ANALYSIS OF FACTORS INFLUENCING AGRICULTURAL EXTENSION WORKERS IN ADOPTING SMART TECHNOLOGY IN WEST JAVA

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ABSTRACT

*Agriculture plays a central role in Indonesia's economy, especially in rural areas such as Garut Regency, West Java. In the face of technological advancements, the adoption of smart technology is important to improve agricultural efficiency. This study aims to understand the factors that influence the adoption of smart technology by agricultural extension workers in Garut Regency and formulate strategies to increase the adoption of such technology. The research method includes primary and secondary data. The results showed that factors such as technological infrastructure, awareness and education, institutional support, resources, trust, culture, economic benefits, and regulations influence the adoption of smart technologies. Collaboration between the government, educational institutions, agricultural organizations, and the private sector is needed to increase technology adoption. Agricultural extension workers in Garut Regency have a positive perception of smart technology, indicating great potential for its adoption. This is expected to support sustainable growth and development in Garut's agricultural sector**.** This study aims to analyze the factors that influence the decision of agricultural extension workers in adopting smart technology in West Java. In the context of globalization and technological advancement, the adoption of smart technologies has become the key to improving agricultural productivity and sustainability. However, at the agricultural extension level, the adoption of smart technology still faces a number of challenges. Agricultural extension officers play an important role in connecting technology with farmers, but their decision to adopt smart technology is influenced by complex factors such as knowledge, access to technology, institutional support, and socio-cultural aspects. Through quantitative and qualitative approaches, this study will investigate these factors and identify strategies to increase the adoption of smart technologies at the agricultural extension level. The results of this study are expected to provide valuable insights for policy makers and agricultural practitioners to strengthen the agricultural extension system and accelerate the adoption of smart technologies in West Java, which in turn will contribute to increased agricultural productivity and farmer welfare as well as the sustainability of the agricultural sector as a whole.*

Keywords: *agriculture, smart technology, extension*

1. INTRODUCTION

Agriculture plays a central role in Indonesia's economy, especially in rural areas such as West Java. By providing information, training, and technical guidance, agricultural extension officers play an important role in improving farmers' productivity and welfare. However, with the rapid advancement of technology, the use of smart technology is becoming increasingly important to improve agricultural productivity and competitiveness. West Java, which is an agricultural region, faces several problems when utilizing smart technology in agriculture. The rate of technology adoption by agricultural extension workers is still low despite the many technological innovations available.

Therefore, an in-depth understanding of the factors that influence the adoption of smart technologies by agricultural extension workers is crucial to formulate appropriate strategies. Some of the factors that might influence the adoption of smart technologies by agricultural extension workers in West Java include the availability of technological infrastructure, awareness and education, institutional support, resource availability, trust and confidence, cultural and social factors, economic benefits, and regulatory factors. With these factors in mind, further research can be conducted to identify barriers and opportunities in the adoption of smart technology by agricultural extension workers in West Java. Collaborative implementation of strategies between the government, educational institutions, agricultural organizations, and the private sector is expected to help increase the adoption of smart technologies and promote sustainable growth and development in West Java's agricultural sector. Agriculture plays a major role in Indonesia's economy, especially in rural areas such as West Java. In an effort to improve farmers' productivity and welfare, agricultural extension officers play a crucial role. They are tasked with providing information, training, and technical guidance to farmers. However, in the midst of rapid technological development, the adoption of smart technology is important to improve the efficiency and competitiveness of the agricultural sector.

Agriculture plays a vital role in Indonesia's economy, providing food and livelihoods for the majority of the population and national economic development. In the context of globalization and technological acceleration, the application of smart technology is an urgent need to improve the agricultural sector. Smart technologies, such as the use of sensors, data analytics and artificial intelligence, can improve agricultural efficiency, productivity and sustainability.However, despite the importance of such smart technologies, their application at the agricultural extension level, especially in rural areas such as West Java, is often faced with various obstacles. The role of agricultural extension officers in facilitating technology adoption by farmers is crucial, yet their decision to accept smart technologies is influenced by a complex array of factors.

