	

Table 3. Assessment of Gender Preference on The Aesthetic Quality of Makassar City Agriculture

Respondent group	Category	SBE score	Landscape	Percentage
				%
Male had never been to	low	0 - 44.62	2,3,16	15
Makassar (MnM)	middle	44.63 - 89.25	4,5,10,14,15	25
	high	89.26 - 133.88	1,6,7,8,9,11,12,13,17,18,19,20	60
Male had been/ lived in	low	0 - 44.49	2,3,11,14	20
Makassar (MIM)	middle	44.5 - 88.99	1,4,5,9,20	25
	high	89 - 133.49	6,7,8,10,12,13,15,16,17,18,19	55
Female had never been to	low	0 - 34.44	2,3,6,10	20
Makassar (FnM)	middle	34.45 - 68.89	4,5,9,11,14,18	30
	high	68.90 - 103.34	1,7,8,12,13,15,16,17,19,20	50
Female had been / lived in	low	0 - 38.18	2,3	10
Makassar (FIM)	middle	34.45 - 68.89	4,6,8,13,14,15,17,18	40
	high	76.38 - 114.56	1,5,7,9,10,11,12,16,19,20	50





The diversity of perceptions indicates that there are differences in visual perceptions of each group. This analysis produces zoning of visual quality that can support visitors' activities in enjoying the beauty and comfort of the object attraction (<u>Budiyono & Soelistyari, 2016</u>). It is the most crucial factor in enhancing the overall scenic beauty (<u>Peng & Han, 2018</u>), such as the urban agricultural landscape, especially since the pandemic, the community's social activities have been more limited because of the recommendation to stay at home (<u>Marroquín et al., 2020</u>).

Table 3 shows an assessment of the visual preference of each respondent group. More than 50% of the male group, both who had been/lived and had never been to Makassar City, rated it in the high category. Meanwhile, only 50% of the women group rated it as high. However, this group gave a pretty good rating, bigger than the male group, which was 30% - 40%. Meanwhile, all respondents only gave a low rating of no more than 20%. The positive perception is a form of satisfaction (Kinasih et al., 2020) that provides further urban agricultural development (Grebitus et al., 2020). Thus, agriculture in Makassar City has the opportunity to be developed as an agropolitan by paying attention to other macro planning (Nugroho et al., 2018), especially the tightening of community activities outside the region during a pandemic.

At the beginning of its development, some Makassar people associated green space with green colours in their environment. Consequently, in some alleys, they painted walls, fences, and roads green.

Apart from being a means of early education for children (<u>Chenarides et al., 2021</u>; <u>Khan et al., 2020</u>) during distance learning activities, encouraging women's participation (<u>Azurre et al., 2019</u>; <u>Khan et al., 2020</u>), and creating biodiversity (<u>Galimberti et al., 2020</u>), this green space effort can realize sustainable urban development (<u>Adidja et al., 2019</u>; <u>Ibrahim & Salim, 2020</u>; <u>Khan et al., 2020</u>; <u>Li et al., 2020</u>); <u>Yusoff et al., 2017</u>). It was different from before the pandemic, where urban agriculture was dominated by working family and a larger number of household (<u>Chenarides et al., 2021</u>). In Montreal, urban Canadian agriculture is still dominated by well-educated and high-income family groups (<u>Bellemare & Dusoruth, 2020</u>).

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The low category assessment in the 2nd landscape was cassava field in Sudiang Village, Biringkanaya District, and the 3rd landscape was chili fields owned by farmers in Barombong Village, Tamalate District (Figure 2). This low rating was because the two landscapes appeared to be dry and only had one plant type. Besides, the green colour seems to dominate the landscape so that it looks monotonous (Ilhami & Gunawan, 2011). The middle categories were being given to a vacant land, namely the 4th landscape on land managed by the Az-Zahrah Women Farmers Group, Kapasa Raya Village, Biringkanaya District, and the 14th landscape on land planted with mustard greens and water spinach in Parang Tambung Village, Tamalate District. This assessment was because the cultivated plants were still in uniform colour, not much different from the low category landscape, but several types of plants had been cultivated. The high category was given to three landscapes. The first was the 7th landscape in the form of land on the Tallo River banks, which is managed by the Citra Women Farmers Group of Tello Baru Village, Panakukang District. The second was the 12th landscape is on empty land managed by the Selasih Women Farmer Group, Bangkala Village, Manggala District, and the last one was the 19th landscape, a vegetable plant verticulture planting technique in Barombong Village, Tamalate District. The four groups of respondents evaluated the three landscapes with high ratings due to the diversity of colours and types of plants and verticultural hydroponic cultivation techniques (Goodman & Minner, 2019; Lal, 2020; Martin & Molin, 2019) suitable for the increasingly narrow land in urban areas (Li et al., 2020b; Nguyen et al., 2016) and the limited availability of clean water (Molden et al., 2010; Saccon, 2018).

Landscapes can give the impression of a large space and provide many alternative recreational activities that visitors can do, e.g. sightseeing or having picnic (<u>Hidayat, 2009</u>) in urban areas because landscape aesthetic indicators can be expressed as estimates of unique scenic beauty or well-being estimates (<u>Fanariotu & Skuras, 2004</u>). Therefore, landscape management can also be given a special focus on suburban areas as residential developments that can develop rapidly (<u>Molnárová et al., 2017</u>).

Low category

02 Cassava gardens

Middle category



04 Az-Zahrah women farmer group



12 Selasih women farmer group



High category



03 Chili fields

14 Mustard greens and water spinach land

07 Citra women farmer group



Concerning these three categories, Budiyono & Soelistyari (2016) stated that the assessment of preferences for landscapes has three levels: the most beautiful landscapes with a high level of preference, landscapes that are quite beautiful with a moderate level of preference, and the landscapes that are not beautiful with a low preference. For example, the preference assessment for the most beautiful agricultural landscape of Makassar City had a high preference, namely the 7th landscape, the 12th landscape, and the 19th landscape. The landscape is well-ordered, neat, and orderly with a harmonious combination of colours and plants and has artistic value. According to Hidayat (2009), beauty can emerge from visible lines, shapes, colours, and textures to provide inner satisfaction and five senses. Besides, the complexity of the shapes that also arise

due to the planting pattern in a multilevel configuration provides a variety of views and unites with nature (<u>Bell, 2004</u>).

Table 4. Visual Perception Difference Test

Item	Male	Female
Mean	79.85	71.60
Variance	1234.71	669.96
Observations	20	20
Pooled Variance		952.33
df		38
t-stat		0.84
t Critical two-tail		2.02

Visual perception based on sex differences showed no statistical difference between the two groups (Table 4). It is consistent with Table 2, where the male group evaluated a more excellent beautiful rating than the female group but graded a lower score of stunning beauty. These results can be used as urban agricultural development regardless the gender. This finding is in line with <u>Shular et al. (2005</u>), but not with <u>Vanston & Strother (2017</u>), who argued that there are differences in the two's neurological abilities. Likewise, it is also in line with the findings of <u>Bosley (1993</u>); <u>Jashari et al. (2018)</u>; <u>Norman et al. (2018</u>). Therefore, visual perception analysis needs to pay attention to other factors (<u>Jashari et al., 2016</u>, 2018), such as age and education level.

Research Implication

Urban agriculture is multifunctional (Valley & Wittman, 2019), but the aesthetic function of landscapes is preferred over other uses such as houses or other urban infrastructure buildings (Aubry et al., 2012). This is indicated by a high SBE score. Agriculture in Makassar City with a high SBE score is managed by a group of women farmers. We can not deny it because women have more leisure time than men to manage the farm. This farm can also be used as a means of recreation or just a hobby that can reduce stress, even reduce gender inequality (Khan et al., 2020). The most cultivated agricultural products were horticulture with diverse colours and sizes. Urban agricultural development can empower women (Adidja et al., 2019; Khan et al., 2020), both in the production and marketing of products independently (Mulyani et al., 2019), as well as become a learning tool for children while doing distance-learning during the pandemic.

Then, the high visual perception of respondents, both who had been/lived in Makassar and who had never been to Makassar, shows the agricultural landscape's beauty level in Makassar. This assessment did not differentiate the results from male and female respondents. This provides opportunities for the development of Makassar as a sustainable city (Ibrahim & Salim, 2020; Li et al., 2020b; Yusoff et al., 2017) through agropolitan development. It is expected to increase the income of the community, especially that of the middle to the lower class (Zezza & Tasciotti, 2010). Likewise, with the success of urban agriculture and a positive perception (Grebitus et al., 2020; Yusoff et al., 2017) from the community influenced by age, gender, education level, and household size, people's interest in urban farming will increase (Admire, 2014; Ngahdiman et al., 2017). Of course, it is still important to pay attention to the macro-condition of Makassar Hastuti et al., Gender preference on the quality of landscape...

(<u>Nugroho et al., 2018</u>) and good urban management (<u>Galimberti et al., 2020</u>).

Therefore, through its extension workers, the government can provide resources and motivation for the community to like gardening starting from the yard, especially for people constrained by time and resources (Chenarides et al., 2021), besides maintaining the remaining agricultural land. Meanwhile, millennials can develop urban agriculture with more modern technology, such as hydroponics and verticulture techniques (Lal, 2020; Martin & Molin, 2019), so that the stereotypes around farming such as being messy and dirty can be reduced. Thus, it is hoped that fresh (DiDomenica & Gordon, 2016; Grebitus et al., 2020), healthy, and nutritious local food (Benis & Ferrão, 2018; Ibrahim & Salim, 2020) will be available during the pandemic and after the pandemic.

CONCLUSION AND SUGGESTION

The assessment of preferences for the most beautiful agricultural landscape of Makassar City has a high level of preference, namely on land planted with various plants and hydroponic cultivation techniques verticulture with the SBE score of 108.53, 114.53, and 130.27. A reasonably beautiful landscape has a moderate level of preference in the form of land that is only planted with two types of plants which is shown the SBE score of 68.7 and 77.85 so that the SBE value is in the medium category. While the landscape is not beautiful and has a low preference, there are gardens and rice fields that look arid and untidy with the SBE score of 11.2 and 35.22. Furthermore, the highest SBE score (133.85) as a potential attraction that men can develop is given by men compared to women.

The potential resources of urban agricultural landscapes must receive attention to be developed as an agropolitan by way of more neat, regular, and clean arrangement, so that they have high artistic value without differentiating gender. This beauty will provide comfort to visitors who come for leisure, both from inside and outside Makassar City. Thus, the limited land in urban areas does not preclude the opportunity to develop aesthetic agriculture regardless of age or gender.

Thus, it is hoped that the government will provide resources and support to households to develop urban agriculture and maintain the remaining agricultural land. Likewise, the millennials can contribute through more modern agricultural development. That way, we can reach food security, increase income, and city sustainability.

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Economic growth and inequality of income distribution between regions: Evidence from Bali Province, Indonesia

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ABSTRACT

Bali Province shows a prominent performance in the development of the tourism sector. However, essential problems were found related to inequality in the distribution of income between regions. The aim of this study was to analyze the effect of locally-generated revenue, education spending, health spending, investment and infrastructure on economic growth and inequality in income distribution between regencies and cities in Bali province. This study used a quantitative approach. The study explored panel data that combined time series and cross section data from the Regency/City of Bali Province during 2010 -2017. The data analysis method used was path analysis. The results showed that local revenue, education spending, government spending on health, investment, and infrastructure have a positive effect on economic growth and reduced income inequality between regions. Economic growth is also able to mediate the influence of variables on inequality. The findings of this study emphasize the importance of planning coordination from each district and city to mutually commit in mobilizing all local resources such as human resources, finance, investment and infrastructure; to generate economic growth and reduce inequality between regions.

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INTRODUCTION

Indonesia's economic development in accordance with the mandate in the Preamble to the 1945 Constitution is to create a just and prosperous society. This is achieved through economic development policies with the main target of reducing poverty, income inequality, and the unemployment rate. Development is also directed at creating employment opportunities for residents in various regions in a sustainable manner. The economic growth is not the only main goal of development efforts, but it reaches out to socio-economic development, equitable development, and eliminates inequality.

Poverty and inequality are at the core of general economic development problems (<u>Arsyad, 2010</u>). Poverty alleviation and income inequality are currently the main problems in development in many countries. Inequality between regions is a common aspect including poor countries, developing countries, and even developed countries. Inequality between regions is caused because each region has differences in resources, labor, and technology (<u>Berg & Ostry, 2017</u>; <u>Chen & Groenewold, 2019</u>).

The relationship between income inequality and economic growth and related issues has been extensively researched in the literature. A typical study is that of <u>Barro (2000)</u>; <u>Forbes (2000)</u>, followed by various other studies (<u>Fawaz, Rahnama, & Valcarcel, 2014</u>; <u>Hong Vo, Van Nguyen, Minh Nguyen, The Vo, & Cong Nguyen, 2020</u>; <u>Huang, Fang, Miller, & Yeh, 2015</u>; <u>Madsen, Islam, & Doucouliagos, 2018</u>; <u>Wahiba & Weriemmi, 2014</u>).

<u>Kuznet (1955)</u> and <u>Berg & Ostry (2017)</u> emphasized that inequality is a consequence of economic growth. Thus, inequality increases at the early stages of the economic development process before decreasing with later stages of development. Since then, most studies related to inequality and economic growth have been conducted and show a positive relationship (<u>Lundberg & Squire, 2003; Rubin & Segal, 2015; Wahiba & Weriemmi, 2014</u>) while some analyzes support a negative relationship (<u>Majumdar &</u> <u>Partridge, 2009; Nissim, 2007</u>). Several studies also offer mixed results (<u>Chambers, 2010; Huang et al.,</u> <u>2015</u>).

The awareness that income inequality affects economic growth has been considered, along with the findings of <u>Kuznets (1955)</u>. Various studies have investigated whether inequality contributes to economic growth and have revealed a positive

Table 1. Williamson Index in Bali Province, in 2013-2019

relationship (Forbes, 2000; Li & Zou, 1998) or a negative relationship (Cingano, 2014; Wahiba & Weriemmi, 2014). For instance, Fawaz et al. (2014) confirmed the negative impact of income inequality on economic growth in low-income developing countries.

Bali Province is an area known as a tourism destination, where the tourism sector is the backbone of economic growth in Bali Province. The development of tourism in Bali has made the structure of the Balinese economy experience a shift from primary to tertiary. The sector of providing accommodation, food, and beverage, which is the sector with the largest linkage to tourism, and gives the most dominant contribution to the GRDP of Bali Province.

Urban areas continue to display higher economic growth as potential resources continue to shift to developed regions as growth centers with higher economic growth. This condition in turn causes growth centers to experience accumulated growth, supported by the potential of migratory resources. If a region is unable to compete to keep up with regions with high economic growth, this can result in the unequal distribution of income between regions. Therefore, planned and oriented development efforts to reduce inequality of income distribution between regions is very important.

Regency/City	2013	2014	2015	2016	2017	2018	2019
Jembrana	0.11	0.11	0.10	0.10	0.10	0.13	0.13
Tabanan	0.08	0.07	0.07	0.06	0.06	0.08	0.08
Badung	0.55	0.54	0.52	0.51	0.51	0.62	0.61
Gianyar	0.02	0.02	0.01	0.01	0.01	0.04	0.04
Klungkung	0.12	0.13	0.12	0.11	0.11	0.13	0.13
Bangli	0.47	0.47	0.47	0.46	0.46	0.47	0.47
Karangasem	0.30	0.30	0.29	0.29	0.29	0.30	0.30
Buleleng	0.08	0.07	0.06	0.06	0.06	0.08	0.08
Denpasar	0.05	0.05	0.04	0.03	0.03	0.01	0.01
Bali province	0.14	0.13	0.12	0.10	0.10	0.16	0.15

Source: Author's calculation

Inequality in income distribution between regions occurs due to the high concentration of economic activity in certain areas (Berg & Ostry, 2017). The process that causes inequality is very complex, influenced by differences in economic growth, regional financial capacity, investment allocation, infrastructure availability, the quality of human resources in a region (Bappenas, 2014; Tambunan, 2007; Rahmawati et al., 2020). The occurrence of inequality between regions is caused by differences in resources, differences in

demographic conditions, less smooth mobility of goods and services, the concentration of regional economic activities, and allocation of development funds between regions.

The greater the inequality figure indicates that the distribution of income between regions is not even. Badung, Bangli, and Karangasem regency have high inequality rates when compared to the inequality rate in Bali Province (Table 1). This is a problem that needs to be resolved immediately, so it is not to cause

widespread negative impacts. Investment in Bali Province is very dominant in developed areas such as Denpasar City and Badung Regency. The amount of investment in this area cannot be separated from the influence of the tourism sector, which is the backbone of the economy in the area.

Investments in Bali Province are predominantly carried out in developed areas such as Denpasar City and Badung Regency. The amount of investment is inseparable from the tourism sector activity which is the backbone of the economy in the area. In general, the tourism sector provides a major contribution to the economy in Bali Province, especially in these three areas. This flow of investment or economic activity has resulted in other regions not getting the results of development and they becomes underdeveloped regions.

Investors' reluctance to invest in other sectors such as agriculture makes it difficult for other districts to compete with the three regions in attracting investment. Research conducted by <u>Danawati et al.</u> (2016) stated that investment has a positive and significant effect on the economic growth of regencies/cities in Bali Province. This shows that increased investment will increase economic growth. According to <u>Samuelson & Nordhaus (2006)</u>, investment is needed as a supporting factor to improve the production process.

Efforts to reduce inequality are carried out by accelerating development in disadvantaged areas (Elia et al, 2020). One important aspect of the implementation of regional autonomy authority is to strengthen the level of regional independence and increase the potential for regional income to finance government administration and development activities (Enceng, Irianto, & Purwaningdyah, 2014). Regional financial independence can be measured from the receipt of Locally Original Revenue (PAD) against total regional income. PAD is a source of local revenue originating from local taxes, local levies, BUMD products and other legitimate local revenue. Increasing PAD will provide flexibility to local governments to provide the best services for the community and develop new economic potential.

One of the causes of inequality between regions is the difference in the quality of human resources. Government spending on education and health is the government's effort to improve the quality of human resources in the regions. According to <u>Garcia &</u> <u>Soelistianingsih (1998)</u>, education is needed to reduce regional inequality and health is needed to optimize all the potential that the community has in order to be able to make a positive contribution to the regional economy. Investment is the accumulation of capital that can later be used to boost the economy of a region. According to Zulvanto (2010), increased investment will increase revenue multipliers in the regions. It is hoped that increased investment in underdeveloped areas will boost the economy in these areas so that inequality between regions can be reduced. Infrastructure is the main support in the implementation of business processes, development, and projects (Berg & Ostry, 2017; Chen & Groenewold, 2019). Infrastructure is an important element in the development of a region because infrastructure facilitates and integrates economic activities. The study by Maryaningsih et al. (2014) stated that the provision of basic infrastructures such as the availability of quality roads and access to remote areas has a positive impact on economic development in these areas.

The relative availability of infrastructure in the Denpasar and Badung regions is relatively better compared to other areas in Bali Province which is also a driving force for investment in these regions (Danawati et al., 2016). This shows that the efforts of local governments to direct investment more fairly have not shown optimal results. If this happens in the long term, the existing regional income gap will widen in Bali Province. Economic activity in Bali Province shows serious imbalances. Economic activities in Bali Province are mostly concentrated in the southern part of Bali Island.

Inequality in the availability of infrastructure can lead to disparities between regions (<u>Chen &</u> <u>Groenewold, 2019</u>). The right infrastructure functions to encourage various economic activities, streamline the production process and the mobility of people, goods and services. Equitable road infrastructure will improve the smooth mobility of goods and services to support regional economic activities. The road density ratio shows the level of accessibility between regions. The greater the road density ratio reflects the ease of reach between areas connected to road infrastructure in region and vice versa.

<u>Maryaningsih et al. (2014)</u> stated that the availability of adequate road conditions both in quality and quantity is one way to achieve sustainable economic growth. It is hoped that the improvement in the quality and quantity of road infrastructure in underdeveloped areas will have a positive impact on economic development in these areas to spur economic growth.

This study aims to study the effect of local revenue, government spending on education and health, investment, and infrastructure on the inequality of income distribution between regencies/ cities in Bali Province.

RESEARCH METHOD

The research elaborated on the regencies and cities data in Bali Province, Indonesia. There were indications of regional imbalances in Bali region as shown by Williamson index numbers in several regencies. This research is quantitative research, with the research design aims to explain the relationship between the differences or the influence of one variable with another. This study used panel data which is a combination of time series and cross-section data. By accommodating information related to both cross-section and time-series variables, panel data can substantially reduce the problem of omitted-variables, a model that ignores relevant variables (Gujarati, 2004). This research was conducted in the regencies/cities of Bali Province for the period from 2010 - 2017.



Figure 1. Relatonship between variables

The selection of variables is motivated by efforts to reduce the inequality between regions by reducing the distance between the richest and poorest regions, through special efforts to significantly elevate the poorest regions (Bappenas, 2010). The variables include locally-generated revenue (PAD), government spending in the education and health sector, investment (from domestic and foreign), road infrastructure, economic growth, and inequality between regions (measured using the Williamson index). The relationship between variables presented in Figure 1 and Equations 1 and 2.

$$Y_{1} = \beta_{1}X_{1} + \beta_{2}X_{2} + \beta_{3}X_{3} + \beta_{4}X_{4} + \beta_{5}X_{5} + e_{1} \dots (1)$$

$$Y_{2} = \beta_{6}X_{1} + \beta_{7}X_{2} + \beta_{8}X_{3} + \beta_{9}X_{4} + \beta_{10}X_{5} + \beta_{11}Y_{1} + e_{2} \dots (2)$$

in which Y1, Y2, X1..5, are variables (Figure 1); $\beta_{1..11}$, is coefficient; e1, e2 is error.

The data analysis technique used in this study was Path Analysis, which was analyzed using Smart PLS software. The choice of path analysis is based on the consideration that the form of the causal relationship and form of relationship of simultaneous systems.

RESULT AND DISCUSSION

Inequality in Bali Province

Efforts to increase PAD are carried out as much as possible to realize the spirit of regional independence. Realization of PAD regencies/cities in Bali Province during the period 2010 to 2017 continued to increase (Figure 2 and Table 2). Badung Regency is the district with the highest PAD in Bali Province, sourced from tax revenue especially from hotel and restaurant taxes as the main economic activity.

Education is one of the determining factors for the quality of human resources which will later contribute to development in an area. The government should prioritize the education sector by allocating spending on education. District and municipal education spending in Bali Province has fluctuated. In several regions, government spending on education has decreased. This decline was likely caused by weak coordination between budget planning and implementation which resulted in low budget absorption.

The health sector is an important part in efforts to improve the quality of human life. Fulfilling health need by the government is one of the provisions to meet basic needs. Without health, an area cannot generate productivity. Economic activities will run if there is certainty about health insurance for the community.



Figure 2. Variables related to inequality between region in Bali Province, 2010-2017

District and municipal health sector spending in Bali Province from 2010 to 2017 shows various developments. Regions such as Tabanan, Gianyar, Klungkung, and Karangasem districts show a decline in government spending on health. In 2012, there was a decline in health sector financing but then increased in subsequent years. Meanwhile, health spending in Karangasem Regency has decreased in a row, namely 2013 and 2014.

Investment is important in economic development to support an increase in the production process. The investment ensures that the community continues to increase economic activity, employment opportunities, national income, and the level of community welfare. Investment also encourages capital accumulation. The addition of the stock of buildings and other important equipment will increase the potential output of a nation and promote long-term economic growth.

The highest investment occurred in 2015 in Denpasar City with a value of 15.7 trillion rupiahs (Figure 2), on the other hand, the lowest investment was in Bangli Regency at 30.7 billion rupiahs. Bangli Regency has always received the lowest investment value during the period 2010 to 2017. There is a tendency for investment in southern Bali to have a relatively high attractiveness. This cannot be separated from the activities of the tourism sector which are concentrated in the area.

Road is important infrastructure to support transportation, which has a strategic function to connect one area to another. Road infrastructure development has an accessibility function to open up disadvantaged areas and a mobility function to spur developed regions. The availability of infrastructure and other facilities in southern Bali is better than in the northern part. Thus, it can provide a significant incentive to invest in economic activity.

The development of the road density ratio in regencies and cities in Bali Province has increased. In 2017 the highest road density ratio was in Denpasar, namely 5.46 km per km2; and the lowest was in Buleleng Regency, namely 0.98 km per km2. Buleleng Regency is dominated by hilly areas. This causes road infrastructure development to experience and obstacles more.

The economic growth of regencies and cities in Bali Province varies. All districts and cities in Bali Province show fluctuating economic growth. The highest economic growth occurred in Badung Regency in 2012, namely 7.64 percent and the lowest economic growth occurred in Jembrana Regency in 2010, namely 4.57 percent. From 2010 to 2017 Bangli Regency had the lowest economic growth, namely, 5.70 percent, and Denpasar City had the highest economic growth, namely 6.74 percent.

The Williamson index for districts and cities in Bali Province is varied and relatively low. The higher the index, the higher the inequality of income distribution in a region. Income inequality between regions occurs due to the high concentration of an economic activity in certain areas. This has resulted in many regions not getting economic benefits so that they become underdeveloped regions. In general, the tourism sector provides a major contribution to the economy in Bali Province, especially in Badung, Gianyar, and Denpasar City Regencies.

Economic Growth and Inequality

The results showed that PAD had a positive and significant effect on the economic growth and inequality of income distribution of regencies/cities in Bali Province (Table 3 and 4). Table 3 indicates a direct relationship between PAD and economic growth. Generally, PAD in all regions in Bali Province has increased so that it has an impact on increasing economic growth. This finding is consistent with the results of Bratakusumah (2001) which states that PAD has a positive effect on economic growth in the regions. PAD also shows a negative and significant effect on the inequality of income distribution between regencies/cities in Bali Province (Table 4). The increasing PAD causes the inequality reduction of the income distribution. This is in line with a research conducted by Nurhuda (2013) which revealed that PAD has affected inequality reduction in 38 regencies and cities in East Java Province.

Regions with high PAD growth tend to have higher per capita income. One of the main objectives of fiscal decentralization is the creation of regional independence so that local government can explore regional financial sources and strengthen local revenue. High PAD will be used to finance regional development expenditures which will ultimately increase regional economic growth (<u>Tambunan,</u> <u>2007</u>), and also reduce economic inequality among regions.

Regency/City	Locally- Generated Revenue	Education expenditure	Health Expenditure	Investment	Road Infra- structure	Economic growth	Inequality of income distribution between regions ¹
		bill	ion rp		km/km2	%	
Jembrana	121.34	551.92	313.81	276.07	1.40	5.28	0.10
Tabanan	426.64	514.62	362.71	189.99	1.27	5.37	0.06
Badung	4172.46	767.28	562.02	5910.93	1.93	6.08	0.51
Gianyar	662.75	572.33	288.56	186.99	2.08	5.46	0.01
Klungkung	153.21	385.23	208.25	2980.99	1.72	5.32	0.11
Bangli	104.59	379.46	180.98	26.45	2.02	5.31	0.46
Karangasem	198.58	576.13	240.48	393.88	1.72	5.06	0.29
Buleleng	455.20	703.69	382.69	1126.41	0.98	5.38	0.06
Denpasar	1008.71	527.06	383.37	6366.39	5.46	6.05	0.03

Table 2. Variables Related to Inequality between Region in Bali Province in 2017.

¹ measured by Williamson index

Table 3. Variable Affecting Economic Growth of Regions in Bali Province

Variable	Coeffi- cient	t	p value
(Constant)	1.923	2.246	0.025
Locally-generated revenue	0.231	2.598	0.012
Education expenditure	0.715	2.410	0.019
Health Expenditure	0.700	3.373	0.001
Investment	0.628	4.851	0.000
Infrastructure	0.126	2.223	0.030

Table 4. Variable Affecting Inequality of Income Distribution of Regions in Bali Province

Variable	Coeffi- cient	t	p value
(Constant)	3.536	2.695	0.009
Locally-generated revenue	-0.167	-6.897	0.000
Education expenditure	-0.239	-2.343	0.031
Health Expenditure	-0.138	-2.310	0.024
Investment	-0.041	-2.745	0.028
Infrastructure	-0.054	-3.429	0.001
Economic growth	-0.040	-4.634	0.000

Education is a vital component to contribute to economic growth. <u>Huang et al. (2015)</u> and <u>Li & Zou (1998)</u> stated that spending on the education sector has a positive impact on economic growth. This finding implies that an increase in government spending on education has proven capable of driving economic growth (<u>Elia et al, 2020</u>).

Government spending on education has a negative and significant effect on inequality in income distribution between regions. Income inequality between regions can be caused by the quality of human resources. Low-quality of human resources are neither unable to produce progress in economic development nor develop the potential for creating new economic activities. Therefore, education spending needs to be optimized to encourage improvement in the quality of human resources. Education is an approach to uplifting human dignity and achieving social and economic welfare. Education at all levels will increase people's income and economic productivity. According to <u>Schweke (2015)</u>, education will not only produce quality human resources (HR), knowledge, and skills in the use of technology but it can also foster a healthy business climate to support economic growth.

