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ANALYSIS OF GARLIC FARMERS' WELFARE IN BULELENG REGENCY, BALI, INDONESIA

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ABSTRACT
High production costs, a lack of institutional roles for farmers, a lack of farmer competence, and limited use of agricultural support technologies, such as information technology (IT), all contribute to low garlic production. The high level of garlic imports into Indonesia makes it difficult for farmers to sell their produce because their prices are higher than that of imported garlic. This impacts the money farmers can earn from growing garlic. This study investigated the roles of the government, farmer institutions, and farmer competencies in garlic farmers' ability to adopt IT, their farming performance, and overall welfare in Buleleng Regency. The study's research design was quantitative and employed structural equation modeling (SEM). It included 196 garlic farmers from Buleleng Regency as participants. The findings revealed that the government, farmer institutions, and farmer competencies all had a direct and significant impact on garlic farmers' adoption of IT, as well as on their performance and welfare in Buleleng Regency. Also, the adoption of IT and farming performance have the potential to mediate the roles of government, farmer institutions, and farmer competencies in determining welfare. The study also discovered that farming performance was capable of mediating the effects of government involvement, farmer institutions, farmer competencies, and the capacity to embrace IT on the well-being of garlic farmers in Buleleng Regency.

Contribution/Originality: This study describes how government and farmer institutions, as well as farmer competencies, can influence farmers' ability to adopt information technology to improve their farming performance and perceived welfare. The findings of this study can help strengthen institutions for small-scale farmers, help farmers improve their information technology literacy, and be a reference for the government to increase garlic farmers' production.

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1. INTRODUCTION

The majority of poverty is found among people whose primary source of income is agriculture. In the agricultural sector, income is a major issue due to inefficient resource use in the production process, which results in lower yields than the resources expended by farmers during the production process (Hinderink & Sterkenburg, 1985; Jetté-Nantel, Freshwater, Katchova, & Beaulieu, 2011; Wortmann-Kolundézija, 2019). The inefficiency in resource use is due to farmers' use of traditional agricultural techniques, which means that the resources spent are not proportional to the results obtained by the farmers (McDougall, Kristiansen, & Rader, 2019).

In 2020, Indonesia had more farmers than workers in any other sector. Due to the COVID-19 pandemic, the number of farmers increased by 3 million between 2019 and 2020. Yet despite having the most workers, the agricultural sector contributed only 13.70 percent of the Gross Domestic Product (GDP), which is less than the 19.88 percent contribution of the manufacturing sector, which employed 17 million people (BPS Republik Indonesia, 2021). This fact confirms that agricultural productivity is low and implies that poverty in the agricultural sector remains prevalent.

Agriculture's low productivity can be seen in the import of certain foodstuffs. Garlic has been one of the most important food imports in the last decade. In 2020, garlic imports reached a total of 594 thousand tons, accounting for 95 percent of domestic demand (Kementerian Pertanian, 2021). Although the garlic planting area has been expanded, the domestic demand for garlic is not being met. In theory, the supply of goods and services always follows the demand for these goods. However, in the case of garlic, the high demand is not being matched by an adequate domestic supply.

Garlic production is being developed in several areas, including Buleleng Regency. Buleleng Regency's local government has announced the development of garlic farming on a total area of 50 hectares, which is thought to have a high potential for garlic production. Buleleng Regency's agricultural productivity of garlic increased from 8.31 tons/hectare in 2018 to 9.32 tons/hectare in 2019 (BPS Kabupaten Buleleng, 2020), exceeding the target of 7 tons/hectare. This demonstrates that agricultural land for garlic cultivation in Buleleng Regency is abundant. However, garlic farmers' reliance on assistance is quite high, as evidenced by a drop in productivity during the COVID-19 pandemic in 2020, when garlic agricultural productivity decreased to 6.8 tons/hectare. The temporary cessation of assistance caused a decrease in arable land area as well as the productivity of arable products.