West Java, which is one of the agricultural sentra agriculture in Indonesia, has a strategic role in meeting national food needs. However, the adoption of smart technologies by agricultural extension workers in this area has yet to reach its full potential. Factors such as lack of knowledge and skills, access to technology, institutional support, economic conditions, and socio-cultural aspects are some of the factors that influence the decision of agricultural extension workers to adopt smart technology. Therefore, a study that identifies the factors that influence agricultural extension workers' decisions to accept smart technologies in West Java is very important. With a deeper understanding of these factors, strategic steps can be taken to increase the adoption of smart technologies at the agricultural extension level. This will have a positive impact on increasing agricultural productivity, improving farmers' welfare, and the sustainability of the agricultural sector in the region.

2. RESEARCH METODOLOGY

This research uses primary data and secondary data as sources of information. Primary data was obtained directly from the original source through various field observation methods. These include structured interviews with the use of questionnaires, direct observation of farmers and other objects, in-depth interviews to obtain more in-depth data, as well as Focus Group Discussions (FGDs) as a tool to confirm quantitative data obtained in the field. The research informants involved were the Head of BPP, heads of District and Provincial Extension Centers, farmer groups, and farmers.

Meanwhile, secondary data was obtained through literature studies, which included analysis of various sources such as books, research journals, and relevant documents from institutions such as the Central Bureau of Statistics, the Ministry of Agriculture, and the Department of Agriculture. The secondary data collection method also involved the use of questionnaires and literature studies to support the initial data collection as research outputs.

3. RESULTS AND DISCUSSION

Respondent Characteristics Age

The characteristics of agricultural extension workers studied include age, formal education, non-formal education, and length of service. Age is considered a factor that influences work ability, where older extension workers tend to be less responsive to changes in innovation and technology, while younger extension workers are considered more productive and have high ideals. The data shows that the age of agricultural extension workers in West Java Province varies between 25 and 59 years, with an average age of around 40 years. This indicates that most of the extension workers are at a productive age, in accordance with the definition of productive age by Statistics Indonesia (2016) for the rural population aged above 15 years.

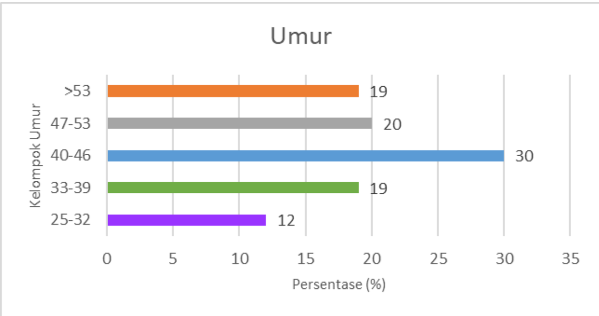


Figure Distribution of Respondents' Age

Agricultural extension workers in West Java are dominated by the 40-46 years age group, indicating that most of them are in their productive age, which allows them to work optimally in improving farmers' attitudes, abilities, and skills. Despite having to reach out to remote areas, these productive-age extension workers are still dexterous in carrying out their duties. They have the ability to receive information well, including in the face of changes towards smart technology.

In contrast, older people tend to experience physical decline and find it difficult to accept new innovations, tend to think traditionally, and maintain old habits. However, despite this, agricultural extension workers in West Java show a good ability to accept and implement technological innovations, despite being at an older age.

Formal Education

Education is considered an important indicator in development and determines the quality of human resources. According to Slamet (2003), education is an effort to create changes in human behavior, while according to Soeitoe (1982), education is an organized process to achieve changes in behavior. In the context of this study, formal education refers to the type of education that farmers have successfully completed. The types of formal education that farmers have successfully completed include primary education (6 years), secondary education (9 years), senior secondary education (12 years), and higher education (15 years).

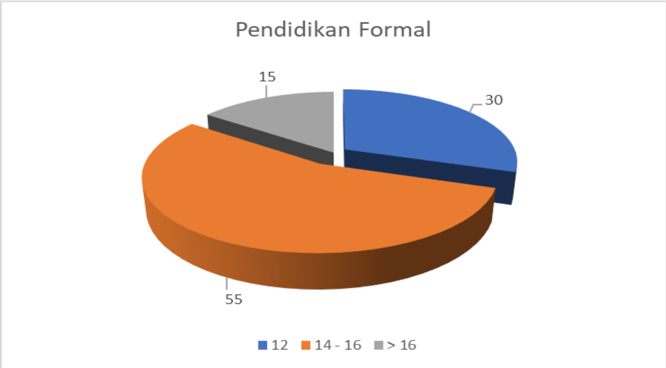


Figure Distribution of Respondents' Formal Education Level

The data shows that the majority of agricultural extension workers have a formal education level in college (14-16 years), although there are still around 30 percent who only have education up to the high school/vocational school level. This difference may result in knowledge disparities between extension workers with different levels of education.