Government spending in the health sector has a positive and significant effect on the economic growth and income inequality between districts and cities in Bali Province for the period 2010 - 2017. Government spending in the health sector will increase the coverage of health services so that the quality of public health is more secure and better. Better health will support people to be more productive and live longer so that economic activities will increase. With increasing longevity, savings and investment in education and pensions increase. This will attract a higher investment in health. This leads to the accumulation of capital, which in turn leads to the efficiency of the aggregate economy and an increase in the level of economic activity (Aísa & Pueyo, 2006; Cervellati & Sunde, 2011; Lopez-Casasnovas et al., 2005). Furthermore, an increase in spending in the health sector will reduce inequality in income distribution, as the study by Ospina (2014) of similar findings in Latin American countries.

<u>Bloom et al. (2004)</u> found that improving health increases output not only through labor productivity but also through capital accumulation. There is a positive impact of health and health spending on the economy. There are four ways in which health affects economic growth. This increases labor productivity, creates a greater supply of labor, acts as a catalyst for skills-boosting education and training, and saves more savings for investment in physical and intellectual capital. <u>Bloom & Canning (2008)</u> further revealed that health also affects life expectancy and life cycle behavior. Insofar as income is a health consequence, investment in health is a priority. The argument for health as an investment is particularly relevant because inexpensive and easy-to-implement health policies can dramatically improve health.

The results showed that the infrastructure variable had a positive and significant effect on the economic growth and inequality in income distribution between regions. Investment is needed as a supporting factor in improving the production process (Danawati et al., 2016; Samuelson & Nordhaus, 2006). Additional investment in various sectors will have an impact on production expansion and a growing economy and reduce income inequality. Barro (2000) stated that investment affects reducing income inequality between regions. Investment plays an active role in determining the rate of output growth and the amount of output (Arsyad, 2010). Investment is an important asset to develop a more advanced region. New investment in underdeveloped areas will increase the capacity of the regional economy to produce goods and services.

Road infrastructure is an important infrastructure in supporting land transportation to connect one area to another. It has an accessibility function to open up disadvantaged areas and spur more developed areas. The availability of adequate roads will ensure a faster and more efficient distribution of goods and services, and lowering income inequality between regions. This study is the same as what was done by <u>Maryaningsih</u> <u>et al. (2014)</u> that the road infrastructure reduces regional economic development inequality. The development of road infrastructure will ensure the efficient movement of goods and services, and increase the added value of the economy as well as become a factor driving regional productivity.

Regional financial policies are always directed at realizing an independent regional economy by adhering to the principles of economic democracy based on Pancasila and the 1945 Constitution. According to Elia et al (2020), regional development requires development financing that involves the development of fiscal activities, particularly allocation,

distribution and stabilization, a bigger source of financing (<u>Tangkilisan, 2013</u>).

During the period of 2010 to 2017, economic growth showed a negative and significant effect on inequality in income distribution between regions. In line with increased economic growth, the inequality of income distribution between regions will decrease. This is in line with <u>Yasa & Arka (2015)</u> that economic growth in a region can reduce income disparity between regions (<u>Chen & Groenewold, 2019</u>).

Direct and Indirect Effect

This study also shows the direct and indirect effects of each variable on inequality in income distribution (Table 5). The indirect effect can be observed from the role of economic growth as a mediation for the effect of any variable on income inequality. As the findings have been presented, all variables have a significant effect on economic growth (Table 3). Meanwhile, economic growth also significantly affects income inequality (Table 4). This shows that economic growth can be a significant mediating variable or an indirect effect of economic growth in the working model.

PAD has an indirect effect on the inequality of income distribution between regions through economic growth. This mediation of economic growth increases the influence of PAD in reducing the inequality of income distribution between regions in regencies/cities in Bali Province.

Moreover, economic growth is proven to work to mediate the role of the government in the fields of education, health, investment, and infrastructure in reducing income inequality among regions in Bali province. Road infrastructure and investment flow will help increase the mobility of goods, services, and people. Road infrastructure as a link between regions will help spread economic activity. This will lead to the emergence of new economic growth points so that other regions will also grow and develop simultaneously in accordance with the potential of their respective regions. Banister & Berechman (2001)stated that increasing transportation accessibility will reduce travel time and costs, increase mobility volumes and cause financial and allocative externalities which in turn lead to economic growth and spatial redistribution of economic activity.

Variable Delationship	Direct	Indirect	Total
	Effect	Effect	Effect
PAD \rightarrow Economic growth (X ₁ \rightarrow Y ₁)	0,468	-	0,468
$PAD \rightarrow Income inequality (X_1 \rightarrow Y_2)$	-1,111	-0,245	-1,356
Education Expenditure \rightarrow Economic growth (X ₂ \rightarrow Y ₁)	0,527	-	0,527
Education Expenditure \rightarrow Income inequality (X ₂ \rightarrow Y ₂)	-0,436	-0,276	-0,712
Health Expenditure \rightarrow Economic growth (X ₃ \rightarrow Y ₁)	0,695	-	-0,695
Health Expenditure \rightarrow Income inequality (X ₃ \rightarrow Y ₂)	-0,449	-0,364	-0,813
Investment \rightarrow Economic growth (X ₄ \rightarrow Y ₁)	0,080	-	0,080
Investment \rightarrow Income inequality (X ₄ \rightarrow Y ₂)	-0,384	-0,042	-0,426
Infrastructure \rightarrow Economic growth (X ₅ \rightarrow Y ₁)	0,259	-	0,259
Infrastructure \rightarrow Income inequality (X ₅ \rightarrow Y ₂)	-0,359	-0,136	-0,495
Economic growth \rightarrow Income inequality (Y ₁ \rightarrow Y ₂)	-0,524	-	-0,524

Table 5. Direct and Indorect Relationship between Variables

These findings indicate that all potentials in each region need to work optimally by coordinating economic, financial, investment, infrastructure, and human resources, to jointly plan for the creation of economic growth in each region. The allocation of resources in a balanced manner between regencies/cities will encourage higher economic growth so that it has an impact on reducing inequality between regions.

Research Implication

The government needs to work hard to increase PAD from a local resource and implement policies that make it easier for people to carry out economic activities, especially in the service sector such as hotels and restaurants, as well as manufacturing industries and agriculture that have significant economic contributions in regencies/cities in Bali Province.

Research shows that government spending on education encourages increased economic growth in regencies/cities in Bali Province. The education budget of 20 percent of the APBN and APBD is the realization of the government to improve education. A large budget for the education sector provides opportunities for everyone to be able to access education properly. Supervision needs to be carried out in an orderly manner to prevent budget leakage and to achieve better and evenly distributed targets for the quality of human resources.

The existence of a free education program financed or facilitated by the government will help the community to gain access to education services. Education should be able to produce quality human resources who have knowledge, understand technology, have adequate technical and life skills. According to <u>Schweke (2015)</u>, education will not only produce quality human resources but it can also foster a healthy business climate to support economic growth.

Government spending in the health sector provides opportunities for the community to get better health services to create healthier and more productive human resources. The quality of human resources can further create and develop economic activities to generate economic growth in the region (Rahmawati et al., 2020). Increasing and equalizing the quality of human resources in underdeveloped areas will spur the emergence and growth of innovation in underdeveloped areas so that they can catch up with more developed regions. Sachs (2002) states that health expenditure policies affect the welfare of present and future generations which in turn affects economic growth.

Investment is one element of the production that actively determines the level of output and can be a starting point for the success and sustainability of future development. Investment and strengthening of infrastructure will further increase the economic growth of regencies/cities in Bali Province. The investment climate will also be developed optimally when the quality of human resources and infrastructure is conditionally available. The tourismbased economy in Bali Province desperately needs the support of good road infrastructure that will help smooth the mobility of resources between regions. Road infrastructure as a link between production centers and marketing areas is very useful to improve the economy of a region. Furthermore, improving infrastructure will reduce the inequality of income distribution between regions in regencies/cities in Bali Province.

CONCLUSION AND SUGGESTION

Locally-generated revenue, education expenditure, government spending on health, investment, and infrastructure have a positive effect on economic growth and inequality reduction of income distribution in regencies/cities in Bali Province. The research further shows that economic growth can work to mediate the role of the government in the fields of education, health, investment, and infrastructure in reducing income inequality among regions in Bali province. This study emphasizes local governments to cooperate and coordinate in planning to mobilize human resources, finance, investment, and infrastructure; to generate economic growth and reduce inequality between regions.

The research provides a suggestion that the government needs to increase local revenue from PAD, allocate funding for education and health, which reach all the population equally with the provision of adequate facilities and services. The government has also found breakthroughs to promote the investment climate in the region, as well as strengthen road infrastructure to access economic resources throughout the region.

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Household finances and social comparison: Determinants of financial well-being in Indonesia

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ABSTRACT

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JEL Classification C31; D14; I31 To achieve a vision of sustainable financial well-being (FWB) in Indonesia, generating more knowledge in household behavior and FWB is pivotal. This study assesses the impact of household financial position and social comparison on individual FWB in Indonesia. Using the latest wave of Indonesia Family Life Survey (IFLS) dataset, subjective FWB was assessed by questions on subjective prosperity, perceived current standard of living adequacy and perceived future standard of living. The empirical analysis showed that net wealth and total assets are among the essential determinants and positively related to FWB along with income. On the contrary, though it was only found significant on the perceived current standard of living adequacy, the total debt level has a negative effect on FWB. The findings also confirmed that socioeconomic and demographic factors also significantly affect FWB (being female and more educated has a positive effect on FWB). Furthermore, it was also found that relative financial position (social comparison) has important roles in determining individuals' FWB level. Being above the reference group's average for a particular financial measure (income and total assets) has a positive effect on an individual's FWB. The findings of this study suggest for promoting financial education in the national school system starting from senior high school to increase the level of financial well-being among young adults and people with lower educational attainment.

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INTRODUCTION

Household sector has a considerable power to affect the overall economy due to its scale and its substantial exposure to the financial sector. It becomes the concern of many governments across the world, who then developed frameworks to increase households' financial literacy. In 2017, the Financial Services Authority (OJK) launched the revised National Strategy on Indonesian Financial Literacy with a vision of "to actualize a highly financial literate population who thus can take advantage of suitable financial products and services to achieve sustainable financial well-being (FWB)" (<u>OJK, 2017</u>). Generating more knowledge in household behavior and FWB in Indonesian case is vital to understand whether the Indonesian people may behave to achieve such vision. This study aims to contribute to this research body by exploring subjective FWB measures and its household finances factors as well as socioeconomic and demographic factors in Indonesia.

FWB has been studied across academic fields and its definition varies among researchers (<u>Aggarwal</u>, 2011; <u>Mahdzan et al., 2019; Prawitz et al., 2006; Shim</u> et al., 2009). Brüggen et al. (2017) clustered the existing definitions and measures of FWB into three groups: (i) those that use both objective and subjective characteristics; (ii) those that use only objective characteristics; and (iii) those that use only subjective characteristics to define FWB. Furthermore, Brüggen et al. (2017) suggested that subjective approach is more suited to capture and measure a complex and personal phenomenon such as FWB.

After a thorough literature review, Brüggen et al. (2017) synthesized the various definitions and meanings of FWB and proposed a specific definition of FWB as "the perception of being able to sustain current and anticipated desired living standards and financial freedom". There are three important aspects from this definition. First, FWB is a subjective measure as it is based on perception of oneself. Secondly, FWB is measured by perception of people on their own standard of living. Lastly, the definition of FWB has two time dimensions which are current and future situation. Furthermore, Michael Collins & Urban (2020) suggested that researchers can proxy FWB using proximate questions which are available in existing surveys. In this study, we measure FWB following above definition by utilizing unique questions on the existing household survey, namely, Indonesia Family Life Survey (IFLS).

Previous studies have confirmed that certain financial measures of household are important determinants of FWB. Headey & Wooden (2004) explored the effect of household net wealth on both subjective well-being and ill-being in Australia. Using the Household, Income and Labour Dynamics in Australia (HILDA) survey in 2002, the findings indicated that both income and net wealth are positively linked to financial satisfaction. Similarly, Hansen et al., (2008) explored the impact of assets and liabilities on financial satisfaction in old age. Utilizing the first wave of the Norwegian Life Course, Aging, and Generation Study (NorLAG), the results indicated that a significant proportion of the rise in FWB in old age can be attributed to the increase in assets and decline in debt carried by the elderly. Similary, Plagnol (2011) investigated the effect of assets and debt on financial satisfaction in the U.S. Using data from the second and third waves of the National Survey of Families and Households (NSFH), the analysis showed that the level of financial satisfaction grows along with increasing income while having more assets and lower debt will lead to greater financial satisfaction in later life. Following <u>Headey &</u> <u>Wooden (2004)</u>, <u>Brown & Gray (2016)</u> examined the effect of the household's financial position on the overall life satisfaction and FWB. Using the HILDA survey in 2002, 2006 and 2010 waves, the empirical analysis revealed that the household's level of net wealth and total assets are positively related to financial satisfaction, while debts are inversely related to FWB. We build on these studies by initially exploring the effect of household financial position as measured by net wealth, total assets and debt, on FWB measures. Furthermore, we explore whether relative financial position or social comparison effect does matter on individual's FWB in Indonesia.

Social comparisons have been extensively studied in a variety of disciplines including economics and psychology. The theory was initially proposed by <u>Festinger (1954)</u>, who postulated that human beings have an innate drive to evaluate their abilities and opinions in order to gain a better understanding of themselves by comparing themselves with others who are similar to them. This topic regarding social comparisons and its effect on subjective well-being, often measured by life satisfaction and happiness, has been researched by several authors (<u>Corazzini et al.,</u> <u>2012; Easterlin, 1974; Hagerty, 2000</u>), but only few of them examined its effect specifically on FWB (<u>Brown & Gray, 2016; Chatterjee et al., 2019</u>).

Brown & Gray (2016) explored the effect of social comparison on individual's level of FWB in Australia. The authors found that relative position of household's financial measures in the comparison group are important determinants of FWB. The empirical analysis showed that having a household income above that of the average of the comparison group has a positive impact on financial satisfaction. Furthermore, the results indicated that having a level of net wealth and total assets above that of the comparison group are positively related with financial satisfaction, whilst having a level of secured debt above the average of the reference group has a negative effect on financial satisfaction.

Furthermore, we also include demographic and socioeconomic factors such as age, gender, education, marital status and income in the analysis, following the existing literature (Brown & Gray, 2016; Chatterjee et al., 2019; Gutter & Copur, 2011; Joo & Grable, 2004; Mahdzan et al., 2020; Vera-Toscano et al., 2006). Several authors have found that FWB increases with age (Brown & Gray, 2016; Mahdzan et al., 2020),

while some others found that that age is positively related with FWB but not linearly (<u>Chatterjee et al.,</u> 2019; <u>Michael Collins & Urban, 2020</u>).

Furthermore, many authors found a U-shaped relationship between age and FWB (Headey & Wooden, 2004; Hsieh, 2003; Vera-Toscano et al., 2006). The effect of gender has also been researched by many authors. While some authors found that gender has no significant effect on FWB (Hsieh, 2003; Michael Collins & Urban, 2020; Vera-Toscano et al., 2006), many authors found that being female is positively related with FWB (Chatterjee et al., 2019; Clark et al., 2020). Higher levels of income and educational attainment had a positive effect on FWB in all previous studies, possibly due to the increased financial efficacy (Chatterjee et al., 2019). It was also found in those studies that being unemployed is negatively related with lower FWB (Brown & Gray, 2016; Chatterjee et al., 2019; Michael Collins & Urban, 2020). Most authors also found that, compared to being married, being divorced/ separated and being widowed are inversely related to FWB (Brown & Gray, 2016; Fan & Babiarz, 2019; Hsieh, 2003); whilst being single or never married is positively related to FWB (Gutter & Copur, 2011; Mahdzan et al., 2020). Furthermore, the number of people present in the household is found to be inversely related to FWB (Brown & Gray, 2016; Joo & Grable, 2004; Vera-Toscano et al., 2006).

This study has three main objectives. The first one is to analyze the effect of household finances attributes beyond income (net wealth, total assets, financial assets, non-financial assets and debt) on various FWB measures (subjective prosperity, perceived current standard of living satisfaction, and perceived future standard of living) in Indonesia. The second objective is to explore whether the social comparison effect does matter in determining individual's FWB. Finally, the third objective is to explore demographics factors that affect FWB in Indonesia.

This study contributes to the literature in three ways. First, to the author's knowledge, there is no previous research that analyzes the subjective FWB and its determinants in Indonesia. Using the latest wave of IFLS dataset, a large nationally representative household survey, we are able to empirically analyze the effect of household financial position (net wealth, the level of total assets and debt) along with socio-demographic factors (age, income, gender and

education) on various FWB measures in Indonesia. Secondly, we contribute on the growing area of social comparisons by further explaining how the relative financial position may affect individual's FWB in Indonesia. Lastly, the results of this study will support evidence-based policymaking to enhance FWB in Indonesia.

RESEARCH METHOD

The empirical analysis was based on data drawn from the Indonesia Family Life Survey (IFLS), a continuing longitudinal socioeconomic and health survey based on a sample of households representing about 83% of Indonesian population. The IFLS data supported the analysis of interrelated issues ranging from household-level information (consumption, housing, household characteristics), individual-level information (education, health, employment), and community-level information (electricity, water and sanitation, school availability).

For the analysis, this research focused on the latest wave of IFLS survey which was fielded in 2014 and early 2015 where the information related to subjective well-being was available. Further details of the IFLS survey are described in <u>Strauss et al. (2016)</u>. We dropped all individuals who report missing values for any of the dependent variables, making the sample of individuals analyzed throughout the study consistent (N=30,385).

As the nature of our dependent variables are ordinal, cross-section ordered logistic regression models were employed to examine factors correlated to FWB (Figure 1). Based on the previous literature, this research formed the following research hypothesis:

- H1. Net wealth is positively related with FWB
- H1a. Total assets is positively related with FWB
- H1b. Total debt is negatively related with FWB
- H2. Social comparison is significantly related with FWB
- H3. Income is positively related with FWB
- H4. Age has a U-shaped relationship with FWB
- H5. Being female is positively related with FWB
- H6. Education is positively related with FWB
- H7. Being unemployed is negatively related with FWB
- H8. Being married is positively related with FWB
- H9. Household size is negatively related with FWB



Figure 1. Conceptual framework of research

The underlying model of the research is based upon the latent variable model:

$$FWB_i^* = x_i'\beta + \epsilon_i, i = 1, \dots, N, \tag{1}$$

where FWB_i^* is a latent measure of the i^{th} individual's FWB, x_i' is a vector of observable household financial measures and demographic and socio-economic characteristics, β is a vector of coefficients to be estimated and ϵ_i is an error term. We observed FWB_i related to FWB_i^* as follows:

$$FWB_i = k \quad if \quad \mu_k < FWB_{it}^* \le \mu_{k+1}, \quad k = 1, \dots, K$$
 (2)

$$Pr(FWB_i = k | x_i') = Pr(\mu_k < x_i'\beta + \epsilon_i \le \mu_{k+1})$$
(3)
= $\Lambda(\mu_{k+1} - x_i'\beta) - \Lambda(\mu_k - x_i'\beta)$

The probability of observing outcome k corresponded to the probability that the estimated linear function, plus random error within the range of the threshold parameters estimated for a certain outcome. Where the threshold parameters μ_k were assumed to be strictly increasing for all values of k, and $\mu_1 = -\infty$ and $\mu_{K+1} = +\infty$. The coefficients β and the threshold parameters μ_k were estimated together using maximum likelihood estimation (MLE). While the error term ϵ_i , was assumed to be independently and identically distributed (IID) by the logistic distribution and $\Lambda(.)$ represented the cumulative logistic distribution. The ordered logit model was implemented in Stata using the "ologit" command.

RESULT AND DISCUSSION

Well-being Characteristics

Utilizing unique questions on subjective well-being section from the latest IFLS dataset, we try to capture self-perception of one's FWB. Following the definition of FWB by Brüggen et al. (2017), we explored three measures of FWB, namely, (i) subjective prosperity; (ii) current standard of living; and (iii) perceived future standard of living. Similar to Brown & Gray (2016), our subjective prosperity measure was based on the question, "Please imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. On which step are you today?". The mean level of perceived subjective prosperity was 3.024 with the median being 3. The full information of the distribution of responses to this question is presented in the Table 1.

Furthermore, in accordance with the definition of FWB by <u>Brüggen et al. (2017)</u>, this study tries to capture information on the self-perception of one's current standard of living as well as the perceived ability to sustain current standard of living in the future. The measure of perception on one's current standard of living was based on the question, "Concerning your current standard of living, which of the following is true?: (i) it is less than adequate for my needs; (ii) it is just adequate for my needs; (iii) it is more than adequate for my needs". The mean level of this measure was 2.04 with the median of 2.

Subjective Prosperity	Frequency	Percentage
		%
1: Poorest	2,059	6.78
2	5,357	17.63
3	14,189	46.7
4	7,651	25.18
5	844	2.78
6: Richest	285	0.94
Total	30,385	100

Table 1. Distribution of Subjective Prosperity Measure Responses

Source: IFLS 5, processed

Meanwhile, the perceived future standard of living was measured as the response to the question, "Knowing about how prices change in recent year, do you think you can keep the standard of living you have today in the next 5 years? (i) Very unlikely; (ii) Unlikely; (iii) Likely; (iv) Very likely". The mean level of perceived subjective prosperity was 2.613 with the median of 3.

Table 2. Distribution of Current Standard of Living Measure Responses

Current standard of living	Frequency	Percentage
		%
1: It is less than adequate for my	5,968	19.64
needs		
2: It is just adequate for my needs	17,231	56.71
3: It is more than adequate for my	7,186	23.65
needs		
Total	30,385	100

Source: IFLS 5, processed

Various financial measures were used in order to capture the household's financial position. These measures included the household's net wealth, total assets (including both financial assets and nonfinancial assets), and total debt. It should be noted that all of the financial variables are measured at the household level; consequently, each household member was given the same value of financial measures. In line with Gropp et al. (1997) and Brown & Gray (2016), in order to take account of the skewed nature of the monetary financial variables, the empirical analysis included the natural logarithm of each of the monetary measures. Following Brown & Taylor (2008) and Brown & Gray (2016), where net wealth, assets and debt take a positive value, the natural logarithm was simply taken. When the values of these variables are equal to zero, the natural logarithm is defined to be zero. When the value of net wealth (nw) is negative, the natural logarithm of net wealth is defined to be $-\ln \frac{f_0}{f_0}(|nw|)$.

Table 3.	Distribution of Future Standard of Living	
	Measure Responses	

Can keep the standard of living in the next 5 years	Frequency	Percentage
		%
1: Very unlikely	2,110	6.94
2: Unlikely	9,191	30.25
3: Likely	17,439	57.39
4: Very likely	1,645	5.41
Total	30,385	100

Source: IFLS 5, processed

In order to explore social comparison effects, a reference group must be defined for each individual. According to existing literature, there are several ways to define an individual's reference group in the context of income. <u>McBride (2001)</u> defined an individual's reference group to be all individuals five years older or younger than the individual. While <u>Clark et al. (2009)</u> and <u>Luttmer (2005)</u> defined an individual's reference group based on precise geographic location. Furthermore, <u>Ferrer-i-carbonell (2005)</u> defined an individual's reference group based on a variety of individual characteristics, namely, years of education, 5 age brackets, gender and regions (West and East Germany).

In line with <u>Brown & Gray (2016)</u>, this research defined an individual's comparison group to be based on a variety of characteristics including the respondent's age, education level, gender and geographical region. Specifically, gender was separated into males and females, and education was divided into five categories (primary, junior secondary, senior secondary, tertiary, others). Following <u>Ferrer-icarbonell (2005)</u>, the comparison group was defined into 5 age brackets (under 25, 25-34, 35-44, 45-65, 66 and above). In addition, the geographical region was based on province level area.

First, the average value of certain financial measures of the reference group for each individual was calculated. Then, the difference between the household's own financial measure and the average of the financial measure in the reference group was calculated. It was anticipated that relative financial measures in the comparison group are important determinants of FWB (Brown & Gray, 2016; Chatterjee et al., 2019; Clark et al., 2020).

Table 4. Demographic and Socio-Economic Characteristics

Variable	Mean	Std. Dev.	Min.	Max.
Dependent Variable				
Subjective prosperity	3.024	0.946	1	6
Current standard of living	2.040	0.657	1	3
Future standard of living	2.613	0.696	1	4
Household Finances				
Ln(net wealth)	17.146	5.444	-20.721	22.096
Ln(total assets)	17.991	1.665	6.908	22.096
Ln(financial assets)	4.131	6.774	0	20.723
Ln(non-financial assets)	17.957	1.705	0	21.951
Ln(total debt)	6.273	7.659	0	20.723
Demographic Variables				
In(household income)	15 460	2 775	0	20 245
Age	37,120	14.779	14	101
Female	0.531			
Below primary (Omitted cat.)	0.047			
Primary education	0.296			
Junior secondary education	0.210			
Senior secondary education	0.319			
Tertiary education	0.128			
Unemployed	0.012			
Married (Omitted cat.)	0.728			
Never married	0.199			
Divorced/separated	0.025			
Widow	0.048			
Ln(Household Size)	1.335	0.485	0	2.833
Comparison group				
Ln(avg. household income)	17.659	0.491	0	21.344
Ln(avg. net wealth)	18.731	1.458	-18.743	21.751
Ln(avg. total assets)	18.843	0.603	10.820	21.754
Ln(avg. financial assets)	14.365	2.412	0	20.030
Ln(avg. non-financial assets)	18.821	0.596	10.820	21.558
Ln(avg. total debt)	15.535	1.830	0	19.588

In accordance with the existing literature, a wide variety of demographic and socio-economic variables was included in the econometric analysis. Those included age, gender, education, employment status, marital status, and size of the household. This study distinguished the highest level of educational attainment between primary, junior secondary, senior secondary and tertiary education, with the omitted category of below primary education.

For the employment status, the study focused on those who were unemployed. This unemployment dummy variable was coded as 1 for individuals who were unemployed and 0 for otherwise. Furthermore, this study explored the effect of individual's marital status by categorizing whether the respondent is never married, divorced/separated or widowed, with being married as the omitted category. Table 4 presents summary statistics related to all variables used in the empirical analysis.

Determinants of Financial Well-Being

Table 5, 6 and 7 present the determinants of three different measures of FWB which are subjective prosperity, perceived current standard of living, and perceived future standard of living, respectively. Each table presents three models which capture different aspects of the household's financial position along with the same set of socioeconomic and demographic variables. Model 1 includes the household's level of net wealth, while model 2 separates net wealth into total assets and total debt in order to explore whether a particular component of net wealth has distinct influences on FWB. In addition, model 3 divides the overall assets into financial and non-financial assets to discover whether there are distinct effects on FWB. Financial assets include savings, certificate of deposit and stocks, while non-financial assets include land, properties, vehicles, and other tangible assets.

I	,		
Variable	1	2	3
Ln(net wealth)	0.0281***		
	(0.00211)		
Ln(total assets)		0.287***	
· · · ·		(0.00752)	
Ln(financial			0.0276***
assets)			(0.00160)
Ln(non-financial			0.251***
assets)			(0.00787)
Ln(total debt)		-0.000642	-0.00115
、 ,		(0.00141)	(0.00141)
Ln(household	0.0298***	0.00339	0.00107
income)	(0.00402)	(0.00403)	(0.00403)
Aae	-0.0154***	-0.0244***	-0.0246***
5-	(0.00492)	(0.00494)	(0.00495)
Age-squared	0.000234***	0.000256***	0.000267***
5	(5.67e-05)	(5.68e-05)	(5.69e-05)
Female	0.423***	0.399***	0.400***
	(0.0221)	(0.0222)	(0.0222)
Primary education	0.497***	0.448***	0.432***
,	(0.0718)	(0.0727)	(0.0728)
Junior secondary	0.897***	0.777***	0.748***
education	(0.0742)	(0.0753)	(0.0755)
Senior secondary	1.248***	1.039***	0.991***
education	(0.0733)	(0.0745)	(0.0747)
Tertiary education	1.815***	1.426***	1.326***
,	(0.0762)	(0.0778)	(0.0784)
Ln(household size)	0.0232	-0.198***	-0.165***
((0.0231)	(0.0241)	(0.0244)
Never married	0.266***	0.184***	0.210***
	(0.0381)	(0.0384)	(0.0386)
Divorced/separa-	-0.488***	-0.459***	-0.454***
ted	(0.0763)	(0.0771)	(0.0773)
Widow	-0.291***	-0.283***	-0.298***
	(0.0665)	(0.0676)	(0.0677)
Unemployed	-0.392***	-0.338***	-0.339***
	(0.100)	(0.100)	(0.100)
Observations	30,385	30,385	30,385
Pseudo R ²	0.0330	0.0495	0.0516

Table 5. Ordered Logit Estimates of of Subjective Prosperity

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1. Household finances

In line with previous studies (Brown & Gray, 2016; <u>Hansen et al., 2008; Headey & Wooden, 2004</u>), the results showed that net wealth and total assets was positively related with all FWB measures. Our estimation results indicate that the higher people's net wealth and assets, the more likely people see themselves as rich compared to others, feel adequate with their current standard of living, and perceive themselves as being able to keep their standard of living in the future. Although both financial and nonfinancial assets were positively associated with all FWB measures, it was found that non-financial asset had a larger magnitude than financial assets on all three FWB measures: 0.251, 0.199 and 0.125 compared to 0.0276, 0.0377 and 0.0208, respectively (Table 5, 6 and 7 column III). This indicates that owning nonfinancial asset has greater association with the three FWB measures than owning financial asset. This is possibly due to the functionality of tangible assets served that increase individual's FWB. Similar results were also found in Australian (Brown & Gray, 2016).