The low uptake of information technology (IT) to support agriculture is inhibiting an increase in the productivity of garlic farming in Buleleng Regency. The average age of farmers is over 40, making it difficult for them to apply IT. Even though agricultural digitalization has been extensively implemented, and information communication networks have reached remote areas of Buleleng Regency, garlic farming remains resistant to such implementation. In contrast, growers of certain agricultural commodities, such as fruits and vegetables, have used IT through digital applications to increase agricultural productivity (Burhan, 2018).

Information technology has been shown to increase agricultural output in several countries, including Bangladesh, Japan, China, and Thailand (Akbar, 2017). Several studies support this, stating that the adoption of IT in the agricultural sector largely determines farmers' ability to increase agricultural production and thus their income (Burhan, 2018; Efendy & Balai, 2014; Organisation for Economic Co-Operation and Development, 2001; Paiboonrat, 2017; Warman, 2017). In addition to increasing agricultural yields, the adoption of IT can reduce agricultural risks, streamline costs to maximize profits, and expand farmers' communication and knowledge networks (Delima, Santoso, & Purwadi, 2016). In Bali, IT is widely used in agriculture. 74.1 percent of Bali farmers seek information to solve farming problems (Suarsana & Karyati, 2020). This shows that the use of IT in agriculture has become quite prevalent and plays an important role in finding information to overcome agricultural problems.

Farmer institutions are also a concern in garlic farming in the Buleleng district. Several studies have shown that farmer institutions in villages generally do not function well for a variety of reasons (Agustian, Friyatno, Supadi, & Askin, 2003; Purwanto & Santoso, 2007; Syahyuti, 2003; Zuraida & Rizal, 1993). Farmer groups are typically formed to coordinate government programs, but in practice, farming activities are carried out individually. Farmers are more concerned with production issues, whereas farmer groups are less concerned with capital and marketing issues.

The problem of immediate concern to achieve agricultural self-sufficiency is increasing the competence of existing farmers. Farmers' education, both formal and informal, is a determining factor in their ability to achieve agricultural independence (Marliati, Sumardjo, Asngari, Tjitropranoto, & Saefuddin, 2010). Indonesian farming is currently dominated by people over the age of 40, the majority of which have only completed elementary school. According to the Indonesian Statistics Agency, known as Badan Pusat Statistik (BPS), in an agricultural survey from 2013, up to 32.7 percent of farmers had not completed elementary school. As many as 39.9 percent had completed elementary school, and 27.4 percent had a junior high school diploma or higher (Idris, 2017). Farmers' low education levels reflect their low level of competence, which impedes their ability to deal with a variety of issues, including access to production facilities, access to agricultural extension, profit forecasting, and their role as direct consumers of agricultural products (Wastutiningsih, Wati, Maulida, & Andini, 2020).

The issues addressed in this study centered on the welfare of garlic farmers in Buleleng Regency in terms of the government's role, farmer institutions, farmer competencies, ability to adopt information technology, and farming performance. According to Friedlander, cited in Rukminto (2012), the concept of community welfare is realized through the efforts of both the individuals and organizations that are integrated into an institution to produce a business performance that can improve welfare at all levels of society. To achieve agricultural prosperity, it is necessary to improve farm performance through the use of owned production factors (Cobb-Douglas production theory). The use of technology that is developed in response to problems is one production factor that can support agricultural success (Mosher, 1991). The role of the government in agriculture in developing countries is also critical

to agricultural success (Pejovic & Jovanović, 2013). Finally, in agricultural development, the role of institutions in assisting farmers to increase production and welfare must also be considered (Shiferaw & Muricho, 2009).

2. LITERATURE REVIEW

Social welfare is an organized system of social services and institutions designed to assist individuals and groups to achieve satisfactory standards of living and health. Social welfare also helps people make personal and social connections that allow them to reach their full potential and improve their health and well-being in ways that meet the needs of their families and communities (Friedlander, 1968). The concept emphasizes that welfare is achieved by assisting individuals or community groups to meet the standard of living that they expect and allowing them to improve themselves in an attempt to enhance their future welfare.