A study by Mosher (1987) showed that the level of education has a significant impact on the performance of agricultural extension workers, where the higher the level of education, the broader the knowledge and insight. Kartasapoetra (1991) adds that a low level of education can result in a lack of knowledge in utilizing available resources. Therefore, extension workers with higher education have greater potential to improve their performance. Research by Lubis (2016) also supports these findings, showing that the level of education of agricultural extension workers has a significant influence on their performance, with the level of influence reaching 57 percent.

Non Formal Education

In addition to formal education, this study also analyzed non-formal education for agricultural extension workers in West Java. Non-formal education is an organized educational activity outside the formal system, which aims to provide special services to participants or help identify learning needs to suit their learning goals. Non-formal education is defined as a structured education system that aims to achieve learning objectives outside of formal education. In the context of this study, non-formal education is an effort to improve knowledge, attitudes and skills through various trainings and courses. The data shows the distribution of non-formal education that respondents have attended.

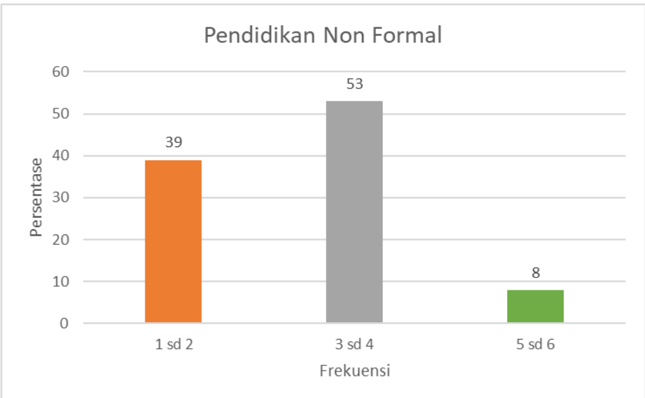


Figure Distribution of Non-Formal Education Data of Research Respondents.

Non-formal education provides opportunities for agricultural extension workers to improve their knowledge and skills, in line with Anwar's (2013) view that frequent training can improve the quality of extension activities. Respondents in this study have attended various non-formal education, including training on cultivation and agricultural extension management. The data shows that the majority of respondents attended non-formal education 3-4 times, indicating a fairly high intensity in the development of their skills and knowledge. This is in accordance with the concept that non-formal education can be a starting point for more in-depth human resource development (Fauzi, et al., 2019), providing opportunities for agricultural extension workers to improve their qualifications in carrying out their duties as agricultural extension workers.

Length of Service

Tenure in this study refers to the length of time agricultural extension workers have worked in the profession. The experience accumulated during the working period is considered as knowledge gained through human thinking and experience, which is then organized into a consistent pattern. This experience influences the attitude of extension workers in accepting new technologies and innovations, in accordance with the theory presented by Soekartawi (2006). The data shows the distribution of respondents' tenure in this study.

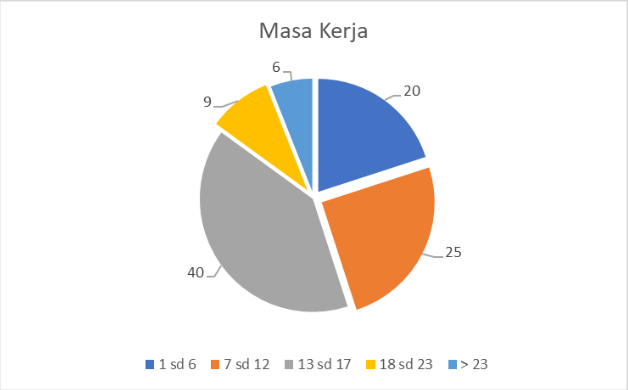
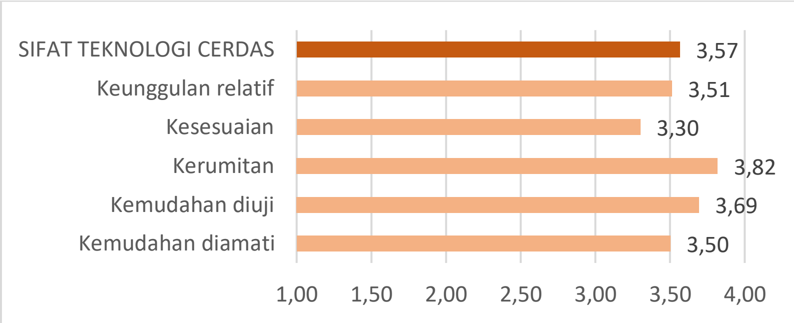