Table 6. Ordered Logit Estimates of Current Standard of Living

Variable	1	2	3
Ln(net wealth)	0.0274***		
	(0.00224)		
Ln(total assets)		0.243***	
		(0.00783)	
Ln(financial			0.0377***
assets)			(0.00172)
Ln(non-financial			0.199***
assets)			(0.00798)
Ln(total debt)		-0.00723***	-0.00791***
		(0.00152)	(0.00152)
Ln(household	0.0439***	0.0229***	0.0197***
income)	(0.00426)	(0.00424)	(0.00427)
Age	-0.0623***	-0.0702***	-0.0713***
	(0.00472)	(0.00477)	(0.00478)
Age-squared	0.000521***	0.000540***	0.000560***
	(5.19e-05)	(5.24e-05)	(5.25e-05)
Female	0.255***	0.230***	0.229***
	(0.0234)	(0.0235)	(0.0236)
Primary education	0.206***	0.164***	0.142**
	(0.0592)	(0.0599)	(0.0601)
Junior secondary	0.483***	0.377***	0.336***
education	(0.0629)	(0.0638)	(0.0639)
Senior secondary	0.819***	0.645***	0.575***
education	(0.0618)	(0.0628)	(0.0631)
Tertiary education	1.431***	1.113***	0.969***
	(0.0656)	(0.0674)	(0.0679)
Ln(household size)	-0.117***	-0.293***	-0.247***
	(0.0239)	(0.0250)	(0.0252)
Never married	-0.0856**	-0.165***	-0.136***
	(0.0403)	(0.0409)	(0.0411)
Divorced/separa-	-0.403***	-0.394***	-0.386***
ted	(0.0776)	(0.0787)	(0.0790)
Widow	-0.115**	-0.0963*	-0.116**
	(0.0577)	(0.0582)	(0.0581)
Unemployed	-0.680***	-0.644***	-0.649***
o	(0.109)	(0.110)	(0.111)
Observations	30,385	30,385	30,385
Pseudo K	0.0463	0.0603	0.0664

*** p<0.01, ** p<0.05, * p<0.1

p<0.01, p<0.03, p<0.1

On the other hand, having a higher level of total debt was found to have a significant and inverse relationship with perceived current standard of living, whereas there was a negative but statistically insignificant effect on subjective prosperity and perceived future standard of living. This finding is also consistent with previous studies in Australia (Brown &

<u>Gray, 2016</u>) and UK (<u>Vlaev & Elliott, 2014</u>). <u>Vlaev &</u> <u>Elliott (2014</u>) found that higher debt to income ratio is associated with lower financial satisfaction of the respondents in the UK.

To summarize this part, the empirical analysis indicates that it is necessary to account monetary variables beyond income when considering the determinants of FWB. Furthermore, the study found that assets and debt have distinctly different effects on FWB, highlighting the need of segregating net wealth into its own parts.

2. Demographic factors

The results of all socioeconomic and demographic factors were relatively uniform in all of three FWB measures. Consistent with existing studies (Brown & Gray, 2016; Fan & Babiarz, 2019), the empirical analysis showed that household income is positively associated with FWB. In line with Hsieh (2003) and Vera-Toscano et al. (2006), this study found a Ushaped relationship between age and all FWB measures. This finding is also similar with Sohn's (2013), who found a U-shape relationship between age and other subjective well-being measure (happiness) in Indonesia. Being female is significantly associated with higher level of FWB. This finding is also in line with studies in other countries: United States (Fan & Babiarz, 2019), Japan (Clark et al., 2020), and India (Chatterjee et al., 2019).

In line with previous studies (Brown & Gray, 2016; Chatterjee et al., 2019; Fan & Babiarz, 2019), higher level of educational attainment had a positively significant effect on FWB. This is possible due to the increase of financial efficacy. This finding was consistent in all three FWB measures (Table 5, 6 and 7). For example, on the subjective prosperity on the basic model I (Table 5 column I), the magnitude for primary education, junior secondary and tertiary education were 0.497, 0.897, 1.248 and 1.815, respectively. Providing financial education starting primary level of education might help in increasing the level of FWB among young people and people with lower educational attainment. Conversely, being unemployed was inversely related to all three FWB measures (similar with Brown et al., 2015; Chatterjee et al., 2019; Fan & Babiarz, 2019). In accordance with existing literature (Brown & Gray, 2016), being divorced/separated and widowed had significant and inverse relationship with all FWB measures. Interestingly, being never married had positive association with subjective prosperity, but negative association with perceived current and future standard of living. In line with existing studies (<u>Brown & Gray,</u> <u>2016</u>; <u>Joo & Grable, 2004</u>; <u>Vera-Toscano et al., 2006</u>), the more number of people living in the household was negatively associated with all three FWB measures.

Table 7.	Ordered	Logit I	Estimate	es of	Perception	on
	Future S	tandar	d of Livi	ing		

Variable	1	2	3
Ln(net wealth)	0.0205***		
	(0.00196)		
Ln(total assets)		0.148***	
		(0.00760)	
Ln(financial			0.0208***
assets)			(0.00173)
Ln(non-financial			0.125***
assets)			(0.00767)
Ln(total debt)		-0.000435	-0.000817
· · ·		(0.00150)	(0.00150)
Ln(household	0.0192***	0.00543	0.00338
income)	(0.00393)	(0.00407)	(0.00406)
Age	-0.0268***	-0.0318***	-Ò.0320***
5	(0.00466)	(0.00468)	(0.00468)
Age-squared	0.000219***	0.000236***	0.000243***
0	(5.18e-05)	(5.19e-05)	(5.18e-05)
Female	0.281***´	0.266***	0.265***´
	(0.0236)	(0.0236)	(0.0236)
Primary education	0.271***	0.242***	0.230** [*]
,	(0.0587)	(0.0589)	(0.0589)
Junior secondary	0.372***	0.298** [*]	0.274** [*]
education	(0.0626)	(0.0629)	(0.0630)
Senior secondary	0.348** [*]	0.224** [*]	0.182** [*]
education	(0.0608)	(0.0616)	(0.0617)
Tertiary education	0.745** [*]	0.526***	0.441** [*]
	(0.0640)	(0.0656)	(0.0661)
Ln(household size)	-Ò.122***	-Ò.231***	-Ò.208**́*
. ,	(0.0241)	(0.0250)	(0.0252)
Never married	-0.141***	-0.183***	-0.167***
	(0.0394)	(0.0396)	(0.0397)
Divorced/separa-	-0.222***	-0.206***	-0.203***
ted	(0.0717)	(0.0722)	(0.0723)
Widow	-0.190***	-0.177***	-0.188***
	(0.0593)	(0.0596)	(0.0596)
Unemployed	-0.0300	0.000673	-0.00185
	(0.103)	(0.103)	(0.103)
Observations	30,385	30,385	30,385
Pseudo R ²	0.0108	0.0154	0.0172

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3. Social comparison

For brevity, Tables 8, 9 and 10 present the findings related to the financial variables only. The results related to the standard control variables were generally consistent with those discussed in previous section. Table 8 presents the results related to the effect of the difference of households' financial measures with the average of their comparison group, for subjective prosperity. Furthermore, Tables 9 and

10 present the coefficients related to the perceived current standard of living and perceived future standard of living, respectively. It is anticipated that if households have higher level of net wealth or asset than the average of its comparison group, they tend to have higher level of FWB, and vice versa. However, it is also possible that people see an increase in the average income of the comparison group as a positive sign that their financial position will improve in the future. This phenomenon is called the "information effect" by <u>Senik (2004)</u> and the "tunnel effect" by <u>Hirschman & Rothschild (1973)</u>.

Table 8. Ordered Logit Estimates of Social Comparison on on Subjective Prosperity

Variable	1	2	3
Ln(net wealth)	0.0249***		
Ln(total assets)	(0.00201)	0.278***	
,		(0.00767)	
Ln(financial			0.0257***
assets)			(0.00158)
Ln(non-financial			0.243***
assets)			(0.00799)
Ln(total debt)		0.000353	-0.000473
		(0.00141)	(0.00141)
Ln(household	0.0286***	0.00256	0.000469
income)	(0.00405)	(0.00406)	(0.00405)
Observations	30,385	30,385	30,385
Pseudo R ²	0.0325	0.0475	0.0494

Analysis also controls for respondent's age, gender, education, household size, marital status and employment status. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8 shows the result of social comparison effect on subjective prosperity. The empirical analysis showed that having higher level of net wealth and income than the average comparison group was significantly associated with having perception of being richer. This finding supports the statement that comparison effect is an important determinant of FWB. In model 2, this research splits the net wealth into total assets and total debt and found that, while there was positive and statistically significant effect of having higher level of asset than the average comparison group, there was no comparison effect of having different level of debt than the reference group. Furthermore, in model 3, this research explores the different impact of type of assets on subjective prosperity. It appeared that having a higher level of non-financial assets than the comparison group had a greater impact than having a higher level of financial assets than the counterparts. This is in line with Brown <u>& Gray (2016)</u> who supported the idea that comparisons are drawn from more visible assets.

Table 9. Ordered Logit Estimates of Social Comparison on Current Standard of Living

Variable	1	2	3	
Ln(net wealth)	0.0242***			
	(0.00219)			
Ln(total assets)		0.230***		
		(0.00801)		
Ln(financial			0.0341***	
assets)			(0.00169)	
Ln(non-financial			0.189***	
assets)			(0.00809)	
Ln(total debt)		-0.00627***	-0.00738***	
		(0.00152)	(0.00152)	
Ln(household	0.0413***	0.0212***	0.0184***	
income)	(0.00429)	(0.00428)	(0.00432)	
Observations	30,385	30,385	30,385	
Pseudo R ²	0.0455	0.0577	0.0629	
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Analysis also controls respondent's age, gender, education, household size, marital status and employment status. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1. Ordered Logit Estimates of Social Comparison on Perceived Future Standard of Living

Variable	1	2	3
Ln(net wealth)	0.0180***		
	(0.00196)		
Ln(total assets)		0.140***	
. ,		(0.00773)	
Ln(financial assets)		. ,	0.0187***
· · · · ·			(0.00170)
Ln(non-financial			0.118***
assets)			(0.00778)
Ln(total debt)		0.000758	0.000131
、		(0.00150)	(0.00150)
Ln(household	0.0217***	0.00836**	0.00658
income)	(0.00398)	(0.00410)	(0.00410)
Observations	`30,385 ´	`30,385 ´	`30,385 ´
Pseudo R ²	0.0106	0.0146	0.0161
	<u> </u>		

Analysis also controls for respondent's age, gender, education, household size, marital status and employment status. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The social comparison results of the perceived future standard of living (Table 10) were similar with social comparison analysis on subjective prosperity (Table 8). Unlike two other measures of FWB, Table 9 shows different results for the impact of difference level of debt on perceived current standard of living. The result indicated that having higher level of debt than the comparison group had a negative and significant relationship with perceive current standard of living. Ghina and Sukarno, Household finances and social comparison...

Research Implication

This study has at least three research implications. First, the current research contributes to the growing subject of subjective well-being by exploring various FWB measures and its various determinants in Indonesia. Using the latest wave of IFLS dataset, this research is able to empirically analyze the effect of various household financial positions (net wealth, the level of total assets, and debt) and socio-demographic characteristics (age, income, gender, and education) on subjective prosperity, perceived current standard of living, and perceived future standard of living. The empirical analysis revealed that household's net wealth was also an important determinant of FWB other than income. Furthermore, total assets and total debts had distinct impacts on the FWB. While having higher level of total assets is associated with greater level of FWB, it is worth to note that it was the nonfinancial asset, instead of the financial one, that had greater impact on FWB. This may be due to the value that tangible assets add to the individuals' purchasing power and give them a strong influence on FWB. This result is in line with the similar study conducted in Australia (Brown & Gray, 2016). Conversely, it was found that higher level of debt had an inverse relationship with FWB according to the regression results. In summary, this study provides the first view into the study of FWB and its household financial position determinants in Indonesia. Future research may enrich this field of study by analyzing the more actual data, developing а comprehensive measurement of FWB, and including other factors that have not been included in this study. For example, if it is possible, it is worth to further analyze the total debt by separating it into secure debt and unsecured debt as it potentially captures distinct effects on FWB (Brown et al., 2005; Brown & Gray, 2016).

Secondly, this research contributes to the growing area of social comparisons by further explaining how the relative financial position may affect individuals' FWB in Indonesia. This study found that negative social comparison effect was apparent in all three FWB measures. This finding indicates that an increase in the average income, net wealth and total assets of the comparison group is associated with lower level of FWB. Whereas, the average level of total debt in the comparison group fails to have a statistically significant impact on subjective prosperity indicator and perceived future standard of living. This finding is similar with that of the previous study in Australia (Brown & Gray, 2016), while upward social comparison is not statistically significant affecting FWB in a similar study conducted in India (<u>Chatterjee et al.,</u> 2019).

Thirdly, the findings of this study can be used as a basis of information for the development of government's program to promote sustainable FWB. The definitions and determinants of FWB have been explored in the Financial Services Authority (OJK) document on the National Strategy on Indonesian Financial Literacy. However, there is no empirical study based on Indonesia case that is presented in the references, as the study on FWB is still strictly limited either in Indonesia or other developing countries.

Based on our research findings, there are two policy recommendations. First, in line with previous studies (Brown & Gray, 2016; Chatterjee et al., 2019; Fan & Babiarz, 2019; Sabri et al., 2020), our finding shows that lower educational attainment was significantly associated with lower level of individual's FWB. Therefore, this study suggests that financial education be delivered as early as possible to increase the level of FWB among young adults and people with lower educational attainment. According to the report by OECD (2020), financial education alongside financial consumer protection and inclusion are key elements to individuals' FWB. The premise is that providing financial education along with strong literacy and numeracy skills will increase financial literacy and support decision-making and FWB.

Second, the research finding showed that the higher the total debt, the lower is the individual's FWB. However, due to the availability of the data, we could not separate between secured debt and unsecured debt. According to previous studies in UK (Vlaev & Elliott, 2014), Malaysia (Sabri et al., 2020) and Australia (Brown & Gray, 2016), higher level of the unsecured debt correlates with lower level of the FWB. Furthermore, Vlaev & Elliott (2014) stated that it is encouraged for both young workers and families that they reduce and avoid non-mortgage debt if possible. Therefore, it is strongly suggested that the financial education may include competencies related to credit to build a strong and sustainable FWB (OECD, 2015). In Indonesian context, it is suggested that government promotes financial education that includes competencies related to credit in the national school system, starting from senior high school, to increase the level of FWB among young adults and people with lower educational attainment.

CONCLUSION AND SUGGESTION

The findings suggest that levels of net wealth and assets are positively associated with all FWB measures being used in the analysis. Furthermore, non-financial assets are found to have a greater impact on FWB than financial assets. In contrary, the level of total debt is inversely related with FWB but only found significant in perceived current standard of living. This study also suggests that the role of relative income, as measured by the difference between one's own financial measures and the average financial measures of the comparison group, are important determinants of individual's level of FWB. In regard to the socioeconomic and demographic factors, consistent with existing studies, the results indicate that the levels of income and educational attainment are positively related with FWB. Employment and marital status are also important determinants of FWB, with being unemployed, divorced/separated, or widowed are found to have a negative effect on FWB. Being female is also positively associated with higher level of FWB.

As one of the first studies of FWB in Indonesia, this study provides valuable information about how FWB in Indonesia is influenced by various household finance measures other than income (net wealth, total assets, and total debts), as well as by various socioeconomic and demographic characteristics (age, gender, education, employment status, marital status, and size of household). This study also found that there is negative social comparison effect among Indonesian population.

The findings of this study can be used as a basis of information for the development of government's program to promote sustainable FWB especially for the Financial Services Authority (OJK). Future research may develop of a comprehensive measurement of FWB, which collects more actual observations and includes other factors that have not been included in this study.

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Inequality and transaction costs in a community-based water supply in rural area adjacent to national park

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ABSTRACT

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National parks can be sensitive state-property areas since the surrounding communities generally need the parks' resources for their livelihood. This paper focuses on inequality and transaction costs in PAMSIMAS (Community-Based Water Supply and Sanitation), a water sector program in Indonesia's rural and peri-urban areas. The method used is a case study of PAMSIMAS in Tajuk, a village adjacent to Mount Merbabu National Park in Semarang Regency, Central Java. The data were gathered from documentary studies, in-depth interviews, and observations, and were analyzed using transaction cost economics and institutional analysis. This study found that the rules of PAMSIMAS, especially water pricing mechanisms, enhanced water availability but could not diminish the uncertainty of water access and transaction costs born by water users. Inequalities of endowment, power, and information among the hamlets affected how PAMSIMAS was run. Mobilization of water resources is related to property rights, which should be well-defined. Still, there was an overlapping property institution of Mount Merbabu National Park forest and its water resources; thus, the water user groups had to bear different transaction costs. The study provides suggestions for providing broader 'rules of the game' in rural water management, recognizing local conditions and prospects, acknowledging community rights to resources, and developing inclusive community participation.

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INTRODUCTION

Pengelolaan Air Minum dan Sanitasi Berbasis Masyarakat (PAMSIMAS) or Community-Based Water Supply and Sanitation) is a community water sector program encouraging communal participation in managing drinking water and sanitation in Indonesia's rural and peri-urban areas. The program refers to Indonesian Law No. 32 on Regional Government and Law No. 33 on Financial Balance between Central and Regional Government that mandates the government to provide basic necessities for the community, including drinking water and sanitation. Additionally, PAMSIMAS refers to Indonesia's commitment to achieving the Millennium Development Goals for the Water Supply and Sanitation Sector (currently the sixth goal of the Sustainable Development Goals). The program involves five Indonesianministries (Ministry of Public Works, National Development Planning Agency - BAPPENAS, Home Affairs, Health, and Villages for Disadvantaged Areas and Transmigration) with the supports from international donor agencies, namely The World Bank and The Australian Government Department of Foreign Affairs and Trade.

By 2020, PAMSIMAS has reached thousands of villages and peri-urban areas throughout Indonesia. PAMSIMAS I started from 2008 to 2012, targeting 7,402 rural and peri-urban areas, then PAMSIMAS II continued in 2013-2017, targeting 5,297 villages and peri-urban areas (The World Bank, 2014). To achieve the target of Universal Access to Drinking Water and Sanitation in 2019, PAMSIMAS III continued to increase the number of low-income rural and suburban residents who can access better water and sanitation facilities and better hygiene practices. The World Bank reports that the institutional sustainability of the PAMSIMAS approach shows positive signs, and even 97% of regencies replicate the path outside the target communities (Wray, 2019). With this success stories, this program will continue in the years to come.

Many researches and evaluations on PAMSIMAS implementation have shown success stories of the program, including increasing access to drinking water and community participation. It is now easier for rural communities to get clean water and sanitation facilities (Pratama & Isnanik, 2018; Sitranata, 2016). This is coupled with the high utilization and maintenance of water supply and sanitation infrastructure (Fitriyani & Rahdriawan, 2015; Suroso, 2018). Participation in PAMSIMAS is in the form of community involvement in decision-making and the spending of energy and money for the program's sustainability (Chaerunissa, 2014). PAMSIMAS has encouraged success in increasing community participation in water supply and sanitation that, in fact, in some areas, the achievement of the program has exceeded the targets (Asminar, 2019; Chaerunissa, 2014).

Although many success stories of PAMSIMAS have been demonstrated by the above studies, yet other studies and evaluations also show several issues in the program implementation that need to be addressed, including water quality and inequality problems. In several rural and urban areas, clinical trials of water quality are critical because of inadequate water quality (Fitriyani & Rahdriawan, 2015). PAMSIMAS implementation evaluation also shows that the development of PAMSIMAS infrastructure has not been evenly distributed (Suroso, 2018). In Pati Regency, for example, only 26.85% of villages have access to the program (Suroso, 2018).

Research on PAMSIMAS implementation in the areas adjacent to national parks has not been done much. National parks can be sensitive state-property areas since the surrounding communities generally need the parks' resources for their livelihood. To protect wildlife and biodiversity, state institutions restrict human access to parks, so behind the success of conservation, conflicts and violence between the state agency and community often occur (De Pourca et al., 2017; Mukherjee, 2009). The root of the conflict varies greatly, not only from the state's political priorities but also from various actors with various interests and needs (Sandlos, 2007; Vedeld et al., Besides, several studies found that 2012). conservation benefits through national parks may increase local economic inequality (Ntuli & Muchapondwa, 2017; Tumusiime & Sjaastad, 2014). Actors with more wealth or power are more likely to have more access to the national park resources than the poor ones.

Sharing the benefits and costs among individuals in resource use is significant in collective action. The inequality of endowments may affect the distribution of benefits and costs (Bardhan et al., 2018). The distribution of access rights to the common-pool resources and its benefits tends to reflect the distribution of wealth endowments, so wealthier users could benefit more from managing resources than relatively poorer users (Kurian & Dietz, 2013). Economic endowments, social norms, and social perceptions such as class, caste, ethnicity, gender can also affect how resources are allocated. Unequal distribution of access rights may lead to unstable and hostile relations among individuals. Thus individuals with fewer endowments will feel uncertain about their future rights (Baland & Platteau, 2018).

Understanding the performance of water sector programs requires a thorough cost analysis, not only the costs of the program implementation process but also the transaction costs involved (Laurenceau et al., 2009). McCann (2013) defined transaction costs as the resource costs of creating and using policies by defining, assigning, maintaining, and transferring rights. Meanwhile, Ostrom (2015) property distinguished transaction costs by comparing them with transformation activities/costs. Transformation activities change a situation into something else, such as building a water reservoir in an irrigation system. Meanwhile, transaction activities are directed at (i) coordinating transformation activities, (ii) providing information, and (iii) gaining strategic over other advantages. All transformation activities in collective action will include transaction activities, or,as some may call it, collective lobbying activities (<u>Meinzen-Dick</u> <u>et al., 2002</u>). They require transaction costs for which large amounts of time, money, and energy are

consumed. The focus of transaction cost economics is the disputes that may arise when individuals, characterized by bounded rationality and opportunistic behavior, are involved in contractual relationships (Williamson, 2019). Relationships between individuals who do not have the same information, incentives, resources, and social norms may give rise to transaction activities and the resulting costs (Ostrom, 2015). This situation encourages some individuals to adopt opportunistic strategies to obtain unequal benefits at others' expense, namely "free ride," rentseeking, and corruption.

Many studies have widely described transaction costs addressing water management, water market, and policy on water (Deng et al., 2018; Njiraini et al., 2017; Zhang et al., 2013). Arifin (2006) explicitly described the transaction costs of the upstream and downstream relations in community-based forest and water management in protected areas. However, the study has not linked the transaction costs with the problem of inequalities between actors in resources management. Inequalities are very likely to drive an increase in transaction costs, thereby reducing the level of certainty in sustainable water management (Ostrom, 2015).

This study examines inequalities affecting the efficiency of transaction costs in community-based water management by taking a case study of PAMSIMAS program implementation. A better understanding of the performance of PAMSIMAS in sensitive areas like national parks will provide input for future development of the programs and public services. This study is expected to give policy recommendations, especially in improving water supply and sanitation programs in rural areas.

RESEARCH METHOD

The method used was a case study of PAMSIMAS program implementation in Tajuk, a village adjacent to Mount Merbabu National Park in Getasan District, Semarang Regency, Central Java Province, Indonesia. The parts of the research problem and its relationship are stated as follows. The issue of inequality has relevance to transaction costs. Inequalities in this study are the power, endowment, and information owned by water user groups involved in the PAMSIMAS program. Meanwhile, transaction costs are costs from lobbying and negotiation activities to access water resources that built contractual relationships among water users.

Data were collected using the triangulation method. The documentary study was used to obtain data related to the general overview of the village and PAMSIMAS Program. The document sources were from the village government, the Ministry of Public Works, and Mount Merbabu National Park). In-depth interviews to obtain primary data by interviewing key respondents such as the village apparatus, national park staff, and water users in each hamlet (subvillage).Observations were done to obtain data related to the biophysical condition of the village, community socio-economic activities, and water management infrastructure.

This study used transaction cost economics and institutional analysis, considering that transaction costs efficiency is essential for all organization forms, including those involved in managing common-pool resources (<u>Ostrom, 2015</u>). In this study, the said institutions were (i) the property rights regulating access to forest and water resources in the zone of the national park, and (ii) the program rules in PAMSIMAS providing coordination functions for community-based water management. It was then reviewed whether under these two institutions, water users' transaction costs to get water access becoming more efficient.

RESULT AND DISCUSSION

Description of The Study Area

Tajuk Village is located on the slope of Mount Merbabu, Getasan District, Semarang Regency, Central Java Province, Indonesia (Figure 1) and has a wealth of potential resources. Mount Merbabu has about 5,725 ha of dense forest areas which consists of pines, acacia, flowers, and bushes. These forest areas are the primary and upstream catchment areas of 17 rivers in Magelang, Semarang, and Boyolali Regencies (Gunawan et al., 2013). The slopes of Mount Merbabu have many springs, which release 10,055 liters/second of water, so that in a year, there is around 312.75 billion cubic meters of water. Thus, Mount Merbabu has abundant water resources that the local community can utilize.

The village consists of eleven hamlets (subvillages) whose elevations range from 1,000 meters to 1,800 meters above sea level and has an average air temperature of 13 to 23° Celsius. Seven of the eleven hamlets are directly adjacent to the border of the Mount Merbabu National Park. This village has many springs located both in the village area and in the national park zone. The local community recognizes the riparian right, where every hamlet with a land boundary next to spring can fetch its water.



Figure 1. Map of the study location

Table 1. Major Changes in the Property System of Mount Merbabu Forest

Period	Changes in Forest Status and its Management Institutions
Pre-Independence Era	
Before the 20th century	Tribal rules.
1906	Set as 'the forbidden forest' (<i>hutan larangan/tutupan</i>) by the Dutch Colonial Government.
1908	Designation of forest boundaries based on <i>Proces verbaal van grensregeling (Berita Acara Tata Batas/</i> Notes of the Boundary) for Kedu Area (in Muntilan and Tegalrejo District) and Boyolali Regency.
1915	Designation of forest boundaries for Semarang Regency area, including Village communities, lived in the forest called <i>enclaves</i> .
1930	Recognition endorsement of designated boundaries as having de facto and de jure status, resulting from <i>Grensprojectkaart</i> (forest mapping).
Post-Independence Era	
1959-1963	Forest management by Forestry Office at the regency level.
1963-2004	Forest management by Perhutani, a BUMN (state-owned enterprise) that managed most forest areas in Java.
2004-present	Forest management by Central Government through the Ministry of Forestry following the change of forest function into national park which designated zones system with specific provisions for each zone.

Source: From various sources and interviews with local people and a staff of Mount Merbabu National Park

Most of the villagers are indigenous people, inhabiting the area for several generations, so they have strong social ties, both with fellow residents (bonding social capital) and nature. Communities depend on forest resources, such as wood for fuelwood, grass for animal feed, and water from springs located in the national park's forest zone. Around 4,007 people live in Tajuk, and mostly (87.44% of the total workforce) work as farmers or laborers. Only a small proportion of workers are fully employed in other sectors, such as civil servants, military/police officers, tailors, drivers, private sector employees, carpenters, masons, and private teachers.

Collective action for water resources management occurs independently in each hamlet. The rules that define the tasks and participation among them are developed and enforced on their own. Thus, in general, there is only one water supply system in each hamlet. Some hamlets use neighborhood groups at the local level, RT such as (Rukun Tetangga/neighborhood association) or RW (Rukun Warga/citizens association), as water resources management organizations. Several other hamlets form a special team to manage water resources.

Each hamlet's independent management is due to geographical and administrative boundaries and each hamlet's social identity. Geographical boundaries that separate the hamlets include rivers, agricultural land, and forests. The *Dusun* (hamlet) identity is more potent than village identity, even though all people live in the same village. Phrases like *Wong Pulihan* or *Wong Kaliajeng* (a native or inhabitant of Pulihan)

Hamlet or Kaliajeng Hamlet) indicate a social identity embedded in their collective memory. Another social identity entrenches in their belief in the communal tradition, i.e. *Saparan*. Each hamlet has its own belief about a good day to celebrate this tradition that refers to their respective *Danyang* (the village founder or protector spirit)

Institutional Arrangement

1. Mount Merbabu National Park

In 1980, coinciding with the World Conservation Strategy's announcement, Indonesia's government implemented the national park concept. The criteria for determining national parks in Indonesia are regulated and confirmed in Law No. 5 of 1990 concerning Conservation of Living Natural Resources and their Ecosystems and Law No. 41 of 1999 concerning Forestry and various implementing regulations.

In terms of ownership, national parks are generally state property, although the states sometimes give restitution to indigenous people's land (Curry, 2009). In Indonesia, the central government is the leading manager of national parks through the Ministry of Forestry. Meanwhile, the technical implementation unit at the site is the National Park Office under the Directorate General Natural of Resources Conservation. Along the way, based on the agreement of the WCPA (World Commission on Protected Areas) Congress in 1993, conservation areas cannot only be managed by a single institution. The management must involve various concerned parties, especially the

community around the area (<u>Dunggio & Gunawan,</u> 2009).

The property system of Mount Merbabu forest has changed several times. Table 1 shows institutional changes on Mount Merbabu forest concerning its property system. After Indonesia's independence, it was managed by the Forestry Department of Indonesia at the regency level. Subsequently, in 1963, Perhutani (state-owned enterprise) managed some parts of the forest as a timber production source. Finally, in 2004, the Ministry of Forestry of Indonesia took over the management and changed the forest function as a national park.