An increased amount of agricultural production will result in increased agricultural welfare. Cobb-Douglas (Korgitet, 2019) stated that various production factors are required to support an increase in production. Farming activities necessitate the use of capital, land (agricultural land), labor, and expertise. The correct use of agricultural production factors can increase production, which leads to an increase in farmers' income.

When various parties work to build the agricultural sector, it contributes to farmers' welfare. Mosher (1991) explained the absolute conditions that must exist for agricultural development, including markets, technology, means of production, and farmer incentives. Markets for agricultural products are a way for farmers to sell their agricultural products. IT, which is increasingly used in both the production and sale of agricultural products, can support agriculture. Increasingly sophisticated agricultural equipment can save time and energy when performing agricultural work. Furthermore, farmer incentives are a motivator that can encourage farmers to increase their output. To achieve agricultural development, government and farmer institutions must work together to promote the use of IT, adequate equipment, and a market that does not put farmers at a disadvantage. Furthermore, farmers' competence must be increased to enable them to use technology to produce more efficiently and profitably.

Farmer welfare cannot be separated from the government's role as a policy-making authority. The government's role in ensuring farmer welfare can be seen in several ways. As a facilitator, the government can contribute to farmer welfare by directly providing assistance that farmers can use (Lokollo, 2015). So far, the government's agriculture budget, which includes assistance for production facilities and agricultural infrastructure, has been able to help increase agricultural yields and farmers' welfare (Sumedi, Simatupang, Sinaga, & Firdaus, 2013). Furthermore, the government continues to promote the use of IT in agriculture by constructing supporting infrastructure so that IT is accessible in remote areas (Ahearn, Yee, Ball, & Nehring, 1998). Given the challenges that farmers face, the government's role in agriculture remains very important. As a result, it is necessary to dig deeper into each of the indicators of the government's role to determine which role farmers require most. This will allow the government to optimize its agricultural policies.

Farmer institutions are considered capable of assisting farmers in overcoming problems. The effects of various strategies, such as strengthening extension services, increasing cooperation with external parties, maintaining networks among members, increasing farmer skills, and increasing farmer involvement in institutions, have been studied to increase farmers' capacity as economic actors (Anantanyu, 2011). Institutions can also increase output by providing capital for the purchase of agricultural equipment (Rahmadanih, Bulkis, Arsyad, Amrullah, & Viantika, 2018). Institutional innovations can also increase farmers' income (Binam, Place, Djalal, & Kalinganire, 2017). The role of institutional innovation can be seen in the adoption of technology to aid agricultural production (Yohanes & Irianto, 2011). Recently, a food certification movement has emerged through the Industrial Agribusiness Model (IAM), in which the agro-industrial system, supported by participating institutions, is assumed to be capable of realizing a massive food diversification movement by involving various stakeholders (Kementan, 2014). This program has helped farmers overcome a variety of issues. Furthermore, farmer institutions can act as a bridge between farmers and the market, as membership in these associations can increase farmers' access to both the production factor market and the output market (Shiferaw & Muricho, 2009). Farmers' membership in an institution can provide protection for farmers and ensure their interests are defended.

3. METHODOLOGY

This study can be categorized as explanatory research since it focuses on causality among variables via hypothesis testing. It employed the survey method. A questionnaire was used to collect data from the population. The quantitative approach was combined with a qualitative approach to gather information through observations and interviews. Interviews were conducted face-to-face between the interviewer and the informant or respondents to obtain information for this study, with or without the use of interview guidelines (Bungin, 2013).