Figure Distribution of Respondent Work Period Data

Based on the results of the field study, the respondents' length of service varied greatly, ranging from one year to 46 years. The majority of respondents have a working period of 13-17 years with a percentage of 40 percent. This shows that the experience possessed by agricultural extension workers in West Java is quite diverse. A person's tenure will generally affect his or her decision-making process. Similarly, in agricultural extension workers, the working period that forms experience will provide flight hours for agricultural extension workers in making decisions and solving problems that occur in farmers.

Nature of Smart Technology

According to Devore (1980) and Mitcham & Mackey (1972), individual perceptions of technology have an impact on the adoption of innovations. Smart technology is seen as an innovation that can improve the performance of agricultural extension workers. Based on the category of indicators of the nature of smart technology proposed by Rogers (1983), the results showed that the perception of extension workers towards the nature of smart technology was in the good category (3.57).

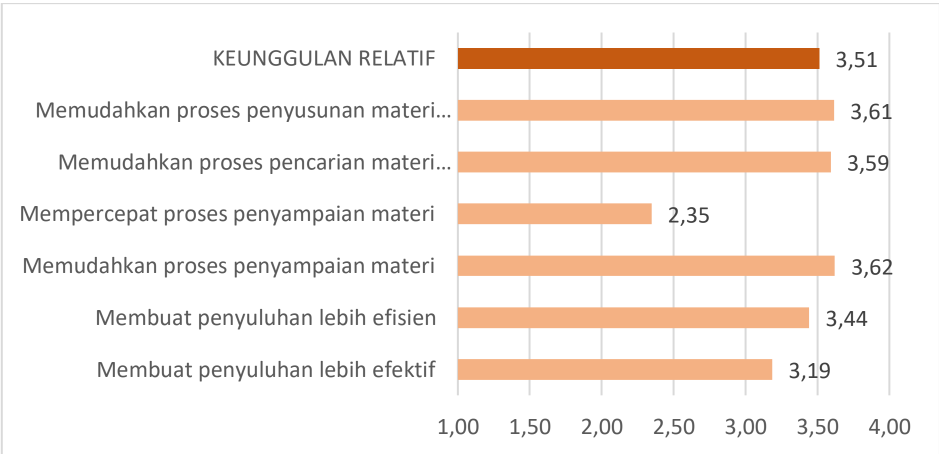


Description: ≤ 1.80 (verry less); 1.81-2.60 (less); 2.61-3.40 (simply); 3.41-4.20 (good); > 4.20 (excellent)

This indicates a great opportunity for the adoption of smart technology by agricultural extension workers. Rogers (1983) states that an individual's perception of innovation predicts the speed of innovation acceptance. Although uncertainty is a major barrier to innovation adoption, the adoption of smart technology is expected to facilitate agricultural extension workers in carrying out their duties more effectively and efficiently. The results show that the perception of the relative advantages of smart technology is observed to be in the good category.

Relative Advantage

Relative advantage is the degree to which an innovation is perceived to be better than previous innovative ideas. Usually, relative advantage is measured in economic terms, convenience, and satisfaction are often important components. The following are the results of respondents' perceptions of indicators of relative advantage in the variable nature of smart technology:



Description: ≤ 1.80 (Very Poor); 1.81-2.60 (Poor); 2.61-3.40 (Fair); 3.41-4.20 (Good); > 4.20 (Very Good)

Figure 5.6 Extension Workers' Perception of the Relative Advantage of Smart Technology in West Java Province