The government divided the the national park area into several zones: (i) the core zone, i.e. a part the national park that is protected, serving to protect the representation of the original and unique biodiversity; (ii) the jungle zone, i.e. a part that, due to the location, the conditions and its potential, can support the interests of conservation in the core zone and the zone of utilization; (iii) the utilization zone, i.e. a part where the natural conditions and potentials are mainly utilized for the benefit of nature tourism and other environmental conditions/services; (iv) traditional zone, i.e. a part that is determined for the benefit of traditional use by the local community who due to their historical background has a strong dependency on natural resources; (v) rehabilitation zone, i.e. a part that needs to be restored since the living community and its ecosystem is damaged; and (vi) cultural zone, i.e. a part in which there are religious sites, cultural and or historical heritage used for religious activities, and protection of cultural or historical values.

Institutional change of the forest into Mount Merbabu National Park affects the relationship between the local community and the forest and its resources. The central government established a government agency responsible for the management of national park. Local people's activities must be adjusted according to the national park's zone designation, although most of them do not understand this system. Some hamlet residents are still allowed to manage the land called lacen in the utilization zone, which used to be obtained from the community-based forest management program (PHBM) when the government organizes the Merbabu mountain forest area as a production forest (Gunawan et al., 2013). Thus, local people may still benefit from forest resources but must comply with state regulations and government agencies responsible for the forests. For instance, in the context of local wood needs, the community cannot cut down and take advantage of forest trees, even trees that have already fallen. There is a rule that fallen trees must be returned to nature by burying them in the forest's ground. Entering the woods with a rifle is also illegal, while incidentally, the local people need to drive out monkeys that often destroy their crops.

The constraints that the government imposes have sometimes created tension between government agencies carrying out state duties and the locals fighting for their livelihoods. For instance, in Sokowolu Hamlet, Tajuk Village, a physical fight between six national park forest rangers had occurred in Sokowolu. The violence that led to the burning of a motorbike belonging to one of the officers was a response to allegations of an elderly villager as being committed in illegal logging. Patrol officers also detained a local resident for carrying a rifle which the resident used to repel a herd of monkeys that destroyed agricultural land. The officers finally released the local resident after the hamlet leader threatened to mobilize the crowd to the detention location. These incidents are in line with the research of <u>De Pourcg et al. (2017)</u> and Mukherjee (2009), namely that conservation policies in national park areas that are insensitive to the needs of local communities are very likely to cause conflict and violence between local communities and the state agency.

There has not been much change in how the local community access water sourced from the national park, but it must comply with applicable regulations. The community can still use water, but only in permitted zones such as the utilization and traditional zones. The locals cannot build and/or rebuild water storage tanks in the restricted zone. There are also variations in how the hamlets in Tajuk Village get their water from the national park areas. Apart from being related to the state-property embedded in the national park, this variation is related to the principle of riparian rights recognized by village communities which means the people closest to the water source are more entitled to access these resources (Craig, 2012). Common variations are (i) communities directly adjacent to the national park can access water straight from the source, and (ii) hamlet communities that are not directly adjacent to the national park can access water, but through coordination with hamlets directly neighboring the national park. Some hamlets also provide water management services to parties outside the village, such as Salatiga City areas, which are relatively remote.

2. PAMSIMAS

In 2013, Tajuk Village received a grant from the government for the PAMSIMAS program by complying with the government's strict rules. These strict rules are part of an effort to change people's behavior and habits within a development project framework (Li, 2016). The village must compete with other villages in the regency. They must make program proposals to Semarang Regency government and meet some requirements set by the policy makers (the government and the World Bank). The requirements included (i) villages were capable of providing Community Empowerment cadres in the Water and Sanitation sector; (ii) the community had to provide an endowment fund in 4% in cash and 16% in kind; (iii) the community must get used to healthy sanitation behavior and bear the costs of transformation activities. After fulfilling these requirements, Tajuk Village received a grant from the State Budget amounting to 216 million rupiahs.

Apart from the rules that the village must meet before program implementation, other rules needed to be implemented during program implementation. These rules were embedded in the technical manuals for ensuring the performance of PAMSIMAS. To implement these regulations, program implementers received various training and technical guidance facilitated by the government. The rules that significantly change water management under PAMSIMAS Tajuk Village are (i) the adoption of a water pricing mechanism; (ii) the obligation for the community involved in PAMSIMAS to install a water use meter; and (iii) the establishment of Water Supply and Sanitation Facility Management Agency (BPSPAMS) as a new collective-choice body. Table 2 shows more details regarding the major rules under the PAMSIMAS program in Tajuk Village.

Of these main rules in PAMSIMAS, the rule that makes water availability higher is the volumetricbased water pricing mechanism. The mechanism can provide incentives for more efficient water use (Narasimhan, 2016). The users must bear the opportunity cost of using water. Based on an interview with a farmer, water use became more efficient after the implementation of PAMSIMAS. Some farmers said that they were worried about using water excessively so that the costs would be high. Thus, water is more available, especially for farmers living in the lower terrain who used to face water shortage. In other words, the market-like institution under PAMSIMAS has resulted in water use efficiency, which means that all water users get sufficient water.

However, the problem usually arises with regard to how a reasonable price can be determined (<u>Chen et</u> <u>al., 2013</u>). Initially, the community responded to this rule with pros and cons. Most of the farmers witha lot of livestock objected to the regulation because they were worried that they would pay a high-water price. Meanwhile, people who mostly live in lower areas strongly agreed. They considered that people living in higher areas used water excessively. Thus, residents in lower areas often experienced water shortages. The whole community ultimately agrees with the rules regarding the cost of water as long as they decide it themselves, and the water price will not be as high as in urban areas

Table 2. Major Rules of Wate	er Management unde	r PAMSIMAS in	Tajuk	Village
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M	ajor Rules	Consequences
1.	The adoption of a water pricing mechanism (a market-like mechanism)	 A volumetric water pricing is enacted (water charge is based on the amount of water used). All water users have to pay monthly abonnement and the charge of water counted per cubic meter
2.	The obligation to install new technology, mostly water meter in each house	 The water system is designed as a closed pipeline network to control water transfer. Smaller pipes connect the main water storage tank to water users' houses. With a gravity system, water flows from the water storage tank to the downstream area. Water meter/calculator is installed in each house to count the amount of water usage per household.
3.	The establishment of a new collective-choice body	 Water users who have installed this machine have automatically joined the program. Changes in stewardship in water management from the leaders of RTs to the BPSPAMS, as a new collective choice body. Members of the BPSPAMS have authority over daytoday management, including operation and monitoring.

Inequalities

With the amount of the fund granted (216 million rupiahs), the program could only reach a limited number of houses in the village. Of the 969 houses in Tajuk Village, only 207 could benefit from PAMSIMAS. Thus, only two hamlets, namely Hamlets of Pulihan and Kaliajeng, could be involved in the program. All houses (140 houses) in Pulihan and a number of the houses (67 houses) in Kaliajeng got the privilege to join the program. Besides, two parties outside the village, an agricultural company and a social foundation, were allowed to join at their own expense. Table 3 shows the groups of water users in the PAMSIMAS program in Tajuk Village.

Table 3. Water Users within PAMSIMAS System in Tajuk Village

Water Users	Number Users	Water Uses
Pulihan inhabitants	140	Domestic use and
		agricultural production
Kaliajeng inhabitants	67	Domestic use and
		agricultural production
Agricultural company	1	Livestock production
		business
Social institution	1	Social activities and
		hospitality business

The two hamlets joining PAMSIMAS, Pulihan and Kaliajeng, have differences in bio-physical condition and endowment. Pulihan has a better advantage in biophysical conditions since it has several abundant alternative water sources in its area. Its location is also in the upper terrain and adjacent to the national park zone where the spring for PAMSIMAS locates. With the principle of riparian rights believed among the villagers, Pulihan has the right to fetch water from the closest park's zone. Meanwhile, Kaliajeng is located lower than Pulihan. Although it has several alternative water sources, it is not sufficient for all inhabitants. Kaliajeng has quite a large spring, but its location is in an area under its residential terrain, so they cannot use a gravity system that facilitates water distribution. Moreover, they do not have sufficient technology to drain water from the bottom to the top. Therefore, Kaliajeng must seek access to water from Pulihan.

Biophysical conditions and endowments of different water users in the village have alluded to who will receive more benefits from PAMSIMAS. <u>Ostrom</u> (2010) suggested that biophysical and material

conditions may affect how resources and property are distributed or restricted. With that unequal situation, Pulihan got more opportunities to allow all its residents could be involved in PAMSIMAS, while Kaliajeng did not get the same chance. Kaliajeng must get 'generosity' from Pulihan to get water access. This confirms <u>Kurian & Dietz's (2013)</u> research results that resource users with more endowments will benefit more than those who do not.

Apart from biophysical conditions, power asymmetries also affect how development programs are implemented in Tajuk. García & Bodin (2019) suggested that participation in various forums is the key to influence decision-making in water governance. Pulihan has become more robust due to several local political elites residing there. The village office is located in Pulihan, and some people holding strategic positions as village officials also lived in Pulihan, including the village head and village secretary. Besides, a resident of Pulihan worked for national park office and all members of BPSPAM as the collective choice body were Pulihan residents. These strategic positions gave Pulihan more opportunities to participate and more power to influence decisionmaking processes than other hamlets.

Power asymmetries, in turn, also intersect with asymmetric information of different groups (Saam, 2007). Since elites' strategic positions were mostly concentrated in Pulihan, information on development programs, especially from the top-level government and the national park agency, ranmostly to Pulihan. The national park staff from Pulihan mostly coordinated more conservation programs with the government and various civil society organizations (CSOs) outside the village. This unequal access to information is very likely to impact development programs significantly, especially if it is not transparent (Lightfoot & Wisniewski, 2014). A hamlet head who did not receive the PAMSIMAS program even expressed a despair feeling and stated, in a satirical tone, "let Pulihan be full first." This shows how Pulihan enjoyed more and earlier development programs than other hamlets.

Furthermore, there is a power imbalance between the surrounding rural communities and the national park management. In the context of state-centered management of national parks, the state has expanded its power (<u>Lunstrum, 2013</u>). To access resources from national parks, neighboring rural communities must follow rules that promoted conservation. Even though local communities recognized riparian rights and felt they own water resources close to them, the national park resources are legally a state property. Enforcement usually follows the zoning system of the national park and the restrictive rules embedded in it. What is often worrying is the exerciseof law enforcement with a militaristic approach, which sometimes worsens the relationship between the national park and the surrounding village communities (Lunstrum, 2014).

Transaction Costs and Uncertainty

Unequal relations among water user groups in PAMSIMAS increased transaction activities which in turn increase costs incurred. This is in line with Ostrom's insight (2015) that transaction costs are very likely to be high if individuals have different information, incentives, resources, and social norms. As described above, Pulihan and Kaliajeng have differences in biophysical conditions, power, and information. Meanwhile, there is an imbalance in power relations between the state that manages the national park and the surrounding village communities. Characteristics of water user groups, such as bounded rationality and opportunism, also transaction costs impact increasing in the development program (Coggan et al., 2013). In the case of PAMSIMAS in Tajuk, user groups prioritized the interests of their respective groups.

In the water market, property rights significantly affect transaction costs (<u>Williamson, 2015</u>). The PAMSIMAS water source in Tajuk is located in the national park area. There is an overlapping institutional arrangement to this water source. The rural communities believed they had the right to use the water source because they recognized riparian rights. Pulihan is close to the water source, therefore acknowledging ownership to the resource and rights to transfer access and distribute water to other parties they agree with. Meanwhile, the government considered that it is legally a state property. The parties who wished to gain water access should carry out transaction activities and incur transaction costs.

There were several forms of transaction costs in implementing PAMSIMAS in Tajuk. Firstly, transaction activities in the form of lobbying for the collective interests of each water user group. Kaliajeng needed to negotiate with Pulihan to keep getting water allocation and getting involved in the PAMSIMAS program. The head of Kaliajeng hamlet met directly with the village secretary, a resident of Pulihan, several times to discuss the possibility of Kaliajeng getting access to water. These meetings were held at the village office and the village secretary's house. During the dry season, Kaliajeng would ask Pulihan to allocate water to them. In the rainy season, Kaliajeng would ask them to stop the distribution because the water sourced from the springs in Kaliajeng has met all its residents' needs. Meanwhile, although not as often as Kaliajeng, Pulihan must also negotiate with the national park authorities to ensure that they could still access water sourced from the national park area. The lobbies were facilitated by the non-civil servant national park staff living in Pulihan.

The lobby and search for information activities required money and effort. Money was explicitly needed, especially for the cost of transportation. In every effort to find information, a hamlet representative visited the targeted parties, so they had to leave their job. Implicitly, costs were incurred in actors' labor and time spent in information seeking or supervision. If converted to the average standard wages per day received by local people as laborers working in fields/ agricultural land, the transaction costs incurred were around 60,000 - 70,000 rupiahs for each time information inquiry process was done. Therefore, Kaliajeng spent more time and resources to negotiate with local elites and BPSPAMS. Negotiations allowed Kaliajeng to continue to access water through PAMSIMAS under the coordination of Pulihan.

Table 4.	Contribution	Fee of	Water	Usage

Water Lleere	Tariff of	Tariff of Using
Waler Users	Household	Water
	rupiah/month	rupiah/m ³
Pulihan inhabitants	1,000	200
Kaliajeng inhabitants	3,000	200
Agricultural company	-	3,000
Social institution	-	3,000

Secondly, other transaction cost was in the form of contractual relationships among groups of water users. Volumetric-based water pricing rules applied to all water users and were managed by BPSPAMS as the collective choice body. The two hamlets were involved in a contractual relationship through the settlementof different water tariffs. Table 4 shows that the costs incurred by each sub-group are uneven. As a part of the unwritten contractual agreement, the residents of Kaliajeng paid a higher tariff than the residents of Pulihan. To continue to get water distribution, however, Kaliajeng must agree to the water tariff decision determined by Pulihan.

Following the transaction costs spent, there was uncertainty regarding water access for each hamlet involved in PAMSIMAS. As embedded in riparian rights, residents of Pulihan had the right to be more prioritized over water access than Kaliajeng or other parties. This means that water users with more endowments will benefit from the management (Kurian & Dietz, 2013). Thus, Kaliajeng depended more on the 'generosity' of Pulihan. While unwritten, there was a mutual agreement between Pulihan and Kaliajeng in which Pulihan would be given a priority in getting water supply during the dry season. Kaliajeng's condition was relatively weak because access to water was only obtained after Pulihan's water needs were fulfilled first. This indicates that the group with lower power or endowment will feel uncertain in getting resources (Baland & Platteau, 2018).

This uncertain situation ended in 2018 when the tension between Pulihan and Kaliajeng peaked. Pulihan asked for a tariff increase for Kaliajeng of 5,000 rupiahs per month due to the construction and reparation of pipes. Kaliajeng objected this unilateral decision, so they were not willing to pay. Pulihan then decided to stop water distribution to Kaliajeng. After five years of PAMSIMAS in Tajuk Village, Kaliajeng finally did not join the program. Unfortunately, the equipment such as water meters and pipes built in Kaliajeng are now not used. Kaliajeng eventually lobbied a hamlet in a neighboring village to get water allocation outside the PAMSIMAS program.

Meanwhile, because water mobilization is also related to property rights, Pulihan had to compromise with the national park agency to access water from the park's zones. In this case, the state has more power because the forest and its resources belong to the state (Lunstrum, 2013). The government agency of national park has once stated their willingness to take over the water management. After one of the staff learned that water service revenue was quite significant, especially that which was paid by the social foundation, the national park agency tried to capture this opportunity. Responding to this move, Pulihan tried to lobby the agency to keep managing the park's water resources. Fortunately, thanks to a resident of Pulihan who was working for the national park agency, the agency was still willing to accommodate Pulihan's aspirations. Thus, without having state's recognition on joint ownership over forest resources, Pulihan remained facing uncertainty regarding water access to the national park zone.

Research Implication

Management of common-pool resources, such as forests and water, always requires appropriate institutions. Common-pool resources refer to goods or services in which users compete highly to use them or find it difficult or expensive to restrict other users from using them (Ostrom, 2015). Institutions are the 'rules of the game' limiting human action and influencing social behavior (North, 2016). The rule itself has some dimensions that define the flow of income and costs and give authority to the decision-making process. Those dimensions affect the distribution of assets and power. Although not always efficient, institutions can reduce uncertainty because rules can control individuals' and organizations' decision-making processes (Schotch, 2018). Therefore, institutions are substantial since the level of certainty and sustainability will, in turn, enable cooperation and create community economic development.

There are two critical institutions for the management of common-pool resources: (i) those that provide coordination and (ii) property rights (Meinzen-Dick, 2014). Coordination is needed to arrange a particular approach to resource management. Coordination function can be provided by the state, collective action, or markets. At the same time, property rights institutions are needed to define the benefit stream of water resources, including access, management, distribution, and exclusion. Many resources are held under certain property rights regimes, which may combine the characteristics of two or more of these types: open-access control (no management intervention), private property (marketbased system), state property (managed by the central government/state), and common property (controlled by the identifiable community based on local rules) (Everard & Dupont, 2018).

PAMSIMAS encourages community-based drinking water supply and sanitation, so the coordination institution for collective action stands out in this program. Collective action refers to actions taken together by a group of people whose goal is to improve their condition and achieve common goals (<u>Ostrom, 2015</u>). However, in achieving the common goal, the actors in the collective action may follow the rules that exist or just do the opposite, such as

engaging in opportunistic behavior (Hardin, 2015). Thus, successful water resources management through collective action requires institutional arrangements and certain characteristics of the resource system, water user groups, and a supportive external environment (Ostrom, 2015). And one of the most significant is that property rights should be well defined (Everard & Dupont, 2018). Property rights will determine whether or not uncertainty can be reduced, and resource management will be sustainable.

The case study's results indicated that two institutional arrangements intersect with the implementation of PAMSIMAS in the research location. Firstly, the property system change strengthens the determination of the national park, where the place of the springs for the PAMSIMAS program is located. Determining the status of Mount Merbabu as a national park means maintaining state property, which also means strengthening the state's power (Lunstrum, 2013). On the other hand, the surrounding rural communities acknowledge riparian rights through which they believe that the water source closest to their hamlet is their right (Craig, 2012). Secondly, coordinating rules for resource management are agreed in PAMSIMAS. The main rules are adopting the water price mechanism, the obligation to use meter technology, and the establishment of BPSPAMS as the new collectivechoice body. The rule of water prices in PAMSIMAS has increased water availability because the mechanism encourages users to use water efficiently (Narasimhan, 2016). Interestingly, village administration's role in this regard was completely absent, especially in defining broader "rules of game" as a reference for operational rule-making by PAMSIMAS in managing water resources. The "absence" of the village government in managing water resources has a context in the local political dynamics, namely the public authorities at the lowest level are already politicized in such a way of held hostage by local political interests during the village head election event (Istiyani, 2014).

Furthermore, the study results also showed several inequalities in the program implementation, namely inequalities in bio-physical condition, power, and information. The difference in biophysical locations among hamlets significantly impacts water access, either weakening or strengthening their capacity to control its distribution. The strategic positions that actors have in water user groups also influence the power and information they get. A group of water users has more chances to participate in the project's decision-making, enabling them to control the project more strongly (García & Bodin, 2019). The inequalities coupled with local elites' opportunistic behavior have hindered equal cooperation between water users (Baland & Platteau, 2018). The case shows that the group with more endowments will get more benefits from the program (Kurian & Dietz, 2013).

Even though rules have helped rural communities to increase water availability, PAMSIMAS cannot reduce the uncertainty of water access and transaction costs borne by water users. The group of users who have fewer endowments has to deliver higher transaction costs. They have to lobby groups with higher endowments to keep access to water. Thus, user groups with lower endowments are trapped in uncertain conditions regarding their secured access to water (<u>Baland & Platteau, 2018</u>).

Given this situation, the presence of public authority at the local level to resolve disputes, define the public goods, and mediate conflicting interests among community members is necessary. In fact, such authority falls under "the principle of subsidiarity" as stated in the Law no. 6 of 2014 concerning Village. This principle, along with the "principle of recognition", gives the village administration a wide range of authority to govern and make decisions on public matters at the local scale to achieve the maximum prosperity of the community (Shohibuddin, 2016; Shohibuddin et al., 2017).

Unfortunately, the village government's absence in governing water access and issuing village regulation had resulted in a win-lose scenario among different groups of water users having conflicting interests regarding water distribution. Such scenario was finally pursued by Pulihan hamlet as they demanded a tariff increase of 5,000 rupiahs per month from water users in Kaliajeng hamlet. This increase was justified by the required costs for financing the reparation and construction of water pipes. However, the group of water users in Kaliajeng hamlet objected such demand and deemed it as a unilateral decision, so they were unwilling to pay. Following this, Pulihan then decided to stop the distribution of water to Kaliajeng hamlet. As a result, after five years of PAMSIMAS, water access for the low endowment group was cut off, so that all equipment that have been invested in the program has been stalled and abandoned.
On the other hand, property system of forest and water resources also explains how the uncertainty of water access and transaction costs remain continued (Williamson, 2015; Womble & Hanemann, 2020). There is an overlapping and even conflicting situation in the property system concerning land and water resources in the national park area, namely state-property as defined by national law and common property based on riparian rights as recognized by local rural communities. Furthermore, the undefined forest land boundaries have led to uncertain institutions of coordination in water management, not only for PAMSIMAS program but also for the village administration in general.

Based on the results of the case study, there are several research implications that we can draw. First, water usage charging in PAMSIMAS can increase water availability for more users, but the important issue that requires attention is the rational and appropriate pricing. Pricing needs to integrate public interest and economic benefits applicable to the project (<u>Chen et al., 2013</u>). This also means that the determination of water usage charging must pay attention to water users' interests related to the ease of access to water and cost recovery for maintaining water infrastructure (<u>Narasimhan, 2016</u>).

Secondly, in determining water usage charging based on water user's interests, local regulation and village governance which can provide broader "rule of game" in the water management should be put in place. This will require the village administration's active engagement in resolving disputes, enhancing public goods, and mediating conflicting interests. Doing so would not let the rule-making process in PAMSIMAS program be greatly determined by some sort of "free fight" mechanism.

Thirdly, policymakers need to recognize the importance of understanding the biophysical conditions, institutions, and attributes of communities in the project area (Ostrom, 2015). Inequality of biophysical conditions, including land ownership, is a structural condition that constitutes a challenge both to conservation and development agendas; thus, it must be fully considered in the policy-making process (Benra & Nahuelhual, 2019). The water management policies under PAMSIMAS in the study area ignored the ownership gap among hamlets and groups' heterogeneity. Mobilization of water resources (as a prerequisite for markets or market-like institutions) in Tajuk is intricate, so ignoring this will require the water

users to bear higher transaction costs. Implementing sensitive and flexible water management based on local conditions and prospects while strengthening local administration may protect the future of rural communities and the resources they depend (<u>Rejekiningrum & Kartiwa, 2018</u>).

Fourthly, government's recognition of common property rights is essential to provide rural communities with incentives and opportunities to manage their resources sustainably in the long run. Mobilization of collective action in resource management depends significantly on property rights, which must be well defined (Everard & Dupont, 2018). The massive lobbying activities carried out by the local community and the national park government agency indicate the uncertainty of water rights for the communities (Williamson, 2019). Therefore, it is vital to recognize communities' rights and to determine water sources and forest resources' boundaries. Gunawan et al. (2013) suggested establishing a buffer zone that can solve the conflict between conservation agenda and surrounding rural communities' needs, along with increasing community-based management and utilization of environmental services of water and ecotourism. Besides, a public domain for rural communities and national parks is essential to build communication and dialogue about conservation policies and rural communities' welfare.

Fifthly, because PAMSIMAS is a community-based program, community participation should be at the center of its implementation (Asminar, 2019). The case study showed the degree of group participation in the decision-making process will influence program implementation. Thus, initial knowledge about the actors and their strategic positions is essential to ensure their influence and interests and to deal with such power imbalances. Encouraging genuine participation across actors in different groups will bring greater impacts and reduce power and information asymmetries (García & Bodin, 2019). Also, regular participatory monitoring and evaluation of the program are essential (Pratama & Isnanik, 2018) to ensure PAMSIMAS providing more sustainable water and sanitation in rural areas.

CONCLUSION AND SUGGESTION

The study, which focuses on such sensitive areas as national parks, disclosed some critical issues in community-based water management. The

government-directed rule in PAMSIMAS program, namely the setting of water price (a market-like mechanism), has helped local communities improve the more efficient use of water and increasing water availability. However, PAMSIMAS program cannot reduce uncertainties in water access and transaction costs that the water users should bear due to two categories of inequalities. The first is due to different biophysical conditions and asymmetry of power and information among community members, which would inevitably influence PAMSIMAS program's performance. The second is inequalities resulting from conflicting property systems regarding land and water inside Mount Merbabu National Park, i.e., between state-property regime and common property regime. Thus, It has impacted as well on uncertainties in water access and transaction access.

By highlighting these two categories of inequality, this study suggests that the rule-making regarding water management in PAMSIMAS program prioritizes rational and legitimate pricing by considering both economic benefits and public interests. The recognition of local characteristics must be incorporated into water management policies, including the biophysical conditions and different attributes of communities in a project area. To ensure the balance between different water management priorities, it is suggested that the village government exercises its broad range of authority to govern "localscale matters", especially by issuing relevant village regulations and carrying out the effective governance of local natural resources. Furthermore, government's recognition of common property rights is essential to provide incentives and opportunities for local communities to manage their resources sustainably. Last but not least, since PAMSIMAS is a communitybased program, genuine and inclusive participation among community members must be the primary concern throughout its implementation.

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Strengthening institutions theory on modification of technology acceptance model: A study of financial information system for local government

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ABSTRACT

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JEL Classification E60; H83; M48 The financial information system for local Government or SIPKD regulation in Indonesia are mandatory. There have been several innovations on it, but in practice mostly they were not effective in term of user acceptance due to several obstacles. This study investigates the modified Technology Acceptance Model (TAM) theory proposed with the institutional strengthening theory on the user performance of SIPKD. Supported by the sample of 556 SIPKD users from the Lampung Provincial Government, the results showed that all constructs are associated in accordance with the theory and concept of TAM. The quality of training had a dominant effect on the ease of use and usefulness. Related to the reinforcement theory, the results showed that facilitating conditions and incentives affect the performance of SIPKD users. Meanwhile, institutional pressure did not show its role to improve the performance of users. The main findings revealed that the TAM model becomes more perfect when imbued with the reinforcement theory. These results suggest that information system acceptance is higher when reinforcement theory is able to manipulate the cognitive of users to further improve their individual performance.

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INTRODUCTION

The formulating government and implementing state budget policies are obliged to be open and responsible for the entire results of development implementation (Yusuf, 2021). One form of responsibility is realized by providing comprehensive financial information to the wider community (Jerene & Sharma, 2020). This condition can only be achieved with financial information system for local governments that utilize information technology advancements (Chen et al., 2016). The end result is an information system that is able to foster a clean,

transparent government and is able to effectively respond to demands for change (Jerene & Sharma, 2020; Carrera-Mora et al., 2019). Indonesian Ministry of Home Affairs through the Regional Financial Administration Agency in 2009 cooperated with a third party to create the Financial Information System for Local Government in Indonesia, referred to as SIPKD. The purpose of this system is for uniformity in the management of regional finances in all local governments in Indonesia.

SIPKD is an integrated application that is used as a tool for local governments to improve the

effectiveness of the implementation of various regulations in regional financial management (Fauzi et al., 2019). SIPKD was developed on the information technology basis and was designed in such a way to be a means of collection, processing, presentation, and reference, as well as to process regional financial data/information communication among the Ministry of Finance, the Ministry of Home Affairs, Local Government, and owners or users (Sayekti & Putarta, 2016; Carrera-Mora et al., 2019). Its application is based on the principles of efficiency, economicalness, effectiveness, transparency, accountability, and auditability. This application is also a realization of the facilitation from the Ministry of Home Affairs to local governments in the field of regional financial management. The main objective is to strengthen the common perception of systems and procedures for regional financial management, especially in interpreting and implementing various financial laws and regulations (Isaac et al., 2017).

SIPKD is applied in order to help to facilitate local governments in preparing the budget, implementing and administering accounting and reporting, as well as maintaining the accountability of APBD (regional budgeting) implementation. The aspect of legality for the presence of SIKD has been affirmed through Republic of Indonesia Government Regulation (PPRI) Number 56 of 2005 concerning SIKD. Halim et al. (2012) in their research showed that out of 524 local governments in Indonesia, 361 local governments (68.89%) already used a financial information system. Meanwhile, 163 local governments (31.11%) were not yet certain about the financial information system that they use. Halim et al. (2012) found a number of obstacles in implementing SIPKD. The biggest obstacle faced was the lack of readiness of human resources, by 30%. Other technical obstacles related to the implementation of SIPKD were network problems (29%), software (11%), application (12%), hardware (8%), and other factors (10%).

Furthermore, <u>Davis (1985)</u>, <u>Venkatesh & Bala</u> (2008), and <u>Venkatesh et al. (2012)</u> explained that user acceptance of technology is a factor that determines the successful use of technology. Technology Acceptance Model (TAM) is a theory that is widely used for research on human behavior in information technology. TAM eventually became the most influential theory in the field of SI. TAM model is considered more parsimonious to explain the behavior of the use of information system in an organizational

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context. TAM model separates cognitive and affective aspects by describing the construct of belief as a cognitive and affective aspect by describing the construct of belief as a cognitive aspect and attitude as an affective aspect (<u>Darsono, 2005; Davis, 1985</u>).