This research took place in six farmer groups in two sub-districts of Buleleng Regency that specialize in garlic farming. The Lumbung Sari and Lembu Nadi farmer groups are in Tambakan village, Kubutambahan sub-district; Subak Munduk and Pucuk Mekar Giri Amerta farmer groups are in Munduk village, Banjar sub-district; Bolangan and Subak Kayuputih farmer groups are in Kayuputih village, Banjar sub-district; and the Manik Pertiwi farmer group is in Wanagiri village, Banjar sub-district. The number of respondents in this study was 196 individuals who worked as garlic farmers and received government funding.

This study employed six variables, both exogenous and endogenous. In this study, the endogenous variable was welfare, which had five indicators, the intermediate variable (intervening variable) was the ability to adopt IT, which had three indicators, and farming performance had four indicators. The government's role was represented by four indicators, farmers' institutions by four indicators, and farmer competence by three indicators. The research variables were analyzed to obtain information to allow them to describe the actual conditions.

In this study, structural equation modeling (SEM) was combined with the Partial Least Squares (PLS) alternative (component-based SEM). SEM is a statistical technique that allows the testing of a relatively complex series of relationships at the same time and in stages. One or more dependent variables can be linked to one or more independent variables to form complex relationships. In SEM, a variable can be either a construct variable or a latent variable formed by several indicators, and it is also possible for a variable to have a dual role, namely as an independent variable in one relationship but a dependent variable in another relationship, due to the existence of a tiered causal relationship.

4. RESULTS AND DISCUSSION

The measurement model used in this study was a reflective indicator. A valid indicator has a loading factor greater than 0.5 for the intended construct.

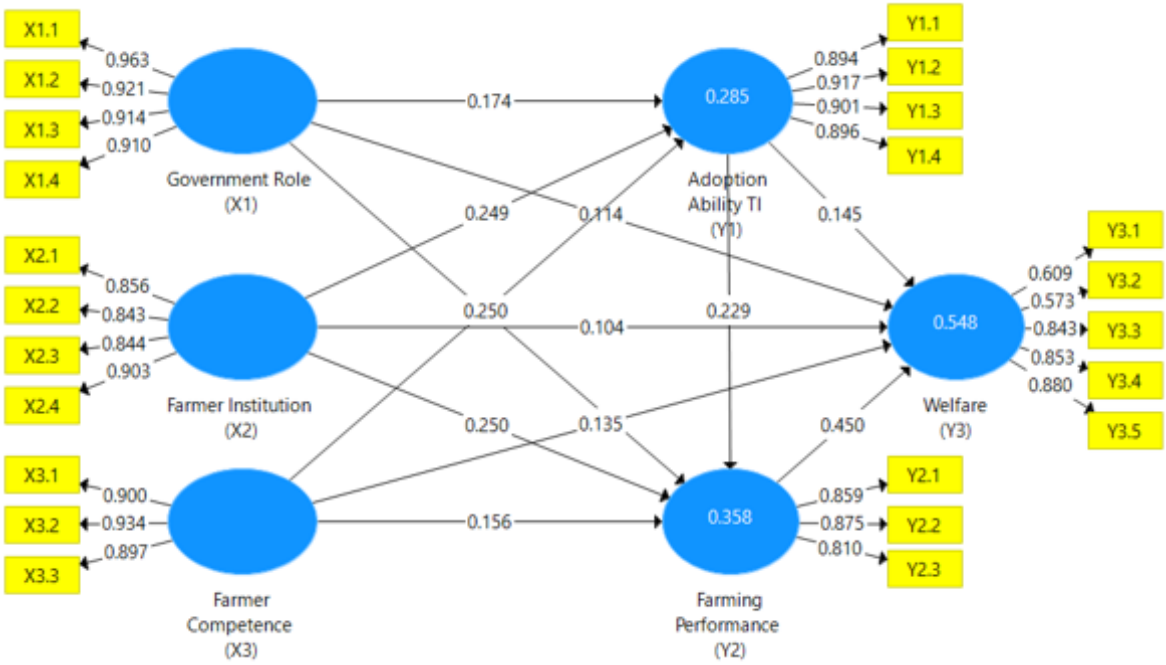

Figure 1. Result of factor loading analysis using SmartPLS

Figure 1 shows the result of the SmartPLS output, which indicates the loading factors. The loading factors were all greater than 0.5. The loading factor (i.e., the correlation between item score/component score and construct score) of the indicators that measure the construct can be used to assess the convergent validity of a measurement model with reflective indicators.