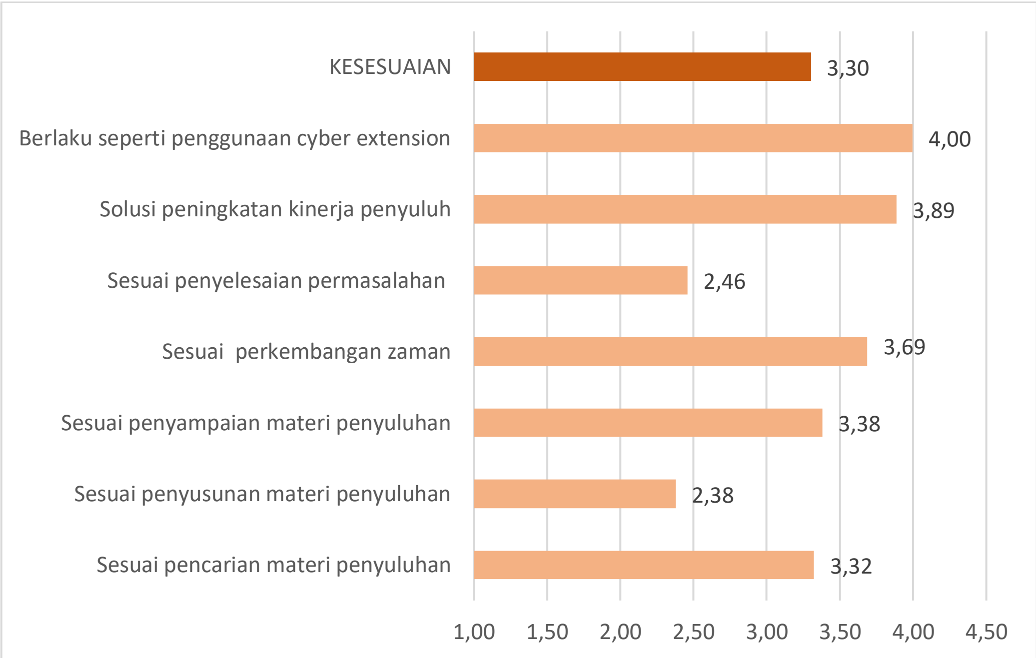
Figure 5.6 shows that respondents' perceptions of the relative advantages of smart technology fall into the good category (3.51). Respondents feel that smart technology can provide benefits for respondents in an effort to improve their performance as agricultural extension workers. This is in accordance with the statement of S, one of the extension workers in West Java.

".... I strongly agree if extension activities are carried out by utilizing smart technology that is developing at this time, we also have access to cyber extension, and it really helps us, ma'am".

The more relative advantages an innovation is perceived to have, the faster its adoption rate will be (Rogers, 1983). This has also been proven by *literature review* research conducted by Tornatzky and Klein (1982) which shows that out of 29 studies on relative advantage, eight articles were found to be statistically directly relevant to the relationship between the relative advantage of an innovation and its adoption rate. Therefore, smart technology in the future must pay attention to aspects of relative advantage so that it will be more easily adopted by agricultural extension workers in an effort to improve their performance. Smart technology must be able to read the needs of agricultural extension workers and predict problems that can occur in the world of agricultural extension.

Suitability

Conformity is the degree to which an innovation is perceived to be consistent with existing values, past experiences, and the needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as quickly as a compatible innovation (Rogers, 1983). Rogers and Shoemaker (1971) explain that conformity refers to conformity with the values or norms of potential adopters or may represent conformity with existing practices of adopters. The first definition implies a kind of normative or cognitive conformity (conformity with what people feel or think about a technology), while the second is practical and operational conformity (conformity with what people do). In this study, the suitability indicator is analyzed based on the assessment of extension workers on smart technology when viewed from the level of compatibility with the circumstances, problems and challenges that have been faced by agricultural extension workers. The following is the acquisition of the perception score of agricultural extension workers on the suitability indicator:



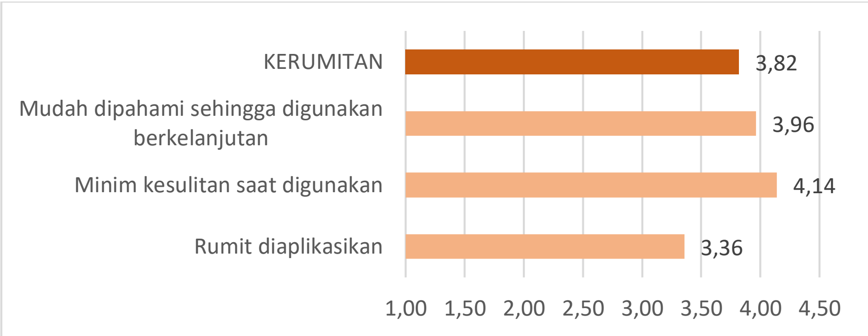
Description: ≤ 1.80 (Very Unsuitable); 1.81-2.60 (Unsuitable; 2.61-3.40 (Moderately Suitable); 3.41-4.20 (Suitable); > 4.20 (Very Suitable).