The successful application of information technology is inseparable from the role of users of information systems to accept systems developed or implemented in management (Chen et al., 2016; Venkatesh et al., 2012; Zhou et al., 2018). Previous researchers documented the integration TAM theory with several aspects, such as customer awareness factors and subjective norms. The main finding of the study stated that financial technology adoption is positively influenced by customer awareness, subjective norms, and perceived usefulness (Winarno & Putra, 2020) on behavioral intention to use accounting information systems by school financial managers (Permatasari et al., 2018). TAM theory related to reputation has a significant influence on users of an e-finance platform (Zhou et al., 2018). Chandra (2015) focused on the impact of extended TAM with constructs (trust, enjoyment, perceived ease of use, and perceived usefulness) and the antecedent constructs (security, time consumption, economic gain, and playfulness).

Meanwhile, Seddon (1997), Sayekti & Putarta (2016), and Zhou et al. (2018) stated that individual performance is the opinion of users of specific application systems that are used to improve their performance within the organization. One of the expected concepts of TAM theory is the strengthening theory, which is a theory that specifically addresses actions to manipulate behavior. This reinforcement theory forms certain behaviors (behavior shaping) since theoretically the consequences of actions need to be regulated, depending on the goals of the actors (Fauzi et al., 2019). This theory is used to design changes in human behavior in organizations. A type of behavior of an employee can be designed to occur repeatedly to behave positively by stimulating employees with certain stimuli (which reinforce certain behaviors). Similarly, a type of negative behavior can be removed with certain certain stimulus (which weakens certain behaviors). Strengthening theory ignores feelings, attitudes, expectations and other variables that are known to influence behavior. Chau & Hu (2001) stated that pressure from top management can have a positive influence on the acceptance of information systems. Gardner et al.

(2009) has shown a double-edged sword pattern of pressure that can have positive or negative implications. In this case, the implication can be seen as an aspect of the quality of institutional pressure.

This study aims to examine the modification of the TAM theory when it is integrated with the strengthening theory. The expectation study provides a stimulus for SIPKD users. TAM modification with the strengthening theory include facilitating conditions, institutional pressure, and incentives. Venkatesh & Bala (2008) and Venkatesh et al. (2012) showed that the condition factors facilitate a positive and significant effect on the use of information systems and information technology that ultimately improve individual performance. The said facilitating conditions and individual performance is in the context of utilizing information systems and information technology. The implementation of SIPKD which in the result is the output of SIPKD user performance is inseparable from the facilitating conditions. Those conditions can be in the form of an SIPKD usage guideline provision, assisting colleagues in the case of difficulties in implementing SIPKD, special assistants for SIPKD use, and systems responsive to fast-changing financial management regulations.

RESEARCH METHOD

This research is a cross-sectional study with the sample study SIPKD users or operators in the local government units (SKPD) in regencies/cities in Lampung Province. Sampling was carried out with such criteria as: civil servants, minimum level of education of high school graduates, experienced in using Microsoft Windows, Microsoft Word, and Excel. Based on the circular letter (SE) of the Minister of Home Affairs No. 900/122/BAKD in 2010, 171 local governments have implemented SIPKD. Lampung Province has 11 regional governments that have used SIPKD. In general, the SIPKD users indicate a homogeneous sample throughout Indonesia. Hence, regencies or cities in Lampung Province are selected as samples. The following is the number of research samples that fit the criteria (Table 1).

Table 1 shows the number of the distributed questionnaires, i.e. to 600 respondents. Returning questionnaires amounted to 571 questionnaires. All returned questionnaires were then checked first to

identify the completeness of responses. It was found that 15 questionnaires were not complete, such as (i) incompleteness in filling out the questionnaire and/or the identity of the respondent, (ii) incorrectly filling out the questionnaire. Thus, the number of questionnaires that met the requirements or were suitable for processing was 556 questionnaires (92.7%).

Table 1. Distribution of Respondents and Questionnaires by Region

		Questionnaire				
Regency/City	Distri- buted	Recei- ved	Not Accep -table	Total	cen- tage	
					%	
1. Lampung Province	60	57	1	56	93.3	
Tulang Bawang	60	58	2	56	93.3	
3. Lampung Tengah	60	56	1	55	92.0	
4. Metro	40	38	1	37	92.5	
5. Lampung Selatan	60	57	1	56	93.3	
6. Bandar Lampung	60	56	2	54	90.0	
7. Way Kanan	60	59	1	58	96.7	
8. Lampung Timur	60	58	2	56	93.3	
9. Tanggamus	40	37	1	36	90.0	
10.Lampung Utara	60	57	2	55	83.3	
11.Lampung Barat	40	38	1	37	92.5	
Total Sample	600	571	15	556	92.7	

The research variables included perceptions, experiences, and supports received by SIPKD users and how they affected their performance (Table 2 and Figure 1). The conceptual framework of the relationship between variables is hypothesized as follows:

- H1: Quality of training has a significant positive effect on perceived ease of use of SIPKD
- H2: Quality of training has a significant positive effect on the perceived usefulness of SIPKD
- H3: Perceived ease of use e of SIPKD has a significant positive effect on the perceived usefulness of SIPKD
- H4: Perceived ease of use of SIPKD has a significant positive effect on the attitude of the technology.
- H5: Perceived usefulness SIPKD have a significant positive effect on the attitude of the technology
- H6: Attitudes on technology have a significant positive effect on SIPKD user's performance
- H7: Facilitating condition have a positive significant effect on SIPKD user's performance
- H8: Institution pressure has a significant positive effect on SIPKD user's performance.
- H9: Incentive has a significant positive effect on SIPKD user's performance

Variables	Definition
<u>Dependent</u> : User's Performance <u>(Fauzi et</u> <u>al., 2019</u>)	Performance is outcome resulted from the function of a particular job or activity during a certain period, including individual psychological and organizational factors (<u>Davis, 1985;</u> <u>Hennessey & Bernardin, 2003;</u> <u>Fauzi et al., 2019;</u> <u>Padilla-Meléndez et al., 2013</u>).
Independent: 1. Perceived Usefulness (PU)	A person's level of confidence in the use of certain information technologies can further improve their performance. Perceived usefulness three-question items adopted from (<u>Davis</u> , 1985; Winarno & Putra, 2020).
2. Perceived Ease of Use (PEU)	It states the degree of confidence someone using a system or technology that can help them from any difficulties to do, as adopted from (<u>Davis, 1985</u> ; <u>Winarno & Putra, 2020</u> ; Shyu & Huang, 2011).
3. Attitude on Technology (AT)	The attitude of individuals to use a system or information technology that already exists as a representation of acceptance. This research leads respondents to state opinions and evaluations related to technology (Davis, 1985; Fauzi, et al. 2019)
4. Training (T)	Training as an objective that employees achieve to master the knowledge, expertise and behavior emphasized in training programs (<u>García-Juan et al., 2019</u>). The quality of training is measured using indicators used by (Isaac et al., 2017).
5. Facilitating Condition (FC)	Facilitating conditions are objective factors that exist in the environment that can make an action easier to do (<u>Venkatesh et al. 2012</u>). The facilitating conditions questions consist of three question items adopted from (Guerrero et al., 2018).
6. Institution Pressure (IP)	The degree of pressure quality received by an employee from the institution (either through official outside or internal supervisory). The indicator used to measure institutional pressure was adopted from Tarbini et al. (2016) and Winarno & Putra (2020).
7. Incentive (In)	Incentives are consequences obtained from taking an action. Incentives are additional income (money, goods, etc.) given to increase workplace enthusiasm or as stimulant money. The conceptions of output expectations are separated into performance expectations, and personal expectations (Savekti & Putarta 2016: Thovib et al. 2012)

Table 2. Variables and Definition of Variables



Figure 1. Conceptual framework of research

Testing in this study began with a test of validity and reliability. <u>Leguina (2015)</u> stated that validity is the level of scale or set of measuring instruments that are accurately able to represent the desired concept, whereas reliability is the level where the variable is consistent with what we are measuring. This study used the analysis of the suitability of the analysis method, namely the Structural Equation Model (SEM). <u>Sarstedt et al. (2020)</u> argued that SEM was chosen because it is more appropriate to examine the relationship between complex variables, examine the presence of unobservable variables or latent variables, and test the suitability of the model. This study tested the hypothesis with multiple regression analysis (multiple regression) by using SEM analysis as a test function simultaneously. Testing with SPSS was done to ensure the results of multiple regression analysis in which several independent variables were used to predict the value of the de variable independent (<u>Gujarati, 2004</u>). Below is the regression formula.

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PU =	a0+ β1 T + β3 PEU+ e	(1)
PEU =	a1+ β2 T + e	(2)
AT =	a2+ β4 PU + β5 PEU + e	(3)
UP =	a3+ β6 AT + β7 FC + β6 IP +	÷
	β6 In + e	(4)

The equation shows that perceived usefulness (PU) is affected by training (T) and perceived ease to use (PEU); perceived ease to use (PEU) is affected by training (T); attitudes on technology (AT) is affected by perceived usefulness (PU) and perceived ease to use (PEU); and user's performance (P) is the function of attitudes on technology (AT), facilitating condition (FC), institutional pressure (IP), and incentives (In). Meanwhile a_i constant; β_i coefficient and e error.

RESULT AND DISCUSSION

Respondent Characteristics

Table 3 presents the characteristics of the research respondents based on sex, years of service, education, and length of duty in SIKPD. Of all respondents (556), 310 people (55.7%) were male and 246 people (44.3%) were female. Characteristics of respondents based on their education levels is as follows. Respondents with a Bachelor's degree was the largest number, with 312 civil servants (56%) of the total sample selected, while the senior high school graduates totaled to 138 civil servants (24.8%). There were 56 respondents with Master's degrees (10.1%) and 50 civil servants with 1-year upto 3-year Associate degrees (9%).

Model Specification

The validity test results shown by the Pearson correlation value indicated that the question items for all significant variables were at the 0.01 level. The validity test results showed that the question items had an adequate level. The reliability test results were shown by Cronbach's Alpha values above 0.6. Therefore, all variables in the research model were reliable (Table 4).

Table 4 shows the result of the goodness of fit test. In general, the model is fit because three or more indicators exceeded the model's normative suitability. The measurement indicators were GFI (0.949), CFI (0.924), and chi-square with a probability of 0.000. The results of all indicators were greater than the t-value and therefore can be said to have an adequate level of conformity. Meanwhile, the results of AGFI test

(0.832) and TLI test (0.807) showed that the indicator values obtained were in the marginal suitability category. Thus, this test yielded good confirmation of the causality relationship.

Tabel 3. Respondent Characteristics

Variable	Total	Percentage
		%
Sex		
Male	310	55.7
Female	246	44.3
Time of service		
≤ 10 years	419	75.3
11 – 20 years	106	19.1
21- 30 years	27	4.9
≥ 30 years	4	0.7
Education		
High School	138	24.8
Associate Degree	50	9.0
Bachelor Degree	312	56.0
Others (Master's Degree)	56	10.2
Time of duty in SIPKD		
< 1 year	151	27.2
>1 year	405	72.8
Commentations FFC		

Sampel size=556

Table 4. Result of Goodness of Fit Test

Goodness of Fit Indices	Critical Value	Result Model
X ² – Chi Square	Small	125.643
Degree of Freedom (df)		11
Probability	≥ 0.05	0.000
Relative X ²	≤ 2.00	11.422
(Cmin /DF)		
GFI	≥ 0.90	0.949
AGFI	≥ 0.90	0.832
TLI	≥ 0.95	0.807
CFI	≥ 0.94	0.924
RMSE	≤ 0.08	0.137

Variable Relationship and SIPKD User's Performance

All hypotheses tests used a structural equation model (SEM) application which included multiple regression. The test results the relationship between training quality and perceived ease of use (H1) showed that the influence of training quality had a positive effect on ease of use with a value of β of 0.545 (Table 5). This result was statistically significant with a CR value of 15.313 at the level of 1.00%. This indicates that there is an association between the quality of training and ease of use. In other words, the high quality of training can increase ease of use, and vice versa. Training is a process to develop employees' talents, skills, and abilities to complete certain jobs. High quality training can increase the degree of employees' confidence to use information which in Fauzi and Jatiningrum, Strengthening institutions theory on...

turn can improve their work performance better and more efficiently. This finding supports the findings of <u>Isaac et al. (2017)</u> and <u>Winarno & Putra (2020)</u>.

Hypothesis testing the relationship between quality training and perceived usefulness (H2) was obtained on the SEM calculation results. The analysis showed that the quality of training had a positive effect on usability with a coefficient ß of 0.409 with a t-value of 10.834. This result had a significance level of 5% because the t-value was greater than 1.96. Therefore, H2 is supported, meaning that the high guality of training is always able to improve the principle of usability for users. This finding is in line with Shyu & Huang (2011) who suggested that the increase in learning provided by the government has a positive impact on the ease of use of information and the benefits felt by information users. These results are consistent with previous research showing that perceived usefulness has a positive and significant effect on the attitude of technology use (Fauzi et al., 2019; Winarno & Putra, 2020).

The relationship between perceived ease of use and perceived usefulness (H3) showed that ease of use had a positive effect on perceived usefulness with a coefficient of 0.342 with a significance value of tvalue of 9.10 or significant at the 5% level. This study concludes that ease of use increases usability. The results of this study support prior studies (<u>Carrera-</u><u>Mora et al., 2019</u>; <u>Davis, 1985</u>; <u>Isaac et al., 2017</u>) stating that there is a positive relationship between attitude to use and perceived usefulness.

Findings of the relationship between perceived ease of use and attitudes to technology (H4) showed that ease of use had a positive effect on attitudes toward technology with a coefficient β of 0.334 and was statistically significant. From the test, it was found that the CR value was 7.508 with a significance level of 5% or above the t-value of 1.96. This means that H4 is supported for attitudes towards technology. In other words, the high ease of use is able to improve attitudes towards technology for SIPKD users. This study confirms the results of <u>Hennessey & Bernardin</u> (2003) and <u>Tarhini et al. (2016)</u> which stated that ease of use has a strong relationship to the attitude of information technology acceptance.



Figure 2. The estimated relationship among variables

Variable Relationship	Coefficient	t-value
Training (T) \rightarrow Perceived Ease of Use (PEU)	0.545	15.313***
Training $(T) \rightarrow$ Perceived Usefulness (PU)	0.409	10.834***
Perceived Ease of Use (PEU) \rightarrow Perceived Usefulness (PU)	0.342	9.100***
Perceived Ease of Use (PEU) \rightarrow Attitude on Technology (AT)	0.334	7.508***
Perceived Usefulness (PU) \rightarrow Attitude on Technology (AT)	0.233	5.247***
Attitude on Technology (AT) \rightarrow User's Performance	0.277	8.481***
Facilitating Condition (FC) \rightarrow User's Performance	0.460	12.946***
Institution Pressure (IP) \rightarrow User's Performance	-0.095	-2.944
Incentive (In) \rightarrow User's Performance	0.050	1.562*

Table 5. Estimated Relationship among Research Variables

For the relationship of use and attitudes to technology (H5), it was shown that usability had a positive effect on attitudes towards technology with a coefficient β of 0.233 (Table 5). The value of the CR attribute was 5.247, having a significance level of 5%. This study concludes that H5 is supported. This finding is consistent with <u>Chandra (2015)</u>, i.e. the high perception of usefulness will increase the attitude toward technology.

Furthermore, the relationship test of attitudes toward technology and user's performance of SIPKD (H6) stated that the attitude towards technology is related to user performance. The results of the SEM calculation analysis showed that the attitude toward technology had a positive effect on SIPKD user performance. The coefficient value ß was 0.277 with a CR value of 8.481, statistically significant at level 5. Thus, H6 is supported. This means that a high attitude towards technology can improve the performance of SIPKD users.

The results on the relationship between facilitating conditions and SIPKD user performance (H7) showed that the facilitating conditions had a positive effect on the performance of SIPKD users with a coefficient ß of 0.46, statistically significant at a significance level of 5%. This study supports the hypothesis, meaning that the highly facilitating conditions can improve the performance of SIPKD users. In other words, facilities, infrastructure, and whatever features that support SIPKD users are able to create more performance in comparison with the absence of technological facilities and infrastructure. This finding is in line with Venkatesh et al. (2012) which revealed that facilitating conditions had a significant positive effect on information technology and information technology which could ultimately improve individual performance. However, the results of this study contradict those of Permatasari et al. (2018) and <u>Tarhini et al. (2016</u>). Both studies stated that the relationship between the conditions that facilitate the performance of information system users was negative.

The results on the relationship between institutional pressure and SIPKD user performance (H8) showed that institutional pressure negatively affected the performance of SIPKD users. The test results had a coefficient ß of -0.095, statistically significant at the 5% level with a CR value of -2,944. The results of this analysis were the opposite of what was hypothesized. Therefore, H8 is not supported. This means that the high institutional pressure reduces the performance of SIPKD users. In other words, institutional pressure that should be able to improve user performance apparently decreases SIPKD users' performance. This evidence shows that institutional pressure is not able to create SIPKD users' higher performance. This is not in line with the research conducted by Chandra (2015) and Darsono (2005). They found that high work pressure affects employee performance. The results of this study indicate that the pressure in the organization cannot fully improve the performance of SIPKD users. Venkatesh et al. (2012) stated that there is a positive relationship between conditions that facilitate the perception of usefulness and perceived ease of use.

The relationship between incentives and SIPKD user performance (H9) showed that incentives had a positive and statistically significant effect on the performance of SIPKD users, with the coefficient value β of 0.050 and t-value of 1.562 at a significance level of 10% (t-value of 1.282). This study still concludes that H9 is supported even though it is significant at the marginal level, meaning that the higher incentives are able to create the improved performance of SIPKD users. This also means that additional incentives will have consequences for increasing the performance of

SIPKD users. Incentives are usually in the form of increased salaries given to an employee at one time specified in the form of a higher base salary. This reward is usually based exclusively on individual performance. This result is in line with the research conducted by <u>Jordan et al. (2017)</u> and <u>Sayekti & Putarta (2016)</u>.

Research Implication

The implication of this research is to contribute in the practice information systems or information technology application as required by the central government to local governments. Apart from the information system, other reliable factors must be considered, i.e. facilitating conditions, institutional pressures, and incentives that can manipulate the performance of system users. Therefore, in implementing the system, the authorities under the related ministries and the central government should pay attention to the standardized regulations to achieve their goals using the system.

Research implications for human resources development at the level of central government ministries and below is that they must take into account SIPKD users in implementing existing systems. Conditions that facilitate the development of Civil Servant Human Resources need to be applied. The career positions for system user operators are made in stages. This is so that system users or operators have a career in their work. Many SIPKD system users in the central and local governments seem to lose the notion that system users or operators are posts with no career path or position.

The results of this study also serve as input for the central government on the implementation of SIPKD since the following factors must be taken into account and implemented by local governments. First, the existence of quality training that can improve the usability of SIPKD and ease of use of SIPKD. This finding is supported by Dewi & Wiratmaja (2020) and Fauzi et al. (2019) who proved that employee performance in terms of regional financial management is strongly influenced by the expertise of its users in using SIPKD. Therefore, government, especially regional ones, should continuously made efforts to provide training for SIPKD users. They are also expected to provide SIPKD usage training widely to all employees including new employees.

Second, SIPKD must be easy to use and useful as an accountability tool for regional financial

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management to lead to positive attitudes of SIPKD users. <u>Permatasari et al. (2018)</u> stated if the system implemented is believed to move users effectively, users believe that this system is easy to use so it does not require hard work to understand and use it. Users are sure that they will have no difficulty in using SIPKD, so that the desired goals can be achieved. Third, local governments are obliged to pay attention to the conditions that facilitate SIPKD users to perceive convenience and subsequently change the positive attitude of users. <u>Isaac et al. (2017)</u> stated that acceptance of information system quite successful in organizations while the organization emphasizes on providing facilities technology that will support users in the system usage.

Fourth, based on the research results, excessive institutional pressure on SIPKD users is not a good policy tool. <u>Winarno & Putra (2020)</u> stated that practices in government information systems should be designed appropriately and systematically in the evaluation and work pressure to improve the performance of SIPKD users. For instance, <u>Venkatesh & Bala (2008)</u> stated that collaborations and participation of users will create effective work in an organization.

Fifth, local governments need to pay attention to and increase the provision of incentives for SIPKD users so that they are all more motivated to improve individual performance and then organizational performance. Jerene & Sharma (2020) proved that compared to incentives for high-performing users, it will be more useful to give incentives to the new users of the financial management system in the government. As potential SIPKD users will create more awareness and increase in performance, as a result, it may play an important role in improving financial system information technology in local government

The finding also implicates the government policy related to the Reporting of Budget Implementation Documents. It should be in accordance with the allotted time, as well as regional government financial reporting for one fiscal year (budget realization, balance sheet, cash flow statement, and notes to financial statements). Therefore, if the regional government is not timely in reporting either the document or the Regional government financial report, they must face sanctions imposed by the central government then strives to be timely in its reporting, namely by placing special emphasis or

attention on users or SIPKD operators to comply with the rules set by the central government.

CONCLUSION AND SUGGESTION

This study empirically proved that the TAM modified with institutional strengthening theory (facilitating conditions, institutional pressure, and incentives) simultaneously had a positive effect on the performance of SIPKD users. This study used a survey method using respondents from SIPKD users in the SKPD of 11 local governments in Lampung province consisting of 556 respondents. The results showed that the performance of SIPKD users who had been supported by 140 good systems if modified with the concept of institutional strengthening was able to create or add individual motivation for SIPKD users to perform even higher. The study then concludes that the facilitating conditions and incentives can support the performance of SIPKD users. However, increasing institutional pressure did not affect the achievement of better performance for SIPKD users. This study suggests that institutional pressure does not affect performance because the punishment system for civil servants is still weak. Thus, it is necessary to evaluate the users and the policies made by the local aovernment.

Regulation of financial management (Minister of Home Affairs Regulation) regarding SIPKD users must be scrutinized with appropriate policies. This policy encourages technical officers to show accountability appropriately to the treasurer. They are required to show performance to encourage their career at the institution. On the other hand, if someone's performance is not adequate, he needs to be subjected to sanctions for coaching in his future career.

This study has several limitations which need to be improved for further research. These limitations include (i) the sample of this study only used the Lampung provincial government, so future studies can extend their samples to all local governments in Indonesia; (ii) this study did not examine the respondents' subjective behavior control, whereas the theory of reasoned action and the theory of planned behavior that provide the foundation for the theory of TAM actually have the assumption that the users have high subjective behavior control.

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Indonesian coffee exports and its relation to global market integration

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ABSTRACT

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JEL Classification D49; Q02; Q17 Coffee price is an important indicator that stimulates farmers to advance their welfare. Unfortunately, coffee crisis makes the farm gate price uncertain and volatile. This study aims to explore the Indonesian coffee export situation related to price risks and coffee market integration between Indonesian coffee price and international price. The time series data were the coffee price from 1987 to 2014 in Indonesian domestic market and in global trade in London. Vector Error Correction Model (VECM) approach was applied to test market integration based on Ravallion's equation. Based on the analysis, the results of the study revealed that Indonesian coffee export performed progressively in the last decade. Export destination countries for Indonesian coffee also developed broadly. There was market integration on the Indonesian coffee market and global price in the London terminal. Although not fully, the shock in the international price was somehow felt in the Indonesian coffee market. There were sufficient shreds of evidence to conclude that the Indonesian coffee market is well integrated with the international market in the long run. The changing coffee price in Indonesia and the International market adjusted in the next three years. In short term, Indonesian coffee price was 76% influenced by international price changes, but not vice versa.

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INTRODUCTION

The global economic condition has been broadly driven by international trade which is considered an important source of income in developing countries. Coffee is one of the valuable international trade commodities across countries. The cash crop coffee trade involves many countries as producers, industries, global chains, and consumers. Dominantly, in consumer countries, global coffee chains have extended rapidly. Consumers do not only justify on quality of material but typically emblematic on quality and in-person services as a lifestyle manifestation. Global coffee industry wave achieves a highly successful, high-quality, customer-centric, and sustained coffee business that meets the desires and needs of today's demanding and knowledgeable coffee drinkers. In the European Union in 2018, the share of coffee consumption had the highest growth include France (32% of all coffee consumption), the Netherlands (31%), and Belgium (27%). The leading countries in Europe are Germany, France and Italy (<u>CBI, 2020</u>). The increasingly sustainable coffee certification consumption also becomes a global trend. Consumers' willingness to pay premium prices to

obtain organic products, which can be viewed as the cost of investment in human health, is encouraging (<u>Mengistie, 2020</u>).

The essential characteristics of the global coffee chain in the last 40 years can be described with two broad historical periods: the International Coffee Agreement (ICA) regime (1962-89) and the post-ICA regime (1989-present). The post-ICA regime exhibits calls a "buyer-driven" chain, specifically labeled as a "roaster-driven" chain. The processes of a commodity supply chain need to understand its internal and external relations with each of its members and accept the positive effects of the supply chain integration in the operational performance of a company (Ramos et al., 2019). The liberalization of the coffee industry has started competition among members. The appearance of a global coffee chain with voluntary regulatory systems excess coincided with the coffee crisis (Muradian & Pelupessy, 2005). Important changes in the governance and institutional arrangement of the coffee commodity chain have been the reasons for explaining the coffee paradox. The coffee paradox is the coexistence of a 'coffee boom' in consuming countries and a 'coffee crisis' in producing countries. When the international coffee prices falls dramatically, the producers receive the lowest prices in decades. Thus, the exporter countries are still poor and of low income. Social accountability has been applied in various forms of effective interactions between the community and village government. Many efforts are required to improve the quality of human resources through more stakeholder engagement, training activity, and community empowerment (Zeho et al., 2020).

The global coffee chain has changed dramatically as a result of deregulation, new consumption patterns, and evolving corporate strategies. Disaggregation embedded in a network of activities controlled by global firms changes the structure of production, trade, and consumption of commodities (Lee et al., <u>2012</u>). Global Value Chains (GVC) analysis emerges. 'Value chains' requires coherent link on input supply, production, trade, and consumption explicitly. GVCs lead to the relationship between the level of coordination and strength asymmetry indirectly. The formulation of the success of production standards is steered by the market. Given the vertical nature of these markets, they are most appropriately characterized by successive oligopoly and or oligopsony.

Indonesian coffee has been getting famous and commercially classified as an agricultural commodity since its first export in 1711. It is the most outstanding commodity in international transactions, as well as the domestic supply, in terms of quantity and value. The major suppliers are located in developing countries and the major customers are the developed countries, where coffee demand is concentrated (de Almeida & Vegro, 2020). Global coffee establishment was well before the first outbreak of rust in Ceylon (Sri Lanka) in 1869 (Igo, 2020). Nowadays, Indonesia is the fourth biggest coffee producer in the world with Brazil, Vietnam, and Colombia. Coffee production within 2014-2018 in average amount was 662.75 thousand ton per year and 70% of it was exported. Coffee production was mostly cultivated by smallholder farmers (95.45%). Robusta coffee was more dominantly produced than arabica coffee, reaching 72.66%. The estimation of Indonesian coffee production in 2020-2024 is 777.73 thousand tons of coffee beans with the increasing growth of 1.36% per year (BPS, 2019). Almost half of the coffee trade in the EU is dominantly controlled by some Indonesian importers: Nestlé (Switzerland), DE Masterblenders (the Netherlands), Tchibo (Germany), Lavazza (Italy), Aldi (Germany), and Segafredo (Italy) (Simamora, 2014). This relationship forms a vertical integration between roasters and international traders.

Globally, ICO noted that coffee export supply is higher than that of the world coffee consumption in 2017-2018. This is contrary to the situation in 2018-2019, where the world coffee consumption was higher than its production (Figure 1).

The changing global coffee supply is linked with the cyclical coffee production pattern in the coffee producer. Mostly it is the global climate change that disturbs the production situation. The data remains a prior work on exchange rate pass-through and export supply curves (Amiti et al., 2019). On the other hand, coffee consumption raised in 2020 after the decline in When the consumption was higher than 2019. production, the farm gate price has an opportunity to have a better price. Global coffee price also depends on consumers' country lifestyle. It links with the trend of sustainable coffee with certification commodities platform (buyer's driven). The coffee market will most likely keep adapting itself to satisfy such changes. Consumer behavior will certainly continue to change. The whole chain currently generates thousands of jobs across the globe, and the potential for new consumers to begin purchasing and drinking coffee is enormous (<u>de Lima et al., 2019</u>). Furthermore, the coffee price

in domestic producer region and global tends to be dynamic and volatile (Figure 2).



Figure 1. World coffee production and consumption (ICO, 2021)



Figure 2. World coffee price 2018-2019 (ICO, 2021)



Figure 3. Global and Indonesia's coffee price, 2018 (BPS, 2019; ICO, 2021)

Coffee as a tradable commodity has high volatility in price (Suyamto and Noordwijk, 2004). Uncertainty and the volatility of Indonesian coffee prices reflected by the variations for prices have been experienced by coffee producers in Indonesia, different from the prices paid by consumers in the developed countries. Coffee price in East Java is only valued between 4.8 to 24.2% of the retail price in the importing countries. Coffee price in Lampung is much lower, only about 1.2 to 7.5% of the retail price in the importing countries (Hutabarat, 2006).