Cronbach's alpha and composite reliability values can be used to assess reliability. Cronbach's alpha and composite reliability must be higher than 0.7.

Table 1. Cronbach's alpha and composite reliability values of the constructs.

Construct	*Cronbach's Alpha*	*Composite Reliability*
Government Role (X_1)	0.885	0.920
Farmer Institution (X_2)	0.924	0.946
Farmer Competence (X_3)	0.813	0.871
Adoption Ability IT (Y_1)	0.805	0.885
Farming Performance (Y_2)	0.897	0.936
Welfare (Y_2)	0.946	0.961

Table 1 presents the calculated Cronbach's alpha and composite reliability values. The findings indicate that each construct's Cronbach's alpha and composite reliability values were greater than 0.70, providing evidence for the reliability of the indicators used in this study.

The GoF (goodness of fit) value assesses how well the structural model fits the inner model and how accurate the resulting model is. The GoF scale ranges from 0 to 1, with 1 being the ideal value. The research model's GoF index was 0.758. Consequently, the structural model that describes how the three variables relate to one another has a good predictive ability (fit).

The results of the calculation of the path coefficient of the role of the government (b = 0.174; p = 0.010), farmer institutions (b = 0.249; p = 0.000), and farmer competence (b = 0.250; p = 0.000) on the ability to adopt IT indicate that the variables of the role of the government, farmer institutions, and farmer competencies had a significant positive effect on the ability to adopt IT. The results of the calculation of the path coefficient of the role of the government (b = 0.150; p = 0.025), farmer institutions (b = 0.250; p = 0.001), farmer competence (b = 0.156; p =

0.023), and the ability to adopt IT (b = 0.229; p = 0.000) on farm performance showed that the variables of the role of the government, farmer institutions, farmer competencies, and the ability to adopt IT had a significant positive effect on farm performance. The results of the calculation of the path coefficient of the role of the government (b = 0.114; p = 0.033), farmer institutions (b = 0.104; p = 0.044), farmer competence (b = 0.135; p = 0.020), IT adoption ability (b = 0.145; p = 0.018), and farm performance (b = 0.450; p = 0.000) on welfare showed that the variables of government role, farmer institutions, farmer competence, IT adoption ability, and farming performance had a significant positive effect on welfare.

The calculated results revealed a coefficient of indirect influence of the role of the government (b = 0.040; p = 0.049), farmer institutions (b = 0.057; p = 0.014), and farmer competence (b = 0.057; p = 0.005) on farm performance through the ability to adopt IT. These results indicate that the variable of the ability to adopt IT mediated the effects of the role of the government, farmer institutions, and farmer competencies on farming performance. The calculation results also showed a coefficient of indirect influence of the government's role (b = 0.068; p = 0.033), farmer institutions (b = 0.113; p = 0.002), farmer competence (b = 0.070; p = 0.030), and IT adoption ability (b = 0.103; p = 0.002), indicating that farming performance variables mediated the effects of the role of the government, farmer institutions, farmer competencies, and the ability to adopt IT on farmers' welfare.

Farmers have recognized the value of the government's provision of agricultural support workers. Agricultural extension workers have been encouraging farmers to use IT to communicate with fellow farmers, as well as providing farming advice and monitoring agriculture. Furthermore, training provided by the Department of Agriculture in collaboration with other parties has improved farmers' ability to locate sources of information. The government's role in increasing farmers' ability to adopt IT is critical. The government's provision of IT-supporting infrastructure must be accompanied by adequate training for farmers in the use of IT to support their agriculture (Paiboonrat, 2017). Government programs, such as those carried out in Bangladesh, have prompted the government to provide farmers with the information they require to increase production yields (Akbar, 2017).