Figure 5.7 Perceptions of Extension Workers on the Suitability of Smart Technology in West Java Province

Based on Figure 5.7, it shows that extension workers' perceptions of the suitability of smart technology fall into the moderately suitable category (3.30). These results indicate that smart technology is suitable enough to be adopted by agricultural extension workers in West Java Province. However, it needs to be improved so that agricultural extension workers increasingly have a strong desire to adopt smart technology in their extension activities. This is in accordance with the statement from Sholahudin and Setyawan (2017) which states that suitability has a significant effect on an individual's desire to adopt an innovation.

Complexity

According to Rogers (1983), complexity is the degree to which an innovation is perceived as difficult to understand or use. Some innovations are easily understood by most members of the social system. Others are more complicated and so will be slow to adopt. Complexity is assumed to be negatively related to the adoption and implementation of innovations. Complexity in this study was analyzed by looking at how complicated smart technology is for agricultural extension workers to adopt. The following is the score of agricultural extension agents' perceptions of the complexity indicator:



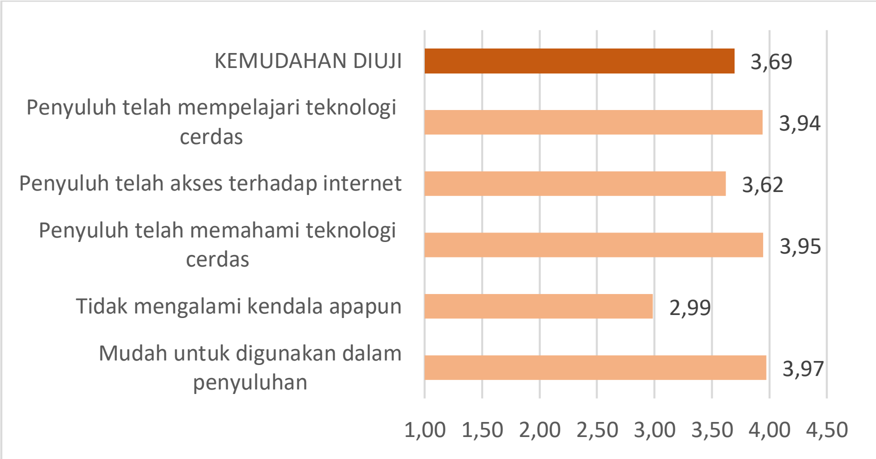
Description: ≤ 1.80 (Very Complicated); 1.81-2.60 (Complicated); 2.61-3.40 (Moderately Complicated); 3.41-4.20 (Uncomplicated); > 4.20 (Very Uncomplicated)

Figure 5.8 Extension Workers' Perception of the Complexity of Smart Technology in West Java Province

Based on Figure 5.8, it shows that the perception of extension workers towards the complexity of smart technology is included in the uncomplicated category with a score of 3.82. Therefore, it can be seen that smart technology can be easily accepted by agricultural extension workers in West Java Province. This happens because the more complicated a technology is, the more reluctant individuals are to adopt it, otherwise if the technology is easy to use, the higher the individual's desire to adopt it (Marshal *et.al*, 2003). However, the complexity of a technology can be minimized by massive socialization and training. In addition, smart technology needs to be equipped with clear instructions for use so that it is easier to understand how to apply it.

Ease of Testing

The degree to which an innovation can be experimented on a limited scope (Rogers, 1983). In theory, according to Rogers and Shoemaker (1971), innovations that can be tried will be adopted and implemented more often and faster than innovations that are less implementable. A technology must of course be tested first before it is adopted, this is to provide an overview as well as to form the perception of its adopters. The ease of testing indicator in this study will be analyzed by looking at the extent to which smart technology can be tried so that the ease of application can be known. The following is the acquisition of respondents' perception scores on the ease of testing indicator:



Description: ≤ 1.80 (Very Uneasy); 1.81-2.60 (Uneasy); 2.61-3.40 (Fairly Easy); 3.41-4.20 (Easy); > 4.20 (Very Easy)