The price of both robusta and arabica coffees at the farm gate in Indonesia tends to fluctuate compared to the global price (Figure 3). Arabica's price tends to fluctuate more than robusta's. There is a wide disparity of price between arabica and robusta.

Price is an important indicator for farmers as an incentive for their production (<u>Stigler, 1987</u>). Price is a key to better income and improving coffee grower's welfare. Even though coffee bean prices in Indonesia is quite low, there is a strong relationship between the coffee industry in Western Europe and the one in Lampung, and a less stronger one between that and the one in Jawa Timur (<u>Hutabarat, 2006</u>).

The dynamic movement of global coffee price is linked with the coffee farm gate at the farmers' level. Previous studies about coffee farmer's income in the production center in West Lampung revealed that the income from coffee farming (<u>Incamilla et al., 2015</u>) was lower than Lampung's regional minimum wage standard. This fact shows that smallholder's coffee farming is not economically sustainable yet. Coffee farmers face poverty and are still underdeveloped.

Vulnerability on coffee prices can reduce farmer's motivation to improve their coffee farming. In many producer countries, farmers are concerned with price stability and access to market information, because constraints in the coffee market evoke high exposure to risks. During the past two decades, the "coffee crisis" has threatened the social structure of communities that rely heavily on coffee cultivation for their livelihood. The crisis was more severe in Vietnam than in Columbia. The change in commodity prices affected land-use decisions on farms, and the environmental services they provide (Li, 2013; Haggar et al., 2013).

Based on the importance of prices for the welfare of coffee farmers, this research seeks to find out such issues as (1) How does the Indonesian coffee export situation deal with price risks? (2) How does Indonesian coffee export progress in the last two decades and contribute to farmer's welfare? and (3) How does the relationship between coffee prices in Indonesia and global prices?

The study of market integration will inform the phenomenon of the price disparity between producers and consumers. It has been exposed through several studies, among which is Pioneer publication's in spatial market integration that belongs to <u>Ravallion (1986)</u>. Therefore, this study focuses on the Indonesian coffee situation due to market connection or integration with global trade. This deals with the Indonesian coffee export situation related to global market participation. Beside that, the study investigates the Indonesia coffee market condition to pursue market integration with global trade (London terminal). This information will be meaningful to improve the coffee market structure at the local and regional levels.

RESEARCH METHOD

The spatial market integration in agriculture commodities is commonly measured by static price correlations. Yet, a dynamic model can also be advantageous through which one can distinguish between the concepts of instantaneous market integration and the less restrictive idea of integration as a long-run target of the short-run dynamic adjustment process. An influential change in spatial market integration literature by using an error correction model which allowed autocorrelation problems distinguishes long and short-run dynamics and seasonal components for spatial price differentials (Ravallion, 1986). The prices of a commodity in two markets are equal and their co-movement is perfect, and when markets are integrated, price changes in a market will be transmitted to the other market on a one-for-one basis. The basic simple bivariate form is tested by estimating (Ervigit & Karaman, 2011):

$$P_{it} = \beta_1 + \beta_2 P_{jt} + \varepsilon_t$$
 (1)

where P_{it} and P_{jt} are the logarithms of the prices in the region i and j respectively. The satisfaction of restrictions $\beta_1 = 0$ and $\beta_2 = 1$. Estimating an equation of the above form, however, can lead to spurious regression problems, since regressions of price levels necessitate that the price series be stationary. The most common approach is to take first the differences of all non-stationary variables before specifying the model. Time-series data may trend over time, i.e.,

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stochastic trends, a spurious regression might exist in the presence of non-stationary variables. In this situation, the method of co-integration can provide a better way to test a more general notion of market integration.

Suppose that trade is infinitely costly between two market locations but that the time series of prices at the two locations are synchronously, identically, and linearly affected by another variable, in term of good trade in a common market or a shared dynamic seasonal structure in production, then one can readily express price in one market as a linear function of price in the other market, with slope unity, even though the markets are segmented. Measurement of market integration can be viewed as basic data for an understanding of how specific markets work (<u>Ravallion, 1986</u>).

Unit root test analysis is the first step to estimate the model. Augmented Dickey-Fuller tests were conducted to verify stationary or presence of unit root in the individual series of the model. The next step was cointegration tested by Johansen criteria. An obvious procedure estimated a Vector Error Correction Model (VECM) on the difference series to define the lag order for the data analysis. The coffee market integration model adopted the spatial market structure by <u>Ravallion (1986)</u>. The model is summarized as follows.

$P_1 = f_1 (P_2, P_3,$	P _N , X ₁)	 (2)
$P_{i} = f_{i} \left(P_{1}, X_{1} \right)$	(i= 2, N)	 (3)

with X_i (i=1,, N) a vector of other influences on the local market. The function f_1 (i=1,N) can be thought of as a solution of appropriate conditions for market equilibrium. Considering the dynamic effect can arise from several conditions underlying behavioral relations, the econometric model of the Tperiod series of the price of N region was assumed:

$$P_{1t} = \sum_{j=1}^{n} a_{1j} P_{1t} - j + \sum_{k=2}^{N} \sum_{j=0}^{n} b_{k} 1_{j} P_{kt} - j \qquad \dots \dots (4)$$

$$P_{it} = \sum_{j=1}^{n} aij \ Pit - j + \sum_{j=0}^{n} bij \ P \ 1t - j + Xit \ ci + e \ it \qquad (5)$$

The e's were appropriate error processes and the a's, b's, and c's were fixed.

- The following hypotheses usually are testable:
- 1. Market segmentation (bij = 0; (j = 0, ..., n))
- 2. Short-run market integration (bio = 1)

3. Long-run market integration (bio = 1);

Consider that the equation (5) taken when $P_{it} = P_{i}^{*}$, $P_{it} = P_{t}^{*}$, and eit = 0 for all t, then

$$P_{t}^{*} = \frac{\sum_{j=0}^{n} bij + Xit ci}{1 - \sum_{j=1}^{n} aij} \qquad \dots \dots (6)$$

Under long-run integration, equation (6) can be written:

 $\Delta Pit = (ai1 - 1)(P1t - 1 - P1t - 1) + \sum_{j=2}^{n} aij (Pit - j - p1t - j) + bi0 \,\Delta Pit + \sum_{j=1}^{n-1} (bi0 - 1 + \sum_{k=1}^{j} aik + bik) \,\Delta P1t - j + Xit \,ci + eit \qquad \dots \dots (7)$

 P_{1t} and P_{1t-1} were coffee prices in Indonesia as a producer at t and t-1 time; P_{2t} and P_{2t-} were coffee prices at the London terminal market at t and t-1 time; Xt was dummy coffee crisis in Indonesia; bi was regression coefficient, and it was an error term.

The research scope study was time series of annual data on a coffee price for the period from 1987 to 2014. The range of studies considered the completeness data of Indonesian coffee prices in farm gate and London terminal (ICO, 2018). The data source was ICO and Indonesia Statistical Bureau. Time series coffee price was in Indonesia as domestic market and global trade in London.

RESULT AND DISCUSSION

Coffee Market Situation

Totally 95% of world coffee production is produced by countries member of the International Coffee Organization (ICO). Brazil and Vietnam contributed more than 44.1% of ICO total production (Table 1). Vietnam has the highest growth as an exporter and also has coffee export competitiveness in the ASEAN market (Sinta, Alamsyah, & Elwamendri, 2017). Indonesia contributed 6.4% of the coffee production share in the global market. It was decreased compared with 2013 which was 8.6%.

Global coffee production in 2019/2020 decreased compared to 2016-2018 (Table 2). Arabica coffee production decreased by 5% to 95.99 million bags, while that of Robusta rose by 1.9% to 73.36 million bags. World coffee consumption decreased by 2.35% in 2018 and rose to 1.28% in 2019, and then there was a coffee deficit in 2019. World coffee exports in the world in January 2021 reached 10.21 million bags. Exports in the first 4 months of the coffee year of

2020/21 (Oct 20 to Jan 21) increased by 3.7% to 41.88 million bags compared to 40.38 million bags in the same period in 2019/20. The Covid-19 pandemic continues to put pressure on the global economy and greatly limits out-of-home coffee consumption in 2020.

Indonesian coffee export attained 49% from national coffee production in 2019 which was equal to 359.053 thousand tons with an export value (US\$.000) 883.183 (Figure 4). Net export value of coffee in 2019 attained (US\$.000) 816.938. The decrease in coffee export was mainly caused by the inefficient coffee production line facade on the coffee farming level and the exogenous factor of climate change. Indonesian coffee farming was characterized by smallholder farming (94%). Mostly, they still showed low productivity, low income, and poverty because of limited access to technology, credit, and the market. Hence, the coffee quality and value addition in coffee processing from small farmers is in Indonesia need to develop further.

Based on the kinds of product, export was dominated by coffee beans (80%), instant coffee (19%), roasted coffee (1%), and coffee extract. Indonesia coffee export destinations are mainly to Europe and Asia. The European market was mainly traded by international roaster corporations (Table 4). The US and Africa have become important to market recently. The demand for Indonesian coffee beans in the US is influenced by row coffee prices. Indonesian coffee is elastic in the main importing countries of the US, Japan, and Germany. Based on the cross elasticity value of Indonesian coffee is inelastic, , Indonesian coffee is complementary to Vietnamese coffee in the US market, while in Japan and Germany the market it is substitutable (Manalu, Harianto, Suharno, & Hartoyo, 2020). Market destination diversification is prior. Diversification of the market destination and commodity composition is necessary to increase the export of processed coffee (Kustiari, 2007).

Table 1. Global Coffee Producer, 2013-2017

No	Country	2013	2014	2015	2016	2017	Average	Share	Cumulative Share
				to	on			%	%
1	Brazil	1,699,147	1,986,506	2,005,034	1,823,886	1,647,811	1,832,477	25.36	25.36
2	Vietnam	1,306,503	1,400,000	1,229,596	1,400,000	1,434,452	1,354,110	18.74	44.11
3	Colombia	543,685	619,108	713,060	734,689	712,542	664,617	9.20	53.31
4	Indonesia	532,157	382,774	499,651	412,529	485,931	462,608	6.40	59.71

Source: <u>ICO (2021</u>)



Figure 4. Indonesian coffee export-import 2010-2019 (Dirjenbun, 2019)

Year	Production	Growth	Consumption	Growth
	000 60 kg	%	000 60 kg	%
2016/17	162,320		161,377	
2017/18	163,693	0.85	168,491	4.41
2018/19	172,461	5.36	164,530	-2.35
2019/20	165,053	-4.30	166,628	1.28
Cources IC	0 (2021)			

Tabel 2. The Global Coffee Production and Consumption, 2016-2020

Source: <u>ICO (2021</u>)

Table 3. Export-Import Value of Indonesian coffee 1980-2019

Year	Export	Import	Balance
	ton	ton	000 US\$
2010	433,595	19,755	779,459
2011	346,493	18,108	987,552
2012	448,591	52,645	1,132,345
2013	534,023	15,800	1,135,191
2014	384,816	19,111	992,573
2015	502,021	12,462	1,166,243
2016	408,838	23,634	949,588
2017	467,790	14,221	1,153,304
2018	279,961	78,847	662,011
2019	359,053	32,102	816,938
	(2010)		

Source: Dirjenbun (2019)

Indonesian Coffee Market Integration

Time series variables are faction from random and stochastic processes. Stationery data need to run the regression for time series analysis. Time series data are often confined in non-stationary conditions. The consequence makes the regression spurious. The unit root test developed by Dickey-Fuller was one of the robust tools to detect the stationery data. Integration market analysis involved time series data prices at the domestic and global levels. The results of the unit root

Table 5. Unit Root Test of Coffee Price

Level	Equation Test (trend and intercept)	ADF Stat	Crit	ical Value	p-value
PF	Level	-0.050067	0.01	-3.699871	0.9454
			0.05	-2.976263	
			0.10	-2.627420	
	First differentiation	-4.606870	0.01	-3.711457	0.0012*
			0.05	-2.981038	
			0.10	-2.629906	
PR	Level	-1.444955	0.01	-3.699871	0.5454
			0.05	-2.976263	
			0.10	-2.627420	
	First differentiation	-5.085010	0.01	-3.711457	0.0004*
			0.05	-2.981038	
			0.10	-2.629906	

*) stationer at a significant 0.05 level

PF = Indonesian coffee price

PR = International trade price represent in London terminal market

test to data coffee price are shown in Table 5. Price coffee data were placed at first differentiation.

Table 4. Export	Destination	Country of	Indonesian
Coffee	, 2019		

No,	Country	Export Volume	Export value	Share of Export Volume
		ton	000 US\$	%
1	USA	58,672	253,872	16.34
2	Malaysia	36,895	62,937	10.28
3	Italy	35,452	60,355	9.87
4	Egipt	34,287	59,057	9.55
5	Japan	25,594	68,572	7.13
6	Great Britain	18,924	38,234	5.27
7	Germany	18,452	44,911	5.14
8	Belgium	16,260	44,759	4.53
9	India	12,579	15,518	3.50
10	Georgia	12,230	20,064	3.41
11	Russia Fed	11,106	17,334	3.09
12	Marocco	9,664	16,275	2.69
13	Singapura	8,723	27,881	2.43
14	Vietnam	7,222	11,273	2.01
15	Spain	5,546	9,256	1.54
	Others	47,448	132,826	13.21

Source: Dirjenbun (2019)

The next step after data placement was to detect cointegration between both coffee prices. The cointegration test is important to determine a kind of (Vector Auto Regression) system. VECM (Vector Error Correction Model) was used in non-structural VAR when data stationed at first differentiation and there was cointegration linkage. Johansen cointegration was applied to test the price variable cointegration. Based on the Johansen cointegration test performed (Table 6), there was a trace 1 cointegrating equation at the 0.05 level.

Coffee price cointegration					
Rank	Eigenvalue	Trace statistic	0.05 critical value		
r=0	0.461598	23.06663	18.39771		
		Max Eigen statistic	0.05 critical value		
		16.0971	17.14769		

Table 6. Johansen Co-integration Test

Trace test indicates 1 cointegrating equation(s) at the 0.05 level

Based on the test results, the trace test indicated the cointegration equation at a 0.05 level. At the same time, the maximum Eigenvalue test also indicated that there is one cointegration. This fact reveals the notices that both trace test and Max-eigenvalue test agree that there was cointegration on the coffee prices in Indonesian and the international market. It means that there is a long-term relationship between the coffee prices in producer countries (Indonesia) and International prices at the London terminal. For centuries, Indonesian coffee has been exported, so the price policies decided by those markets will affect the coffee prices in the domestic market. The cointegration implies an existence of a linear long-term relationship between the non-stationary variables. Hence, co-integration tests for market integration only assess whether there is a statistically significant linear long-run relationship between different price series. The existence of this relationship provides a shred of evidence for market integration (Ervigit & Karaman, 2011).

After the positive cointegration was detected, VECM was applied to determine the short-run and long-run integration market. VECM can expose the dynamic equilibrium relationship of short-run and long-run in a system of equations. VECM regress changes in the price variable fell behind the deviation of long-run equilibrium relationship and also lag deviation of prices in the short-run period. Deviation from equilibrium, as the reflection coefficient by VECM, will bring changes to the balance between these co-integrated variables (Enders, 2008). The top display informed the long-run integration market (Table 7).

Based on the VECM result, it is shown that the first row in the second part presented the estimation of the speed of adjustment coefficient for each variable, the second was standard errors and the third was tstatistics. The equation of coffee market integration in the long-run term performed is as follows.

D(LOG(PF)) = 0.238296055721*(LOG(PF(-1)) + 2.536055449*LOG(PR(-1)) + 3.33150746545*CR(-1) - 22.5192739029 The estimated VECM suggested that the adjustment process was relatively fast about 24% of the divergence from the notion of long-run equilibrium being corrected each year. The changing prices transmitted contemporaneously to the producer price, although just partly. Granger causality test for long-run indicated that the changing price, not vice versa to Indonesia coffee price. Then, asymmetric adjustment to the long-run equilibrium appeared doubtful. It suggested that the increases and decreases in the international coffee price are passed through similarly and symmetrically to the Indonesian coffee market.

Positive trade flows are sufficient to demonstrate spatial market integration under the traceability standard. But prices do not need to be equilibrated across markets (<u>Barrett, 2005</u>). Economic analysis of internationally traded commodities would gain much from explicitly incorporating market structure (<u>Igami, 2012</u>). The equation of short-run integration of coffee market could be formulated as below:

```
\begin{split} \mathsf{D}(\mathsf{LOG}(\mathsf{PF})) &= &- 0.765610412455*\mathsf{D}(\mathsf{LOG}(\mathsf{PF}(-1))) - \\ & & 0.610587811297*\mathsf{D}(\mathsf{LOG}(\mathsf{PF}(-2))) - \\ & & 0.621824452781*\mathsf{D}(\mathsf{LOG}(\mathsf{PF}(-3))) + \\ & & 0.362988669231*\mathsf{D}(\mathsf{LOG}(\mathsf{PF}(-3))) - \\ & & 0.176060193261*\mathsf{D}(\mathsf{LOG}(\mathsf{PR}(-2))) - \\ & & 0.804352441602*\mathsf{D}(\mathsf{LOG}(\mathsf{PR}(-2))) - \\ & & 0.804352441602*\mathsf{D}(\mathsf{LOG}(\mathsf{PR}(-3))) - \\ & & 0.794881960484*\mathsf{D}(\mathsf{CR}(-1)) - \\ & & 0.868618531214*\mathsf{D}(\mathsf{CR}(-2)) - \\ & & 0.633327166545*\mathsf{D}(\mathsf{CR}(-3)) + \\ & & 0.202062846843 \end{split}
```

Based on the ECT (0.2020), it can be implied that 20.20% inappropriate price of coffee in Indonesian and international coffee would be adjusted in three years. The parameter Δ Pft was estimated to be equal to 0.76, suggesting that shocks in the international price directly, although not fully, passed through the domestic market. Finally, there is sufficient evidence to conclude that the Indonesian coffee market is well integrated with an international market in the long run. Price signals are also transmitted in the short run.

On the other hand, lag differenced terms are also estimated to be negative, reflecting a somewhat complex short-run dynamic.

Table 7. Vector Error Correction Estimates

Cointegrating Eq.	CointEal		
	1 000000		
LOG(PF(-1))			
LOG(PK(-1))	2.00000		
	(U.40213) רדרדסא		
CD(1)	[5.48///]		
CK(-1)	3.33150/		
	(0.34047)		
C	[9./8503]		
<u>C</u>	-22.5192/		D(0D)
Error Correction:	D(LOG(PF))	D(LOG(PR))	D(CR)
CointEq1	0.238296	-0.282338	-0.300985
	(0.19832)	(0.10488)	(0.11911)
	[1.20158]	[-2.69208]	[-2.52684]
D(LOG(PF(-1)))	-0./65610	0.338370	0.344950
	(0.28006)	(0.14810)	(0.16821)
	[-2.73377]	[2.28469]	[2.05072]
D(LOG(PF(-2)))	-0.610588	-0.013293	0.314934
	(0.24072)	(0.12730)	(0.14458)
	[-2.53646]	[-0.10442]	[2.17820]
D(LOG(PF(-3)))	-0.621824	0.161744	0.472912
	(0.25124)	(0.13287)	(0.15090)
	[-2.47500]	[1.21735]	[3.13389]
D(LOG(PR(-1)))	0.362989	0.787496	0.109432
	(0.56881)	(0.30080)	(0.34164)
	[0.63816]	[2.61797]	[0.32031]
D(LOG(PR(-2)))	-0.176060	0.363508	0.207971
	(0.54976)	(0.29073)	(0.33020)
	[-0.32025]	[1.25034]	[0.62984]
D(LOG(PR(-3)))	-0.804352	1.062022	0.053035
	(0.51274)	(0.27115)	(0.30796)
	[-1.56875]	[3.91671]	[0.17221]
D(CR(-1))	-0.794882	0.741491	0.443484
- • • •	(0.48350)	(0.25569)	(0.29040)
	[-1.64400]	[2.899931	[1.52712]
D(CR(-2))	-0.868619	0.579119	0.382197
	(0.40244)	(0.21282)	(0.24171)
	[-2.15840]	2.721151	1.581201
D(CR(-3))	-0.633327	0.638573	0.258646
x x - //	(0.36664)	(0.19389)	(0.22021)
	[-1.72740]	[3.293501	[1.17454]
С	0.202063	0.029273	-0.099367
-	(0.09121)	(0.04823)	(0.05478)
	[2.21536]	[0.606881	[-1.81384]
R-squared	0.638191	0.630398	0.730960
Adi. R-squared	0.359876	0.346089	0.524006
Sum sa reside	2 206273	0 617014	0 795911
S F equation	0 411963	0 217859	0 247435
F-statistic	2 293056	2 217299	3 531989
l og likelihood	-5 413536	9 876476	6 821335
	1 367705	0 003677	0.021333
Schwarz SC	1 907736	0.633568	0.310222
Maan dependent	0 120607	0.030500	-0.000105
S D dopordont	0.12009/	0.0300/9	-0.04100/
Dotorminant resid	(dof ad:)	0.209412	0.330041
Determinant resid cov.	(uor auj.)		
	andrice	4.30E-U5	
Log-likelinood	orion	1 522420	
Akaike information crit	erion	1.523429	
Schwarz criterion		3.290510	

Cr: Indonesian coffee crisis period

International price and coffee crisis variable had significant to Indonesian coffee price. The coffee crisis that happened in the past also influenced the Indonesian coffee price. The coffee crisis in Indonesia hit coffee farming starkly. Many farms changed from coffee into other commodities. This is the reason why lag 3 is used for the analysis because the coffee plant needs at least 3 years for its first harvest. The coffee crisis included the drastic decrease of coffee price globally which then affected the domestic price. The domestic farmers responded by changing the coffee plant to other commodities broadly or having failure in production because of pest and disease, drought, flood, and other environmental risks. If there was a crisis shock on Indonesian coffee, there would be changes in domestic coffee price. Coffee price in the Indonesian market was significantly influenced by three-year lag time price. The same situation also happened to international coffee price and coffee crisis variables.

The phenomenon also happened at the global grain market. The changes in the world prices transmitted to the domestic prices are relatively low both in the short run and in the long run, and that adjustment to the new equilibrium following a shock is slow (Ozturk, 2020). Changes in coffee productivity and prices appear to be linked with multiple factors including local market reform, a greater presence of public extension agents, high international prices, and a push for certification by international buyers (Minten et al., 2019). Social innovation based on the collaboration of different actors and the integration of the coffee production chain will promote the social and economic development of the community (Agostini et al, 2020)

The main problem with threshold models of spatial market integration is that in the absence of information on transfer cost, the estimation procedure is rather complicated, particularly with two thresholds. To overcome this problem, outside information on transfer costs is used to formulate a threshold variation of Ravallion's well-known dynamic model of spatial market integration (Ravallion, 1986). Response impulse analysis is used to profound the VECM interpretation. This analysis traces the response of endogenous variables in the VAR system toward shocks or changes in disturbance variables (e). Response impulses for coffee market integration are relayed in the picture below.



The top layer performed response of Log PF toward shock in LOG PR and Log Cr. Shock caused by the increasing international coffee price tended to be followed by increasing Indonesian coffee price sharply for 10 years forward. On the other hand, the coffee crisis shocks affected Indonesian coffee price relatively smoothly for 10 years forward. International coffee price impulse response toward Indonesian coffee price performed sharper than a coffee crisis for 10 years forward. Some previous researches informed that a few producers have the means required to successfully achieve profitable and long-term market integration. The opportunity for the biggest and best-connected producers is necessary to exacerbate asymmetries inside peasant smallholders farming communities and weaken producers' cooperatives (de la Vega-Leinert, Brenner, & Stoll-Kleemann, 2016). There is strong evidence of the link between the coffee price in the European coffee industry and that in Lampung farm gate as reported by Hutabarat (2006).

Research Implication

Based on the analysis, the implication of this research focuses on the following issues. The integration of commodity markets is very important in determining an equitable value chain for all business actors involved in it. An integrated market shows that the information transmission that occurs at the consumer market level is dispersed as information on commodity prices at the producer level. The difference in the results of the market integration index in the short and long term is important to consider in the policy of strengthening coffee farmers as the upstream commodity supply chain. Global corporations that drive vertical business value chains are important in ensuring that their business practices do not come at the expense of smallholders. Interconnections between actors in the business chain need to be built and intensively communicate various programs to ensure the sustainability of quality coffee supplies from farmers.

Price is the main incentive for farmers. The threat of price fluctuations that tend to harm farmers can be the reason for switching to other commodities that can threaten the sustainability of coffee supplies.

Market price volatility can threaten sustainable coffee, especially at the farm gate. The producer will severely restrict the ability to pursue social, environmental, and economic development.

Improving predictability and stability for producers, exporters, and consumers alike through contractual arrangements for promoting sustainability among producers is necessary. The contractual arrangements with an integrated approach addressing basic economic issues within the context of other production and trading practices are essential to provide a reference point for all players along the supply chain, especially enhance producer autonomy. Asymmetric information on the actions of other players within the coffee market usually lying between producers, policymakers, roasters, and even consumers. Minimum protectionist policies and lower levels of government intervention increase the domestic market integration with the international market (Ozturk, 2020). For producers to successfully reap the benefits of the international market, they must have dependable, understandable, and up-to-date market information as well as information on efficient strategies for adjusting to market-changing market conditions (Schuller et al., 2008).

Therefore, coffee business value chain actors (form trade collector, roasting industry, intermediary trader, manufactured industries, and exporter) starting from a local and regional scale need to build and develop the institutional capacity of partnerships, especially in mutual- hubs corporation with coffee farmers. The presence of corporate institutions at the coffee farmer level is needed to capitalize on farming capital, increase market access and price guarantees, to sustain the supply chain capacity in the national to the global coffee business value chain.

Changes appear to be linked with multiple factors including local market reform, a greater presence of public extension agents, high international prices, and a push for certification by international buyers. On the other hand, a combination of production (lack of improved seedlings, weather, and disease shocks), as well as institutional issues (saving constraints and lack vertical integration and traceability), have of seemingly impeded more widespread uptake of improved practices and therefore better farm performance. The eventually promote higher-value coffee exports, with a better image of the country as a high-quality coffee producer and a national trustworthy coffee bean classification system will improve Indonesian coffee performance in global buyer sight. The evolution of the coffee consumer profile with

market trends on coffee consumption is important (<u>de</u> <u>Lima et al., 2019</u>).

The presence of the role of the government as a regulator is needed to provide a business and investment climate in favor of smallholder coffee farmers, especially in access to capital, markets, technology, and institutions. Fulfillment of the farmers' needs-based approach is a priority. Enhance farmer's access to credit and start-up funds for small producers will provide the ability of such producers to enter into such markets. Limitation on access to capital press the ability of producers to adopt strategies towards diversification both along the coffee supply chain as well as into other product areas. The adoption of clear and transparent management practices, combined with the enhanced information on market conditions typically associated with recognized sustainability systems, improves the risk profile of producers, thereby making them more worthy clients for credit.

It is also important to be present in facilitating the improvement of the quality of human resources for farmers through various field school programs and training. The government also should prescribe export and import policies. International trade policy is necessary to enhance the productivity of coffee agribusiness development.

CONCLUSION AND SUGGESTION

Indonesian coffee export performs progressively in the last decade. The export destinations countries for Indonesian coffee also develop broadly. There was market integration on the Indonesian coffee market and global price in the London terminal in the period of 1987-2014. Although not fully, the shock in the international price was somehow felt in the Indonesian coffee market. There was a shred of sufficient evidence to conclude that the Indonesian coffee market is well integrated with the international market in the long run. There was a 20.20% inappropriate coffee price in Indonesia coffee and International coffee will be adjusted in three years. In the short term, 76% of Indonesian coffee price was influenced by international price changes, but not vice versa.

The facts indicate that global coffee price mainly steers the Indonesian coffee market, but this Indonesian market information is not complete yet. The market concentration on vertical integration needs to be explored deeply. Market concentration is another evidence related to the possibility of asymmetric global coffee price workability.

The integrated transmission of coffee price information at local, regional and global market levels is important information in building a fair coffee business value chain. The "coffee paradox" phenomenon that has emerged due to the contradiction between the condition of coffee farmers with their poverty problem and the condition of consumers who enjoy luxurious coffee needs to be addressed carefully. Farmers as the starting point for coffee production are the weakest actors. Only with systematic and directed efforts with clear indicators of achievement of improvement in farmer welfare can coffee farmers be empowered. Strengthening and increasing the capacity of farmers can be done through the implementation of the principles of corporate share value by corporate stakeholders in the coffee business chain. Increasing the business competitiveness of coffee entrepreneurs must be integrated with efforts to strengthen equitable supply chain lines. Empowered coffee farmers will be able to ensure coffee production according to GAP, handle harvest according to GMP, and have a good bargaining position in price and market negotiations. Thus, coffee farming income increases and farmers are empowered and resilient.