The government's provision of infrastructure, such as irrigation pipes and pumps, is extremely beneficial to farmers in increasing garlic production. The government's role in maintaining commodity production can be accomplished by providing various forms of assistance to farmers (Lokollo, 2015). The government's strategic role in improving agricultural performance can be successful if it is supported by adequate resource capabilities (Falo, Kune, Hutapea, & Kapitan, 2016).

Farmers also experience the government's role in improving the welfare of garlic farmers through the provision of working capital. Working capital in the form of seed assistance and fertilizer subsidies can reduce farmers' costs, increasing their income. The government plays a significant role in farmers' welfare via various mechanisms (Sumedi et al., 2013). Agricultural development is the result of a combination of the Ministry of Agriculture's micro-sectoral policies and their macro policies and strategic environmental arrangements affecting the agricultural sector.

Farmers' institutions have frequently been criticized for being too traditional and lacking in innovation, although they have undergone numerous changes. Farmers' increasingly enthusiastic adoption of technology to support increased agricultural production is one of their institutional innovations. This is because the use of technology in agriculture is proving to be increasingly successful. Institutions encourage the adoption of agricultural support technologies, such as IT, in addition to the adoption of agricultural technology (Khairunnisa, Saleh, & Anwas, 2019; Nuryanti, Dewa, & Swastika, 2011).

Farmers benefit greatly from the existence of farmer institutions in garlic farming in terms of increasing their agricultural yields. So far, good communication has been able to overcome a variety of problems faced by farmers. The innovations of farmer institutions are also critical to improving farm performance. Institutional farmers who have adopted new farming methods and agricultural technology have been able to achieve optimal garlic farming production. In line with this, the role of institutions becomes extremely strategic, not only in terms of increasing production capacity but also in terms of implementing various innovations to support agricultural products (Yohanes & Irianto, 2011). Institutions can also increase output by providing capital for the purchase of agricultural equipment (Rahmadanih et al., 2018).

Given that garlic farming in Buleleng Regency is generally on small-scale farms, farmers are in a vulnerable position when selling their crops, and their bargaining power is low. The formation of farmer institutions, particularly among small-scale farms, should also play a role in output processing tasks, such as crop yield management and processing. It is hoped that in the future, farmer institutions will be able to process garlic harvests into higher-value products, such as fried garlic and black garlic, which are currently in high demand. For this reason, there is a need for farmer institutions to cooperate with other parties to process garlic products so that farmers can overcome the challenges of selling their harvest. To support this, a trading system for the sale of processed products is required so that they can be absorbed by the market. The trade system's management must be able to see and exploit processed garlic product opportunities in the market to improve farmer welfare.

Human resources affect the performance of the business carried out (Yuliarmi, Martini Dewi, Rustariyuni, Marhaeni, & Andika, 2021). Farmers' knowledge and skills improve their ability to use IT in agricultural operations. It was discovered that most farmers' are assisted by relatives to understand how to use IT. It is, therefore, necessary for farmers to gain a better understanding of how to use IT. The greater a farmer's ability to farm, the greater his or her ability to adopt new technologies (Masyhur, 2016). When farmers' competence is high, it improves their acceptance of things that can improve their agriculture, such as the adoption of IT (Managanta, Sumardjo, Sadono, & Tjitropranoto, 2019).

Another issue that garlic farmers face is a lack of arable land. Garlic farmers mostly cultivate small plots of land, with 112 respondents (47.14 percent) cultivating less than 0.25 hectares each. Due to the scarcity of arable land, high

production costs are incurred, meaning that farmers must innovate to run their garlic farms. Farmers' ability to overcome the various problems they face determines their success in managing small farms (Manyamsari & Mujiburrahmad, 2014). Farmers' empowerment efforts thus far may have an impact on increasing farmers' competence, allowing agricultural production to increase (Wortmann-Kolundézija, 2019).