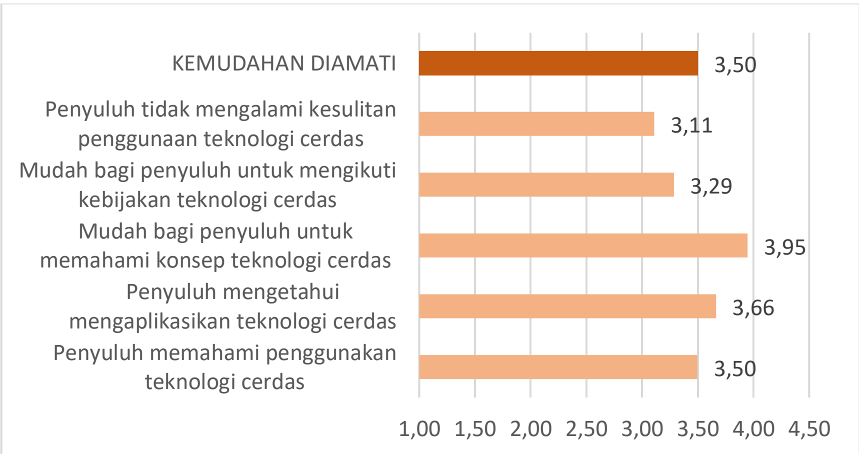
Figure 5.9 Perceptions of Extension Workers on the Ease of Testing Smart Technology in West Java Province

Based on Figure 5.9 shows that the perception of extension workers on the ease of testing smart technology is included in the easy-to-test category with a score of 3.69.of 3.69. This shows that smart technology can be tried and implemented so that it creates an easy impression for the extension workers.implemented so that it creates an easy impression for agricultural extension workers to adopt it.agricultural extension workers to adopt it.

Ease of Observed

According to Rogers (1983), observability is the degree to which an innovation is perceived as difficult to understand or implement.is the degree to which an innovation is perceived as difficult to understand or use. Some innovations are easily understood by most members of the social system. Others are more complicated and will be slow to be adopted. Ease of observability is assumed to be negatively associated to the adoption and implementation of innovations. Ease of observability in this research was analyzed based on respondents' feelings towards the arising from observations of smart technology in agricultural extension.

These observations include ease of understanding and knowledge of smart technology. The following is the score of respondents' perceptions of the indicator ease of observation on the variable nature of smart technology:



Description: ≤ 1.80 (Very Uneasy); 1.81-2.60 (Uneasy); 2.61-3.40 (Fairly Easy); 3.41-4.20 (Easy); > 4.20 (Very Easy)

Figure 5.10 Perceptions of Extension Workers on the Ease of Observing Smart Technology in West Java Province

Based on Figure 5.10, it shows that the perception of extension workers on the indicator of ease of observation related to smart technology is included in the easy-to-observe category with a score of 3.50. The score indicates that smart technology can be understood and understood by respondents based on their observation and sensing. This is a potential that provides hope for the ease of adoption of smart technology in the world of agricultural extension in Indonesia.

4. CONCLUSION

The characteristics of agricultural extension workers in West Java Province, including age, formal education, non-formal education, and length of service, play pivotal roles in shaping their effectiveness in improving farmers' livelihoods. Despite the dominance of extension workers aged 40-46 years, they exhibit adaptability and receptiveness to technological advancements, showcasing a positive attitude towards embracing innovations in smart technology. Formal education, predominantly at the college level, empowers extension workers with broader knowledge and insight, enhancing their performance significantly. Additionally, non-formal education initiatives further augment their skills and competencies, with a notable emphasis on training in cultivation and agricultural extension management.

The diverse tenure of extension workers, ranging from one to 46 years, underscores the wealth of experience within the workforce. This experience enriches decision-making processes and problem-solving abilities, fostering resilience in addressing agricultural challenges.

Smart technology emerges as a promising tool to enhance agricultural extension activities, with extension workers perceiving its relative advantage, suitability, and ease of observability favorably. While perceived as moderately suitable, efforts to refine smart technology and align it more closely with the needs and preferences of extension workers could expedite its adoption and integration into agricultural extension practices.

In essence, West Java stands at the nexus of tradition and innovation, where extension workers, equipped with a blend of experience, education, and openness to technological advancements, are poised to drive agricultural development forward, ensuring sustainability and prosperity for the region's farming communities.

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