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The production risk of broiler farm management at plasma breeders: Evidence from Indonesia

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ABSTRACT

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The broiler chicken business is essential to providing national meat consumption in Indonesia. However, the business also faces a very significant management risk. The purpose of this research is to study broiler farm management and the effect of its business management on the production and production risk. This research was conducted in Lamongan regency of East Java by interviewing broiler chicken farmers and using descriptive and multiple linear regression analysis. The results of the research show that the implementation of broiler farm management reached 73.48% of ideal situation, with planning reaching 67.64% ideal situation, 65.58% for ideal organizing, 84.18% for optimal direction, 74.43% for ideal coordination, and 77.58% for ideal control. Also, the management had a positive influence on the production of the broiler livestock business, with an elasticity of 0.700. The management had a negative effect on the risk of production of broiler livestock business with the elasticity of 0.237. Production risk was negatively affected by the number of chicks and the amount of feed. To provide support for breeders in their business, it is necessary to have a policy of low cost of broiler cultivation, especially the cost of chicks and feed, by setting DOC prices and cheap or cheaper feed. Besides, it is required to develop cooperation with companies using broiler primary products, as well as certain policies so that there will be businesses that use broiler primary products as their main ingredient.

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INTRODUCTION

Production management is a high concern in the broiler chicken business. It is necessary to pay attention to how to manage a broiler chicken business properly. Therefore, it is one of the most important indirect independent variables, and very much determines the success of a business (Suwarta & Darmaji, 2020). Good management can increase the productivity and profits of the poultry industry (Suwarta & Hanafie, 2018). Dun & Bradstreet concluded that 88% of all business failures were due

to ineffective management (<u>Suwarta & Hanafie,</u> 2018). According to <u>Ochieng et al. (2011)</u>, by adopting a full management intervention package, performance is more productive than modifying and selectively.

To support the growth of broiler chickens and provide maximum benefits, it needs to be managed properly by meeting the needs of broilers properly (<u>Suwarta & Darmaji, 2020</u>). The elements of managing the broiler chicken business (<u>Aviagen, 2018</u>), including day old chicks (DOC), feeding and water, health and biosecurity, housing and

neighborhoods, monitoring of live weight and uniform performance and pre-processing management. The management of broiler chicken farming includes waste, curtains, water, nutrition, pumps, heat, and other kinds of management.

Broiler chickens are part of the poultry industry. Broiler chicken has the greatest contribution to support the sufficiency of national meat, and is a good business commodity as a means of increasing income and community welfare (<u>Simatupang & Maulana,</u> 2010). This statement is marked by the fact that broiler chicken is a good business commodity with a major role in improving the welfare of the poor. Broiler chickens can be used to meet the greatest national demand for meat, namely as much as 60% of the national demand (<u>Simatupang & Maulana, 2010</u>).

The study by <u>Simatupang & Maulana (2010)</u> provided motivation to increase the production of broiler chicken farming. Broiler chicken production can be increased by managing the broiler chicken business in the best possible way. First, the management of broiler chicken maintenance, such as the needs for feed, water, vitamins, medicine/antibiotics, chemicals for sanitation, a good environment, should be improved. Second, broilers should be prevented from getting attacked by diseases and other factors that limit their growth.

According to <u>Suwarta, Irham, & Hartono (2012)</u>, broiler chicken production is influenced by number of chicks, amount of feed, age of workers, workers' level of education, farmers' experience, wage, size of cage, partnerships of plasma breeders and nucleus company, and economic scale of chicken population. Studies showed that the management factor plays a very large role in supporting the success of a broiler business. However, they generally did not involve management factors as an independent variable in the broiler production or business productivity model.

Suwarta et al. (2012) also stated that broiler chicken farming business has a high risk of failure. High risks in broiler chicken farming are related to erratic fluctuations in production prices, DOC price, production and feed price, and other factors. The risks affect the extent of the success of a business. The greater the risk of a business, the greater the opportunity for the business to achieve success. Risk and return has a direct or linear correlation. The higher the risk of a business, the higher the level of business acceptance (high risk high return), and vice versa. Broiler chicken farming with certain characteristics has a high risk. High profits in broiler chicken farming can be achieved by applying management theory.

Due to the above mentioned risk, it is very essential for broiler chicken breeders to pay attention seriously to keep the risk of broiler chicken farming appropriate. By maximizing the application of broiler chicken business management, the level of production and the expected level of profit or income can be achieved. Breeders should focus on how to fulfill a best practices of the management of broiler chickens.

With the background of the problems above, this study aims to take the production model and the risk model for the broiler chicken production business. It is expected that the model of production and the risk of production in the broiler chicken business can be used to increase production and reduce the risk of production in the said business. This study tries to develop a business management model where the production and production risks of the best broiler chickens will be achieved, associated with management factors that affect the broiler business.

The purpose of this study is to determine the effect of business management and breeder's social factors on the production and risk of broiler chicken production.

RESEARCH METHOD

The research was conducted in the broiler chicken farm in Jombang regency. Jombang, Malang and Lamongan are the main producers of broiler chicken in East Java. The broiler breeders were plasma farmers who partnered with companies as the nucleus. The number of plasma broiler breeders was 49 breeders selected randomly with minimum business volume of 500 chicks (day old chick). They were spread over the areas of Kedumping District (11 breeders), Sugiro District (9 breeders), Tikung District (2 breeders), Sarirejo District (2 breeders), Kembang Bahu District (3 breeders), and Muntup District (22 breeders). The interviews were carried out to obtain data variables including production of broiler chickens, direct production factors (number of chicks, amount of feed, amount of drug-vaccine-chemicals, labor, and cage area), indirect production factors (age breeders, experience, farmer education, main job), age of harvest, and feeding method.

The management of broiler chicken business was analyzed qualitatively using score value addressing the management function of planning, organizing, implementing, monitoring, controlling. The approach was measured in units of score and comparing an ideal management situation.

The production function and production risk were determined using the Cobb-Douglas production function, as follow.

 $Q = AX_1^{b1} X_2^{b2} \dots X_n^{bn} e^u$.

Factors affecting production and production risk were formulated using the following model

$$\begin{array}{l} {\rm Ln}\; Y = {\rm Ln}\; b_0 + b_1 \, \ln X_1 + b_2 \, \ln X_2 + b_3 \, \ln X_3 + b_4 \, \ln \\ {\rm X}_4 + b_5 \, \ln X_5 + b_6 \, \ln X_6 + b_7 \, \ln X_7 \\ {\rm +}\; b_8 \, \ln X_8 \ {\rm +}\; b_9 \, D_1 + b_{10} \, D_2 + b_{11} \, D_3 + b_{12} \\ {\rm D}_4 \, + \, \varepsilon_1 \ (1) \end{array}$$

$$\begin{array}{l} \text{Ln } \epsilon_{1}{}^{2} = \mbox{In}\beta_{0} + \beta_{1}\mbox{In}X_{1} + \beta_{2}\mbox{In}X_{2} + \beta_{3}\mbox{In}X_{3} + \beta_{4}\mbox{In}X_{4} \\ + \mbox{} \beta_{5}\mbox{In}X_{5} + \mbox{} \beta_{6}\mbox{In}X_{6} + \mbox{} \beta_{7}\mbox{In}X_{7} + \mbox{} \beta_{8}\mbox{In}X_{8} + \\ \beta_{9}\mbox{D}_{1} + \mbox{} \beta_{10}\mbox{D}_{2} + \mbox{} \beta_{11}\mbox{D}_{3} + \mbox{} \beta_{12}\mbox{D}_{4} + \mbox{} \varepsilon_{2} \end{tabular}$$

In which Y is production (kg) and $\varepsilon 12$ is production risk. Those variables are affected by number of DOC (X1), amount of feed in kg (X2), age of harvest in day (X3), area of cage in m2 (X4), age of breeder (years) (X5), farmer education (years) (X6), farm experience (years) (X7), and business management in score (X8). Dummy variable, D1 = 1, business volume > average, D2 = 1, divided feeding, D3 = 1, harvest age < average, D4 = 1, raising broiler chickens as the main work. Meanwhile ε = error, $\beta 0$ = constant, $\beta 1$ - $\beta 8$ = elasticity of the independent variable, $\beta 9$ - $\beta 12$ = parameter of the dummy variable.

Regression analysis tested heteroscedasticity models to determine the percentage of the influence of independent variables on the dependent variable used the statistical Likelihood Ratio.

RESULT AND DISCUSSION

Business Management of Broiler

Business management indicators that affect business concerning the organization functions are planning, organizing, implementing, supervision, evaluation, and control of the production process. Business management functions to direct and deliver the influencing factors for increased production, and to minimize or even eliminate a negative effect on production, so that the level of production is achieved (Suwarta & Darmaji, 2020).

The implementation of management functions in the broiler chicken business can be maximally achieved at the ideal number of 100%. Each breeder has different abilities in implementing broiler business management. The better the application of business management, the broiler chicken business will achieve the desired goals, through increasing production and reducing the risk of production in the broiler chicken business.

For planning function, the results of the analysis (Table 1) show that management in the production planning function achieved a score of 22.32 (67.64% ideal) from a maximum score of 33. The results of the analysis consisted of components of commodity selection with a score of 4.14 (82.8% ideal), site selection at 1.96 (49% ideal), determination of business scale at 1.98 (66% ideal), breed objectives reaching 1.88 (47% ideal), motivation to join the partnership reaching 2.60 (86.7% ideal), preservation period of 3.34 (66.8% ideal), and planning after harvest of 1.9 (63.33% ideal).

These results show that the implementation of management in the planning function is still below the ideal. It means that it is necessary to add instruments that are included in planning activities and have a positive effect to increase production and reduce production risk.

For organizing function, the results of the analysis (Table 2) show that the implementation of management in the organizing function reached a score of 12.48 (65.58% ideal) of a maximum score of 19. The results of the analysis (Table 2) consist of the components of total production at the score 2.12 (53% ideal), production technique as many as 2.58 (86% ideal), marketing at 2.20 (73.33% ideal), purchase of input and output at 1.40 (46.67% ideal), state of money for operational costs at 2.16 (72% ideal), and adapted state of labor at 2.02 (67.33% ideal). Overall, the implementation of management in the organizing function is still far from ideal. Therefore, it is necessary to expand or add instruments included in the organizing function.

For direction function, the analysis results (Table 3) show that the implementation of management in the direction function reached a score of 18.52 (84.18% ideal) of the maximum score 22. The results of the analysis consisted of the components of optimal resource allocation which reached the score of 2.50 (83.33% ideal), optimal production process planning with the score of 2.20 (73.33% ideal), optimal implementation at 1.98 (99% ideal), optimization of production resources as many as 2.46 (82% ideal), optimizing time with 1.78 (89% ideal), optimization of

labor at 2,64 (88% ideal), optimizing the use of tools at 2.9 (96.67% ideal), and directing function on optimizing product damage of 2.06 (68.67% ideal). With these results, it appears that the management implementation in the direction function is still far from ideal. It is necessary to expand or add instruments in the activities of the directive function to gain a positive effect, i.e. increased production and reduced production risk.

Table 1. Management Planning Function of The Broiler Chicken Business

Components	Score	Criteria
Commodity selection	4.14(5)	Easy, short cycle, and profitable
Site Selection	1.96(4)	Far from settlements, the core, or the center of agribusiness.
Business scale determination	1.98(3)	Many demands and competitive conditions
Determination of breeding goals	1.88(4)	To fill in spare time
Economic motives of the business	2.50(3)	To make ends meet and try his best
Production schedule	2.02(3)	The production period is good but the vacuum period is not good
Motivation to join the partnership	2.60(3)	There is no place, no other business, looking for profit
Preservation time	3.34(5)	Shorter maintenance time, standard weight
After harvesting	1.90(3)	To meet the needs of life and business development
Note: () = Maximum score		

Table 2. Management Organizing Function of The Broiler Chicken Business

Components	Score	Criteria	
Production amount	2.12 (4)	Consider facilities and requests	
Production technique	2.58 (3)	proper facilities, most of production facilities is appropriate	
Marketing	2.20 (3)	demand increases, demand>supply, price>market price	
Input and output	1.40 (3)	Input price = market price, output price < market price	
Operational money	2.16 (3)	Not enough available	
Labor	2.02 (3)	Skillful, but not optimal	
Notor () - Maximum cooro			

Note: () = Maximum score

Table 3. Management Directing Function of The Broiler Chicken Business

Components	Score	Criteria
Optimal resource allocation	2.50 (3)	Right quantity and quality
Optimum production process	2.20 (3)	Planning is optimal, the allocation is not fully optimal
Optimal implementation	1.98 (2)	Most of the implementation according to plan
Resource optimization	2.46 (3)	46% recommendations is applied
Time optimization	1.78 (2)	78% sapronak administration is applied
Power Optimization	2.64 (3)	Doing obligations and getting rights, not all live in a cage.
Tool optimization	2.90 (3)	90% facilities needed are met.
Optimization of product damage	2.06 (3)	Pay attention to transportation division

Note: () = Maximum score

Table 4. Management Monitoring Function of The Broiler Chicken Business

Components	Score	Criteria
Budget's utilization	2.48 (3)	48% to the provisions
Production process	2.66 (3)	As per the procedure, 66% refers to experience
Use of inputs	2.32 (4)	Right amount, good quality, wrong time
Work schedule	3.10 (4)	The schedule in the beginning, implementation, a small portion of the end
Notor () - Maximum score		

Note: () = Maximum score

Table 5. Management Controlling Function of The Broiler Chicken Business

Components	Score	Criteria
Use of seeds	2.26 (3)	The right amount, 26% of good quality
Energy use	2.16 (3)	The right amount, 16% of skills are fulfilled
Use of a starter	2.26 (3)	Exact amount, 26% of tub quality
Use of a grower	2.52 (3)	The right amount, 52% of good quality
The use of finisher	2.44 (3)	The right amount, 44% of good quality
Vaccine use, disinfectants	3.10 (4)	Right amount, good quality, 10% right usage
Nata () Mandana and		

Note: () = Maximum score

For coordination function, the results of the analysis (Table 4) show that the implementation of management on the coordinate function reached the level of 10.56 (74.43% ideal). The analysis shows that the management function on coordination, including budgeting achieved the score of 2.48 (82.67% ideal), production process 2.66 (88.67% ideal), input consumption 1.74 (43, 5% ideal), and the coordination function of work schedules 3.1 (77.5% ideal). These results show that the implementation of management in the coordination function is still far from ideal. It is necessary to expand or add instruments in the activities of the coordination function to gain a positive effect i.e. increased production and reduced

For control function, the results of the analysis (Table 5) show that the implementation of management in the control function reached a score of 14.74 (77.58% ideal) from the maximum score of 19. The results of the analysis show that the control function component included the scores for seedlings at 2.26 (75.33% ideal), use of labor at 2.16 (72% ideal), use of starter feed at 2.26 (75.33% ideal), use of grower feed at 2.52 (84% ideal), use of finisher feed at 2.44 (81.33% ideal), and drug, vitamins and chemistry uses at 3.10 (77.5% ideal). With these results, it shows that the management implementation in the control function is still far from ideal. Therefore, it is necessary to expand or add the control function activities to increase production and reduce production risk. Sharma et al. (2021) stated disease control is crucial in the management of a broiler business. It becomes critical to learn about epidemiology, to design mitigation plans, and to underline the need for a one-health approach to protect public health.

The overall results showed that the implementation of broiler chicken business management reached a score of 78.62 (73.48% ideal) from a maximum score of 107. Business management of broiler chickens can be addressed by maximizing the management function and its components. Iheke & Igbelina (2016) said that training programs should be carried out for farmers on poultry technology and risk management.

Production of Broiler

The results of the analysis of the production function (Table 6) showed that the R2 value was 0.998 and F-value was 627.285 (p=0.01). It means that all independent variables in the model affected the

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production of broiler chicken farming. Meanwhile, the results of the partial analysis showed that the independent variables that influenced production were business management, the amount of feed, the age of harvest, and the number of chick.

Table 6.	Estimated Variable Affecting Production of	
	Broiler Chicken Farming	

Variable	Coefficient	p-value
LnX1 (number of chick)	0,282	0,004
LnX2 (amount of feed)	0.760	0.000
LnX3 (harvest age)	-0.869	0.069
LnX4 (cage area)	-0.051	0.357
LnX5 (age of breeder)	0.035	0.349
LnX6 (education)	-0.047	0.577
LnX7 (experience)	0.023	0.536
LnX8 (management)	0.700	0.020
Dummy Variable		
D1 (volume> average)	-0.009	0.513
D2 (divided feed)	0.004	0.871
D3 (average harvest age)	0.019	0.335
D4 (main job raising)	-0.030	-0.128
Constant	-0.103	0.938

The number of chicks (X1) positively affected broiler production, with an elasticity of 0.2820 (p=0.01). The number of chicks cultivated was directly proportional to the amount of broiler production or had a positive effect on the production of broiler chicken farms. Todsadee et al. (2012) found that the number of chicks has a positive effect on production. Suwarta et al. (2012) found an elasticity of 0.42 and the productivity of broilers with an elasticity of 0.54. Likewise, other studies found that the elasticity was 0.3312 (Sunarno, Rahayu, & Purnomo, 2016), 0.0046 (Buntara et al., 2014), and 1.0578 (Wardhani & Waridin, 2012).

This research showed that the amount of feed had a positive effect on broiler production, with an elasticity of 0.760 (p=0.01). <u>Suwarta et al. (2012)</u> found an elasticity of 0.402. <u>Buntara et al. (2014)</u> also found an elasticity of 0.2407. <u>Aboki et al. (2013)</u> found that feed stimulates production and indicates capital formation, drugs or vaccines precaution, and innovations attention. <u>Sitompul, Sjofjan, & Djunaidi</u> (<u>2016</u>) said that difference in broiler feed types has an effect on the increase in body weight of chickens.

The results showed that the harvest age had a negative effect on the production of broiler chickens with an elasticity of 0.869 (p = 0.10). The best harvesting age is during optimal production in broiler growth, or during production phase II. Along with the growing period of broilers, the increasing age of the

production risk.

harvest results in smaller additional production. This explains why the age of harvest has a negative effect on production. This shows that the harvesting age at growth stage III is ineffective and inaccurate. Harvesting decisions are essential in business management, where decisions are influenced by the experience and knowledge of the breeders.

The amount of feed affected the production of broiler chicken farms with respect to the law of decreasing yields. This means that an additional increase in the amount of feed results in a decreased additional production. This concept forms an optimal and maximum production quantity associated with the amount of feed. Optimal production is the achievement of production at an optimal level of feed usage that results in maximum profit. Whereas, the maximum production is the highest level of production achieved, and after that the production will decrease with the addition of the amount of feed. Internal management factors, such as farmer's age, education, and experience have an effect on increasing broiler production.

The influence of business management on production serves to direct factors that have a positive effect on increasing production (Suwarta & Darmaji, 2020). The implementation of the management of the broiler business is directly proportional to the increase in production. In addition, it was found that breeders' age, education, and experience are able to support the internal management that affects production and production risks. Business management (X8) positively affected broiler production, with an elasticity of 0.700 (p=0.05). These results indicate that if the management of broiler chicken farms is increased by 1%, the production will increase by 0.7%. Suwarta & Darmaji (2020) found that broiler business management had an effect on broiler production with an elasticity of 1.68. Suwarta et al. (2012) found that business management had a positive effect on broiler farm productivity with the parameter 0.0658 and on the FCR with the parameter -0.08337.

Suwarta et al. (2012) found that the performance of plasma breeders is better than independent breeders, and plasma nucleus breeders are better than independent plasma breeders. Business management of plasma breeders has a more positive effect on broiler farm production than independent breeders, and management of post-factory core breeders has a more positive effect on production compared to independent plasma breeders. Todsadee et al. (2012) stated that increasing broiler production in Chiang Mai Province could be obtained by adopting good management practices. <u>Baliyan & Masuku (2017)</u> found that to increase the efficiency and productivity of broiler farming, small-scale broiler breeders must be adequately trained in management skills.

Other factors affecting production have been identified by several researchers. <u>Todsadee et al.</u> (2012) found that production affected by increasing operating costs and other costs in Chiang Mai Province. <u>Sunarno et al.</u> (2016) found that production is affected by additional vitamin and heater, and decreased mortality. Production is also enhanced by labor and energy (<u>Mehrjerdi et al.</u>, 2015), the cost of fuel, and electricity (<u>Wardhani & Waridin, 2012</u>).

Ngozi & Chinonso (2013) found that the problems faced in increasing the production of broiler chicken farming are lack of capital, inadequate resources of livestock production, disease, poor transportation network, and labor. Mbuza et al. (2017) stated that the increasing broiler production in Rwanda is done by established 62.2% feed processing industry, increase marketing facilities 35.1%, increase the availability of DOC, access credit 27%, and intensification of farmer training 16.2%. Limbergen et al. (2018; 2020) showed facility, housing size, and infrastructure had the highest condemnation affecting broiler management. Etuah et al. (2013) found that the main production constraints are high feed costs, lack of access to credit, competition from cheap poultry imports, and lack of government support. Other obstacles come from management, low-quality feed, poor access to extension services, lack of government support, lack of sufficient capital, and lack of farmers' technical knowledge (Hassan, 2017).

Production Risk of Broiler

The analysis (Table 7) shows the R2 of 0.996 and F value of 399.92 (p=0.01). This shows that all independent variables in the model affected the risk of production. The results of the partial analysis showed that the independent variables influencing the risk of broiler chicken production were management, amount of feed, harvest age, and number of seedlings. The independent variables with a significant effect on production, namely the number of chicks, feed and management (having a negative effect), and the age of harvest (having a positive effect).

Table 7.	Estimated	Variable	Affecting	Production	Risk
	of Broiler	Chicken F	arming		

Variable	Coefficient	p-value
LnX1 (number of chick)	-0.264	0.008
LnX2 (amount of feed)	-0.400	0.004
LnX3 (harvest age)	1.695	0.000
LnX4 (cage area)	-0.033	0.452
LnX5 (age of breeder)	-0.013	0.728
LnX6 (education)	0.092	0.256
LnX7 (experience)	0.037	0.505
LnX8 (management)	-0,237	0,015
Dummy Variable		
D1 (volume> average)	-0.237	0.015
D2 (divided feed)	-0.013	0.391
D3 (average harvest age)	0.022	0.333
D4 (main job raising)	-0.008	0.675
Constant	0.011	0.500

The number of produced chicks was inversely proportional to the risk of production in the broiler chicken business. The more the number of DOC that was maintained, the smaller the risk of broiler chicken business production was produced, and vice versa. This study showed that the number of chicks had a negative effect on the risk of broiler chicken production with an elasticity of -0.264 (p=0.01). Fajar & Heriyadi (2017) stated that the causes of the risk of broiler production include cage size, weather changes, pests and diseases. Pests presented the highest risk of 38% and climate change contributed the lowest risk of 12%.

This study revealed that the amount of feed had a negative effect on the risk of broiler production with elasticity - 0.400 (p=0.01). Essentially, the use of an efficient amount of feed will also have an impact to enhance to reduce the risk of broiler production. The amount of feed affects the risk of broiler farm production compared to the effect on production. The experience of breeders using the amount of feed is an important decision to reduce the risk of broiler production. This finding is in line with the study of Vinanda et al. (2015), where the amount of feed could reduce the risk of production in independent farmers. Production risks can also be reduced by the use of vaccines, the amount of husks and labor.

The results of this study showed that the harvest age (X4) had a positive effect on the risk of production with an elasticity of 1.695 (p=0.01). These results indicate that extending the harvest time is associated with high risk and indicates inefficient activity. Therefore, the harvest time implementation plan should be strictly implemented in order to prevent a decline in production.

The best harvest is in the second production phase (II), namely in the optimal production area. Harvest time beyond this phase will tend to be inefficient. Harvesting decision making is crucial in broiler business management, in which breeders always use their experience and knowledge to carry out these decisions.

The management of broiler chicken cultivation (X8) had a negative effect on the risk of production of broiler chicken with an elasticity of -0.237 (p=0.05). Business management had an inverse effect on the risk of broiler chicken farming. The better the application of business management, the more reduced the risk of broiler chicken farming will be. Business management is related to the experience and skills (education) of breeders as the provisions to optimize or increase the effect of business management in reducing the risk of broiler production. Habibi, Azizi & Shal (2017) found that the production is influenced by risk factors, including cleanliness, ventilation and temperature, nutrition, disease prevention, hatchability of chickens, and insurance. Van Limbergen et al. (2018) stated that better education of farmers helps to improve overall biosecurity on broiler management.

Besides, <u>Suwarta (2012)</u> stated that business patterns have an effect on the risk of broiler chicken business. In general, independent breeders face a greater risk than joining plasma, in terms of dealing with DOC prices, income earning and broiler product prices.

Research Implication

Ditjen PKH (2020) mentioned that national meat production in 2019 reached 4,888,800 tons, with the contribution of broiler chicken production as many as 3,495,100 tons (71.49%) of the total population of 3,169,805,000 broilers. <u>BPS (2020)</u> recorded a total supply of broiler chickens of 3,484,216 tons and a total demand of 3,442,558 tons with a surplus of 41,658 tons. Meanwhile, the total consumption of fresh meat was 7,299 kg per capita per year, derived from broiler chicken as many as 5,683 kg per capita per year or 77.86%.

<u>Rustam (2020)</u> said there are several strategic indicators that need serious attention from the government, including the increasing meat consumption from 13.2 kg/capita/year (baseline 2019 from prognosis results/estimates for 2019) to 14.6 kg/capita/year in 2024. The consumption of protein
from livestock increases from 10.9 grams/capita/day (baseline 2019 from prognosis results/estimates for 2019) to 11 grams/capita/day in 2024, and the availability of animal protein from 2.4 million tons (2019 baseline) from the prognosis/estimation results in 2019) to 35.3 million tons in 2024. Furthermore, the livestock sector performance target that must be realized in the mid-term development of 2020-2024 is realizing an independent, advanced, just and prosperous Indonesian society.

The self-sufficiency of chicken meat that has been achieved in Indonesia must be maintained so that food stability is fulfilled. If the growth in consumption of broiler meat exceeds the growth in production, it will result in the end of chicken meat self-sufficiency in Indonesia. Therefore it is necessary to increase the production of broiler chicken farms.

Broiler chicken business requires a lot of capital. This can not be done by breeders who have limited capital. In fact, farmers can run a broiler business through a profit sharing scheme, for example by renting out agricultural land, a partnership scheme with capital owners, partnerships with companies that are positioned as the nucleus, and breeders who are positioned as plasma. The distribution of business results depends on the contract agreement at the beginning of the cooperation. The broiler chicken farming partnership business generates significant income and benefits (Suwarta, 2012; Illahi, Novita, & Masithoh, 2019). BPPP (2019) stated that the broiler breeding business is sufficient to provide good business opportunities, as long as maintenance management follows applicable procedures and regulations through various partnership patterns with a business scale of 15 thousand chicks. According to Rondhi et al. (2020), the farm management of the broiler is unstable due to the possibility of farm risk. Contract farming in a plasma-core relationship can reduce production risk. Contract farming participation should focus on young and educated farmers with large farm sizes.

Continuously increasing production is carried out by ensuring the broiler's business profits and reinvestment to increase production capacity. The strategy undertaken by independent breeder entrepreneurs is to look for DOC and feed prices that are more competitive than the manufacturer's price. Another approach is to manage the excess supply of broilers in the market and process them into frozen chicken products even though they require additional processing and treatment.

The indicator for the sustainability of the livestock business is seen from the exchange rate of farmers in the livestock subsector. Exchange rate data is also used as a proxy to measure the level of welfare of farmers. BPS's published data shows that the monthly exchange rate indicators throughout 2019 have increased and tend to improve from month to month.

Rusdiana & Talib (2020) stated that livestock policy has considered various aspects, including risks and market situations, in which cases affect the decisions of breeders and consumers. This will have an impact on national food security and the agricultural sector. The results of this study indicate that breeders' business decisions also support the availability of national meat. It is very important for farmers to implement business management by following and adapting to environmental and technological developments. Good business management will lead to increased production and farmer income. Experience in partnerships also helps the capital aspect and ensures a more profitable business venture.

Meanwhile, the impact of the COVID-19 pandemic has had a significant impact on broiler farms. The large-scale social restriction policy has had an impact on the distribution of feed, meat production and other means of production, affecting manufacturers, livestock entrepreneurs to retailers. According to <u>Armelia et al. (2020)</u> and <u>Harmen (2020)</u>, there has been a decline in feed prices and consumer purchasing power of broiler chickens. <u>Ilham & Haryanto (2020)</u> observed a decline in production during the pandemic.

In general, the pandemic has an impact on the reducing production of broilers, beef cattle, and goats or sheep. However, chicken farmers were more severely affected by the nature of the perishable product. The traders then speculate by lowering the price in the market. In this condition, the breeders' creativity emerged by selling directly from breeders to end consumers. In addition, breeders as producers also sell broilers in processed form, for example grilled or steamed chicken. This step succeeded in increasing added value of broiler, but the turnover for direct sales and processed products was very limited.

Armelia et al. (2020), stated that Covid-19 can have a positive and negative impact on broiler farms. The positive impacts include the prospect of developing frozen food for chicken meat, increasing the issue of Safe, Healthy, Whole and Halal (ASUH) food, and tax relief in the broiler sector. Meanwhile, the negative impact is disruption of the supply chain in the distribution of DOC, feed and medicines as well as operational activities, resulting in decreased productivity of broiler chicken farms and farmer income.

CONCLUSION AND SUGGESTION

The application of management in the broiler business achieved on average 75% of ideal score. It was distributed in the components of planning 67.64%, organizing 65.58%, directing 84.18%, coordinating 74.43%, and controlling 77.58%.

Production was positively influenced by the number of chicks, amount of feed, and business management; and was negatively affected by the age of harvest. Production risk was negatively affected by the number of chicks, the amount of feed, and business management. Meanwhile, production risk was positively influenced by the age of harvest.