Observations in the field revealed that garlic farmers had good knowledge. Garlic farmers can solve various agricultural problems using the knowledge they have. Being able to accept novel inputs to support agricultural products also demonstrates an open attitude. Garlic farmers' skills are also high, as they can address problems directly, saving time and money. Farmers' competence increases their ability to farm, allowing them to implement resource efficiencies that increase agricultural yields and welfare (Damihartini & Jahi, 2005).

Farmers' ability to use IT applications is quite good, and it has been demonstrated that IT can increase agricultural production. However, children or relatives are still assisting them in locating and comprehending information. This shows that IT has become quite important in agriculture in helping to find information to overcome agricultural problems. In addition to increasing agricultural yields, the ability to adopt IT can reduce agricultural risks, streamline costs to maximize profits, and expand farmers' communication and knowledge networks (Delima et al., 2016).

Farmers' ability to find information that supports their agriculture can reduce production costs, allowing them to earn more money. Farmers may be able to overcome the high cost of purchasing agricultural inputs and equipment if they have access to information on more diverse farming methods. The availability of this information is extremely beneficial to farmers in mitigating issues such as the high cost of fertilizers to reduce production costs. The reduction in production costs will have an impact on farmers' income. Farming innovations have a positive and significant impact on farmer welfare (Ajayi, Oluwole, & Akinbamijo, 2018).

As mentioned in the discussion of the concept of agricultural development, the ability to adopt IT is extremely dependent on farmers' digital literacy. Advances in existing technology without a corresponding increase in individuals' ability to adopt the new technologies are pointless, particularly in agriculture, because agricultural development must also consider the development of farmers as agricultural actors. To accelerate the adoption of IT, government and farmer institutions must make an effort to socialize the use of IT through training and direct assistance from agricultural application providers so that farmers understand the benefits of using IT.

Achieving farmer welfare requires multiple efforts from multiple parties. Government involvement through various work programs is expected to help farmers increase their agricultural production, thereby improving farmers' welfare (Sahabuddin, 2015). Given that the majority of farms are small-scale, the government's role in assisting farmers remains critical. Increasing the role of institutions is also vital in small-scale agriculture to improve farming performance, which leads to increased farmer welfare (Effendy., 2020). Institutions must be able to innovate in response to technological advances to remain relevant and contribute to farmer welfare (Yustika & Baksh, 2015). Farmers' competence in managing their farms is required in addition to the roles of the government and farmer institutions. Good agricultural resource management can boost agricultural productivity, increasing farmers' income and welfare (Managanta et al., 2019).

5. CONCLUSIONS AND RECOMMENDATIONS

The government influences farmers' ability to adopt IT, farming performance, and the welfare of garlic farmers in Buleleng Regency. The presence of farmer institutions also influences garlic farmers' ability to adopt technology, farming performance, and overall well-being in Buleleng Regency. Furthermore, farmer competence influences farmers' ability to adopt IT, farming performance, and the well-being of garlic farmers in Buleleng Regency.

The ability to use IT can mediate the role of the government, farmer institutions, and farmer competency in improving the farming performance of garlic farmers in Buleleng Regency. The government's role in providing IT training, institutional innovations, and increasing farmer knowledge can increase farmers' ability to adopt IT for agricultural applications and thereby achieve increased crop yields for garlic farmers in the Buleleng district.

Farming performance has the potential to mediate the role of the government, farmer institutions, farmer competency, and the ability to implement IT in improving the welfare of garlic farmers in Buleleng Regency. Working capital, seed assistance, and fertilizer subsidies from the government, institutions that operate according to their functions, farmer skills, and the ability to understand and use IT can all increase crop yields and profits, thereby increasing farmers' income.

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