The broiler farming business by farmers requires the following policy and management support. In order to reduce the cost of cultivating broiler chickens, farmers need to be assisted by setting competitive prices for DOC and feed. Farmers can produce lowcost feed ingredients by using rice by-products such as bran, or other primary agricultural products, added with Black Seed. To determine the right harvest time, farmers need to plan and collaborate with markets, restaurants, processed chicken entrepreneurs or other food companies so that broiler chickens are immediately distributed to end consumers or other users.

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The financial analysis of nitrogen fertilizers and planting systems and its implications on maize agribusiness: Evidence from Peshawar, Pakistan

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ABSTRACT

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Maize is one of the staple foods that supply the world's food demand. The research aims to determine financial analysis of nitrogen fertilizers and planting systems and its implications on maize agribusiness. The research was conducted in experimental design with a split-plot arrangement comprising four replications. Maize plant density as a system treatment was allocated to main plots (65,000; 75,000; and 85,000 plant per ha). Integrated nitrogen was assigned to sub-plots: control; 0% yard manure (YM) + 100% urea; 100% YM + 0% urea; 50% YM + 50% urea; 75% YM + 25% urea; and 25% YM + 75% urea. Data were recorded on plant harvest, harvest index, and R/C ratio. The result showed that integrated N of 50% Farm Yard Manure + 50% urea in 85,000 plant per ha resulted in a higher harvest index of 31.5% and the highest R/C ratio of 6.2 and enhanced yield of 4,219 kg per ha. This yield almost meets the government's expectations. Total cost was 36,961 PKR, total income was 227,941 PKR, and economic net return reached 190,980 PKR. The government can support the maize crops farmers to activate decomposition household's waste to be organic fertilizer in their house and provide the place for decomposition activity in the crops field to fulfill production government target, food security, and environmental health.

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INTRODUCTION

Maize (Zea mays L.) is a widely crop grown and plays a vital role in food security (<u>Ahmad, Ahmad, et al., 2020</u>; <u>Lesilolo et al., 2018</u>). Maize's rank position is the third after rice and wheat in world food production. A hundred gram of fresh maize grains contains 74.4 g carbohydrates, 4.3 g fats, 361 calories, 1.8 g fiber, 9.4 g of protein, and 1.3 g

vitamins (<u>Ali et al., 2014</u>). Maize is known as cereals queen globally as it has the highest genomic yield potential among other cereals. In Pakistan, the total cultivated area was 1.23 million hectares with a production of 5,702 thousand tonnes and an average yield of 4,640 kg per ha at the national level (<u>Ahmad,</u> <u>Hanif, et al., 2020</u>). The use of stable fertilizers show a central part in improving productivity on a sustainable basis. Nitrogen is an essential nutrient that constrains maize production.

Soil is commonly known to be the critically lacking constituent of the world. The problem of soil fertility has been identified as a significant impediment to maize productivity in Pakistan. The nitrogen, phosphorus, and potassium (NPK) are the majority of deficient elements. Nitrogen is a necessary component of plant growth, along with chlorophyll and many other enzymes involved in plant physiological processes. Its presence in the soil influences potassium, phosphorus, and other mineral nutrients' status in the plant. If there is N deficiency, the soil's optimal amount of these nutrients cannot be utilized (<u>Apriani et al., 2017</u>). Nitrogen fertilization plays a significant role in improving soil fertility and increasing crop productivity.

Maize needs nitrogen during the active growth and development periods, and it directly affects dry matter production by increasing photosynthetic efficiency. Nitrogen at the optimal rate is required to support plant growth and yield (Cameron et al., 2013; Shambhavi et al., 2017; Srivastava et al., 2018). The application of nitrogen fertilizer increased grain and biological yield significantly. Nitrogen fertilization increases maize grain yield (43-68%) and biomass (25-42%). Organic and inorganic nitrogen sources have a positive interaction for increasing crop yield and improving soil fertility (Mahmood et al., 2017; Mamiev et al., 2019; Partey et al., 2018; Sofyan et al., 2019; Tonitto & Ricker-Gilbert, 2016). Synergistic effects of nitrogen and organic manure accumulate more total nitrogen in the soil.

Experiments mixing revealed that the combination of inorganic and organic nitrogen application enhances soil fertility, secure nutrient supply, and increase yield. Inorganic and organic nutrients demonstrate numerous benefits in terms of increased nitrogen uptake by plants and the amount of nitrogen available in soil. It also plays a vital role in enhancing maize as fodder for animal production. There is an urgent need to increase the judicious use of available land through the integrated application, particularly nitrogenous fertilizer, to meet the everincreasing food requirements human population and maintain soil fertility for optimum crop production (Mahmood et al., 2017; Mamiev et al., 2019; Partey et al., 2018; Sofyan et al., 2019; Tonitto & Ricker-Gilbert, 2016). Organic matter like manure promotes seed germination and the crop plants' root growth by improving the water holding capacity and the soil's aeration. Therefore, maize production has a high chance of considerable improvement in yield due to the application of manure and conventional fertilizers. Furthermore, the soil nutrient is a central elementary component of numerous metabolites containing proteins, amino acids, phytochromes, and nucleic acids, in addition to several other nutrients (Cisse et al., 2019). Appropriate nitrogen levels, combined with the increased incorporation of manure, result in an agreeable and palatable fodder yield (Watthier et al., 2019).

Planting density is the most critical factor in increasing yield through intra- and inter-row positioning. Planting population is an essential factor in grain yield. Most plants suffer from unfertile situations that is vulnerable to pest attack and settling at higher planting densities. The ultimate number of plants per area is determined by various factors, including water accessibility, maturity, soil fertility, and row spacing. Increased density reduces the percentage of depriving while increasing grain weight, grain number, and grain rows (Adhikary et al., 2020; Ashrafi & Seiedi, 2011; Srivastava et al., 2018; Zhang et al., 2020). Higher densities encourage canopies to take advantage of solar radiation. The crop's dry matter production is inextricably linked to the utilization of solar radiation, which is influenced by shade. Solar radiation utilization is one of the essential factors in maize production, as it is in all higher plants. Canopy architecture on the vertical distribution of light within the canopy directly influences photosynthetic efficiency. However, as plant population density increases, the conversion of intercepted solar radiation into maize yield decreases due to mutual shading. Furthermore, plant population density affects vegetative and reproductive growth (Khan et al., 2020; Lacasa et al., 2020; Shi et al., 2016).

The effort to increase maize crop production could be influenced by technical, social, and economic factors. The technical factors include farmers' barriers to getting access to technology, input availability, and the social-economic factors include a barrier to getting capital, education level, lower-income, and production input usage. However, the farmer income depends on the amount of production factors cost. It mainly includes soil land availability, fertilizer, human resource, management, and technology advancement (Anggraeni, 2017). Maize crop production and fluctuating harvesting price makes farmers difficult to take a decision.

Many kinds of research about the increased productivity of maize cultivation have been carried out. However, the economic aspect were still inadequately discussed in those experiments. That is why we need a research about the economic return and financial analysis in maize cultivation concerning fertilizer technology. This study's objective is to assess the financial efficiency of using nitrogen fertilizers and the planting system, and its implications for the development of maize agribusiness.

RESEARCH METHOD

The research was conducted during 2018-19 at Agronomy Research Farm, The University of Agriculture Peshawar, Pakistan. The experiment applied Randomized Complete Block Design (RCBD) having a split-plot arrangement replicated four times. Plant density of 65,000, 75,000, and 85,000 plant per ha) was assigned to main plots. The integrated nitrogen (N) was allotted to subplots in six levels of integrated N: Control, 0% yard manure (YM) + 100% urea, 100% YM + 0% urea, 50% YM + 50% urea, 75% YM + 25% urea, and 25% YM + 75% urea. The seed maize of 30 kg per ha was sown for this research. Desired plant density was retained with the process of thinning. The subplot's length and width were 3 m x 3.5 m, respectively adjusting a total of 5 rows. The required plant density were placed in these five rows per subplot treatment details. The source of mineral nitrogen was urea. The economic aspect was analyzed descriptively on total income, total return, and revenue-cost ratio (R/C ratio).

At harvest maturity, plants in three central rows were counted and then harvested to record plants at harvest. Harvest index was recorded by the formula of grain yield/biological yield x 100. Characteristics unit value of Yard Manure (YM) was nitrogen phosphorus potassium (0.225%), (0.546%), (0.613%), dry matter (20.0%), and moisture (80.0%).

The equation model for analysis is following.

 $X_{qij} = \mu + r_q + N_i + D_{qi} + P_j + NP_{ij} + \varepsilon_{qij}$

Where Xgij is the randomized factor of integrated N and plant density, μ is general average, rq is replication, Ni is the integrated N, Dqi is component of error random relate to the main plot, Pj is plant density, NPij is the interaction effect of factor nitrogen and P in each level. Also, ɛqij is a component of error.

Data information on economic aspect for the income of maize used the following formula.

$$\Pi = TR - TC$$
 $TR = P.Q$
 $TC = TFC + TVC$

All unit financial analysis is in Pakistan Rupee (PKR), Л is maize income, TR is total revenue, TC is total cost, P is price, Q is quantity, TFC is total fixed cost, and TVC is total variable cost.

Business feasibility of maize used the formula

$$\frac{R}{C} ratio = \frac{TR}{TC}$$

If R/C ratio is more than 1, it means the business is feasible. R/C ratio equals to 1 means break-even and R/C less than 1 means the business is not feasible, no revenue economically.

Azam variety was used in the research experiment because it performed better in Peshawar's agro climatic conditions compared to other varieties. Besides, it showed better results in dealing with disease and pest attack than numerous other maize varieties. Azam is cultivated in the density range of 70,000 - 80,000 plant per ha, harvested in 95 days (PARC, 2021).

RESULT AND DISCUSSION

Crop Production

Maize crop reached more total yield than each control treatment of integrated N. Table 1 shows the results of analysis of variance, where the treatment of plant density and integrated N significantly affected individually on total yield and harvest index of maize crops. The strong interaction of plant density and integrated N treatment affected the total yield of maize crops.

Table 1. Analy	vsis of	Variances	of	Maize	Yield

Variance Resources	Total Yield	Harvest Index		
Replication	0.620	0.526		
Plant Density (P)	17.606**	5.771*		
Integrated Nitrogen (I)	71.944**	4.649*		
Plant Density x Integrated N	2.039*	0.918		
** Significant at the 0.01 level: * significant at the 0.05 level				

The Duncan Multiple Range Test (DMRT) regarding plant density and integrated N on maize

production is identified in Table 2. Maize total yield improved as the higher plant density and integrated proportionally. More manure undoubtedly Ν increased the total yield of maize. Integrated nitrogen for any dosage in 85,000 plant per ha indicated higher results than the control treatment. The maize production reached 12,120 kg per ha by 100% urea, and the total yield increased to 12,201 kg per ha when treated by 100% YM. A similar result was statistically observed in either 75% YM or 75% urea. However, the best nutrient intake was 50% YM + 50% urea with the highest total yield result of 12,749.50 kg per ha. It is suggested that another treatment to control weed and nitrogen fixation be added to provide sustainable nutrients (Nasar et al., 2020), and some plant regulators such as Salicylic acid as a hormone be given for maize growth and yield (Arshad et al., 2020). Meanwhile, the soil temperature management technologies can increase agricultural productivity and sustainability while reducing environmental impact (Cameron et al., 2013).

The maize crops agribusiness is common in Indonesia. In fact, the highest result of maize gained in Indonesia with spacing maize plant 20 x 50 using

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manure is 15 tonnes per ha (<u>Asbur et al., 2019</u>). Another study using swine dung manure gained 25 tonnes per ha and the one with plant density 70 x 30 cm resulted in 3.48 tonnes per ha dried grain (<u>Bhato, 2016</u>) and 40 x 40 cm with guano 10 tonnes per ha gave 239.75 g per sample (<u>Nasution, 2019</u>).

The result of opened planting in Peshawar is lower than that in Indonesia. It was possibly influenced by environmental factors such as the four different seasons, soil characteristics, and maize description. Indonesia has an advantage as a tropical country with only two seasons: wet and dry.

Maize crop harvest index as affected by planting density with integrated N is presented in Table 3. Planting density and integrated N each had significantly (P≤0.05) affected the harvest index. Planting density and integrated N had no significant interaction. An increasing trend was obtained by planting density up to the specific level of integrated N of 50% YM + 50% urea. However, it decreased, moving towards the integrated N of 75% YM + 25% urea and 25% YM + 75% urea. The high harvest index was produced by planting density of 85,000 plant per ha to integrate 50% YM + 50% urea.

Table 2. Effect of Plant Density and Fertilizer on Maize Yield

Treatment of Fortilizer		Plant Density			
Treatment of Fertilizer	65,000 (P ₁)	65,000 (P ₁) 75,000 (P ₂) 85,000 (P ₃)			
		kg per ha			
Control (I ₁)	8,975.50 a	9,203.75 a	9,466.25 a		
0% YM + 100% urea (I ₂)	10,658.75 bc	11,722.08 bc	12,120.00 c		
100% YM + 0% urea (I ₃)	11,540.80 c	12,125.00 cd	12,201.01 cd		
50% YM + 50% urea (I ₄)	12,252.00 de	12,467.02 de	12,749.50 e		
75% YM + 25% urea (I ₅)	11,618.34 d	12,434.01 de	12,499.89 de		
25% YM + 75% urea (I ₆)	10,475.70 b	11,964.82 c	12,581.50 de		
	1 1000 1 100 11				

Numbers followed by the same letter do not differ significantly at the 0.05 level

Table 3. Effect of Plant Density and Fertilizer on Maize Harvest Index

Treatment	Harvest Index
Plant Density	
65,000 (P ₁)	28.825 a
75,000 (P ₂)	29.837 ab
85,000(P ₃)	30.863 b
Integrated Nitrogen	
Control (I ₁)	27.442 a
0% YM + 100% urea (I ₂)	29.325 b
100% YM + 0% urea (I ₃)	30.192 bc
50% YM + 50% urea (I ₄)	31.450 c
75% YM + 25% urea (I ₅)	30.208 bc
25% YM + 75% urea (I ₆)	30.433 bc

Numbers followed by the same letter do not differ significantly at the 0.05 level

Nutrient of nitrogen has impacted harvest index significantly in combination with YM. Maize yield of grains went down after planting density was beyond optimal planting populations mainly due to decline in harvest index. The findings revealed that suitable and stable nutrient supply through manure mixing and inorganic nitrogen practicing might have enlarged comparatively astonishing assimilates percent during the process of developments.

These results are in line with findings of <u>Cisse et</u> <u>al. (2019)</u> which determine that maize harvest index is influenced by inorganic and organic combination, and also application of 30 m³ per ha swine manure and 20 kg per ha biofertilizers can reduce until 50% of the NPK use without declining grain yields in North China.

Adhikary et al. (2020) and Khan et al. (2017) reported that nitrogen usage from mineral nitrogen and manure increases total N in soil. Cisse et al. (2019) concluded that 30 m³ per ha pig manure and 20 kg per ha bio-fertilizers usage reduces chemical fertilizer need of at least 50% grain yields in the North China Plain. Nutrient contents of organic sources serve as a soil improvement for crops. They provide substantial nitrogen quantity. Soils receiving poultry manure, and it is alone or combined with mineral nitrogen can improve the soil organic carbon. Organic nitrogen sources release nutrients slowly and contribute to provide the residual pool of organic phosphorus and nitrogen in the soil, and reduce nitrogen leaching and volatile. The advantage of organic nitrogen sources are they get mineralized more slowly than mineral N, resulting in improvement of soil organic matter. The organic sources are crucial to improve the chemical, physical, and biological soil properties (Cisse et al., 2019).

The source of organic nitrogen, such as guano manure, constructs a valuable nutrient consisting of organic matter and improved soil chemicals that contain nutrients, and physical traits such as pores, structure, texture, water content, and biological properties owing to soil organic matter. Organic sources increase soil nutrients and organic matters with slow-release effects of soil properties and crop yield (Cisse et al., 2019). The agronomic use efficiency is greater by integrating N use (Partey et al., 2018). Similar results were proposed by (Asbur et al., 2019; Bhato, 2016). Fertilizers level is highly significant for maize's grain yield due to the application of 180 N: 90 P: 60 K kg per ha + 10 tonnes manure per ha (Adhikary et al., 2020).

Financial Analysis

Financial analysis is essential for any business to know how it progresses, including maize crops agribusiness. We need financial and cost analysis to produce some agribusiness products stated in market price (<u>Ginting, 2017</u>; <u>Indrianti et al., 2020</u>).

The financial analysis of maize was affected by integrated N and plant density (Table 4, 5, 6 and 7). Plant density 65,000 per ha yielded the highest net return on 50% YM + 50% urea by total yield of

12,252 kg, total cost of 36,961 PKR, total income of 197,619 PKR, net return of 160,658 PKR, and R/C ratio of 5.7. Whereas, the density of 75,000 plant per ha on the 50% YM + 50% urea gave the same R/C ratio 5.8 with a little higher difference on total yield of 12,467 kg, total cost of 36,961 PKR, total income of 212,765 PKR, and net return of 175,804 PKR. Plant density of 85,000 with 50% YM + 50% urea reached total yield of 12,749.50 kg, total cost of 36,961 PKR, total income of 227,941 PKR, net return of 190,980 PKR, and R/C ratio of 6.2. All maize crop treatments were feasibly developed for farmer agribusiness, but the highest feasibility was 6.2 regarding 85,000 plants per hectare in 50% YM + 50% urea.

Present research results showed that control treatment's total cost was the lowest (28,355 PKR) among integrated N treatments in all plant density treatments (Table 4). The highest total cost was when treatment used 100% urea (40,022 PKR) in all plant density treatments. The total cost for 100% YM decreased to 34,355 PKR. The treatment of 50% urea + 50% YM, the total cost spent by 36,961 PKR. The total cost decreased when manure used more than urea, such as 75% YM + 25% urea. When it was reversed into 25% YM + 75% urea, the total cost increased again. However, the price of manure was lower than urea. All plant density treatments spent the exact total cost, whereas each integrated N treatment spent a different total cost.

Total income increased as the plant population increased and decreased as urea was used. The total income was almost similar to all populations on 100 YM usage; the farmer income range was 194,120 - 201,893 PKR (Table 5). The 85,000 plant per ha on all fertilizer usage gave the highest total income except control. The maize planted in 85,000 plant per ha with 50% YM + 50% urea provided the farmer the highest total income as 227,941 PKR. In Indonesia, it generated total income 16,978,500 IDR and total cost 7,940,123.05 IDR with plant spacing of 75 cm x 20 cm or 65,000 plant per ha (<u>Apriani et al.</u>, 2017).

The farmer got a break-even point proportional to total income but inversely proportional to the total cost. The control in 65,000 plant density met the lowest total cost and income, resulting from the lowest net return (95.804 PKR) (Table 6). The higher density indicated a higher net return (111,618 and 124,828 PKR). The control treatment at all density

showed the lowest net return among all integrated N treatments.

The higher plant density in all integrated N treatments showed the highest net return. Integrated nitrogen by higher urea showed a lower net return. Simultaneously, the higher nitrogen by the higher manure showed a higher net return. Nevertheless, it

went down when the urea had a higher dosage than manure. The highest net return owing to maize crop production was 190,980 PKR by the balanced dosage of 50% YM + 50% urea in 85,000 plant per ha. Furthermore, Table 6 shows that I3 and I6 treatment indicated a similar net return.

Table 4. Effect of Plant Density and Fertilizer on Total Cost of Maize Crops

Treatment of Fortilizer	Plant Density		
riedument of Fertilizer	65,000 (P1)	75,000 (P ₂)	85,000 (P ₃)
	Pakistan rupee		
Control (I ₁)	28,355	28,355	28,355
0% YM + 100% urea (I ₂)	40,022	40,022	40,022
100% YM + 0% urea (I ₃)	34,355	34,355	34,355
50% YM + 50% urea (I ₄)	36,961	36,961	36,961
75% YM + 25% urea (I ₅)	35,722	35,722	35,722
25% YM + 75% urea (I ₆)	38,456	38,456	38,456

Table 5. Effect of Plant Density and Fertilizer on Total Income of Maize Crops

Trastmont of Fortilizor	Plant Density		
	65,000 (P1)	75,000 (P ₂)	85,000 (P ₃)
	Pakistan rupee		
Control (I ₁)	124,159	139,973	153,183
0% YM + 100% urea (I ₂)	165,089	185,036	200,902
100% YM + 0% urea (I ₃)	194,120	196,973	201,893
50% YM + 50% urea (I ₄)	197,619	212,765	227,941
75% YM + 25% urea (I ₅)	185,887	208,217	210,153
25% YM + 75% urea (I ₆)	172,402	193,185	206,268

Table 6. Effect of Plant Density and Fertilizer on Net Return of Maize Crops

Treatment of Contiliner	Plant Density			
realment of Fertilizer	65,000 (P ₁)	75,000 (P ₂)	85,000 (P ₃)	
	Pakistan rupee			
Control (I ₁)	95,804	111,618	124,828	
0% YM + 100% urea (I ₂)	125,067	145,014	160,880	
100% YM + 0% urea (I ₃)	159,765	162,618	167,538	
50% YM + 50% urea (I4)	160,658	175,804	190,980	
75% YM + 25% urea (I5)	150,165	172,495	174,431	
25% YM + 75% urea (I ₆)	133,946	154,729	167,812	

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Treatment of Fortilizer	Plant Density		
	65,000 (P1)	75,000 (P ₂)	85,000 (P ₃)
Control (I ₁)	4.4	4.9	5.4
0% YM + 100% urea (I ₂)	4.1	4.6	5.0
100% YM + 0% urea (I ₃)	5.3	5.7	5.9
50% YM + 50% urea (I ₄)	5.7	5.8	6.2
75% YM + 25% urea (I ₅)	5.2	5.8	5.9
25% YM + 75% urea (I ₆)	4.5	5.0	5.4

Feasibility Analysis

The revenue-cost analysis quantifies the impacts on all society members arising from implementing an agribusiness or policy. The selected and measured quantification is directed to agricultural projects that involve maize crops smallholders.

All of the maize production was feasible to develop as indicated by the R/C ratio of more than one. The R/C ratio is the critical level for deciding whether the business can operate or not. Net return is proportional to the R/C ratio. The higher the net return produces the higher the R/C ratio is. The maize crop production is a profitable business in Peshawar. Without any integrated fertilizer, the 85,000 plant per ha showed R/C ratio of 5.4 (Table 7), same as 25% Y + 75% urea and lower in 100% urea. The highest R/C ratio was 50% YM + 50% urea.

Furthermore, Table 7 shows the value of feasibility of at least 4.1. It means whenever maize crops agribusiness spends 1 PKR, it will gain revenue of 4.1 and profit of 3.1 PKR. The highest feasibility value (6.2) indicated that maize crops are planted in 85,000 plant per ha in which the balance of manure and urea dosage are at 1:1 proportion. The maize agribusiness feasibility in Indonesia is found to be 1.51 (Apriani et al., 2017); while Sumatera (Indonesia) reached an R/C ratio of 2.51 (Ginting, 2017) and 1.87 in Papua (Indonesia) (Palobo, 2019). Although it is feasible, it is lower than Pakistan's R/C ratio. Indonesia has various soil conditions and soil chemical properties due to different genesis in each region geologically.

Table 8. Farmer's Response to Maize Cultivation and Agribusiness

Number of Respondent	Percentage	Classification
30	73.50	Very Good
7	17.60	Good
3	5.90	Less
2	3.00	Bad
Total (n=42)	100.00	

Respondents supported planting maize crops agribusiness recommendation based on research because it has high demand and income growth. The maize biomass could be used as forage for livestock and fire torch. Respondents commented with "very good" (73.50%), "good" (17.60%), "less" (5.9%),

and "bad" (3%) (Table 8). The 3% of respondents said bad since there were other crops. The farmer hoped there was market certainty to ensure that their crop production would be sold and bought by consumer and private sectors. It would keep maize crops and farmers sustainable.

Research Implication

Manure improves the texture of the soil, recycles nitrogen, and introduces beneficial bacteria. Because the pasture has been improved, the animals are fattening up faster. Fertilizers can help reclaim marshland for pasture after it has been drained. This availability is beneficial to plants and waterways, but less watering and fertilizing can save a significant amount of money.

The use of alternatives sources to organic fertilizer will reduce the amount of fertilizer required. Some organic nitrogen-adding methods for soil are planting a green manure crop such as forage, planting nitrogen-fixing plants like peas or beans, adding composted manure to the soil, and incorporating coffee grounds into the soil. Plants require nitrogen compounds from the soil to grow, which can be produced naturally or provided by fertilizers. On the other hand, excess fertilizer application results in the release of harmful greenhouse gases into the atmosphere and the eutrophication of our waterways. Fertilizers are manufactured with a certain ratio of NPK. These nutrients are dissolved and quickly reach the cells of a plant, where they are required. This nutrient consistency in fertilizers enables commercially efficient production. Organic-based fertilizers, as empirically demonstrated, can help boost both nutrient efficiency and organic matter content in the soil, reduce reliance on chemical inputs, restore and maintain soil fertility to foster plant growth, nurture the soil with organic matter, and replace the nutrients that crops remove from the soil.

Fertilizers replenish the nutrients lost by crops in the soil. Crop yields and agricultural productivity would be significantly reduced if fertilizers were not used. That is why mineral fertilizers are used to supplement the soil's nutrient stocks with minerals easily absorbed and utilized by crops.

Compost and other organic fertilizers have been shown to increase soil nutrient levels. Organic matter provides a ready source of carbon and nitrogen for soil microorganisms, improves soil

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structure, reduces erosion, lower soil temperatures, facilitates seed germination, and increases the capacity of soil water retention. Organic farming can restore the damaged soil's natural fertility by increasing soil organic matter, which increases crop productivity to feed the growing population. Organic fertilizers improve natural soil processes, which have long-term effects on soil fertility. Organic fertilizer can be made from various sources, including minerals, animal waste, sewage sludge, and plants.

Global crop production must double between 2005 and 2050 to meet the rising demand for food and biofuels. Nitrogen is the essential nutrient for crop growth, so it must be added to increase crop yield — usually through fertilizers and manure, but in some cases through nitrogen fixation by leguminous crops. However, only about 42–47% of the nitrogen applied to croplands worldwide is harvested as a crop product. The majority of the remainder is lost to the environment, which endangers human and ecosystem health on a local to global scale.

Government policies affecting the domestic economy, foreign affairs, and trade initiatives can significantly impact the agricultural sector. Government agencies at the state level promote local agricultural products, offer food safety and inspection services, soil conservation, and environmental protection. By encouraging modern agriculture inputs, the government has provided farmers with massive subsidies on agricultural inputs such as fertilizers, power, production, irrigation, and productivity. Subsidies are given to farmers for a variety of inputs under this policy. The government has taken several initiatives to develop the agriculture sector, remunerative returns for farmers' produce, and reduce the production cost, thereby reducing the cost of fertilizers and implementations using organic and inorganic minimize the high cost of synthetic fertilizers.

Pakistan's maize production in 2020 was 7,000 thousand tonnes. Pakistan's maize production increased from 705 thousand tonnes in 1971 to 7,000 thousand tonnes in 2020, growing at a 5.15% annual rate (Ahmad, Hanif, et al., 2020).

Government policy about maize crop's sustainable development is crucial to follow up. Those are to increase farmer prosperity and zero hunger as support of United Nation Program of 17 SDGs (FAO, 2018; Wahyuningsih, 2018) and breakdown by all

division and spread out to countries worldwide with any development policies.

Maize is the most important crop in terms of agronomy and global economic impact. Maize produces good crops in a variety of climatic zones, and it thrives in areas that are too dry for rice but too wet for wheat, fitting into a niche between the two. Land, labor, and capital are continuous factors of production in agriculture. Fertilizer, rainfall, and soil all play a role in agricultural output production. With one-inch decrease in rainfall and a high а temperature of 35°C, maize yield drops by 9% (Partey et al., 2018). Thus, even if farmer have developed maize varieties that grow well in various biophysical environments (Abbas et al., 2020; Partey et al., 2018), good maize productivity is still threatened by the effects of climate change.

CONCLUSION AND SUGGESTION

The integrated N of 50% Yard Manure + 50% urea resulted in a higher harvest index of 31.5%, the highest R/C ratio of 6.2, and enhanced yield of 4219.55 kg per ha. It also generates the total cost of 36,961 PKR, total income of 227,941 PKR, and economic net return of 190.980 PKR. This yield almost meets the government's expectations.

The government can support the maize crops farmers to activate decomposition household's waste to be organic fertilizer in their house and provide the place for decomposition activity in the crops field to fulfill production government target, food security, and environmental health in Pakistan. This information is essential for generating suitable fertilization usages to reach a higher yield of maize.

The maize crops' incremental net benefit was positive, which signifies an addition to the maize agribusiness economics. The government's initiative is required to offer sufficient monetary incentive for farmers to engage in it. The net income or revenue change is expected to be positive and covering the initial investment and operational expenses. Thus, the analysis and results showed might be a model for future government investment evaluations intended to assist poor and middle smallholder farmers.

The research provides a suggestion to meet the national production targets, food protection, and environmental health in Pakistan. The government must recognize the effect of increasing input costs on farmers' meager incomes. The shift is from a cash subsidy scheme to a tax relief scheme that would prevent financial capital from being wasted and directly benefit the farming community. It will boost crop productivity, which will benefit the rural economy. As a result, the government should emphasize policy reform rather than fiscally unsustainable subsidies.

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