Knowledge improvement of agricultural extender through technical guidance of paddy soil test kit


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Abstract. Paddy Soil Test Kit is one of the appropriate instruments to determine the nutrient status of lowland paddy and preparation of site-specific fertilization recommendations to increase rice productivity. Agriculture extension agents as technology transfer agents have a strategic role. Technical Guidance is needed to improve knowledge of agriculture extension. This study aims to analyze the level of knowledge of agricultural instructors on Technical Guidance use of Paddy Soil Test Kit and Preparation of Site-Specific Fertilization Recommendations. Data collection was carried out before and after implementation of Technical Guidance through direct interviews with a questionnaire guide. The evaluation was carried out on all participants of technical guidance, totaling 32 extension workers from representatives of 11 sub-districts throughout Bengkulu Selatan Regency by providing pretest and posttest to determine the increase in knowledge of Technical Guidance participants. The level of knowledge of participants is calculated using index % formula. The significance of increasing knowledge of technical and technical training participants was analyzed using non-parametric Wilcoxon Match Pairs Test statistical analysis. Correlation test to determine level of knowledge on age, experience, and education. Results of the analysis showed that there was a very significant increase (<0.05) in the knowledge of officers after the implementation of technical guidance from an index of 52.58% (low category) to 84.83% (high category). There is no correlation between increasing knowledge about Paddy Soil Test Kit with age (sig > 0.05) which is 0.571, experience 0.661, and education 0.130.

1 Introduction

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Technology adoption is a process of accepting new things related technology. This process can be seen based on individual behavior caused by psychological impulses to apply technology [1]. In addition to individual internal factors, technology adoption by users is also determined by external factors such as agriculture counseling by agriculture extension activities [2], sources of information and nature of innovation and communication media [3]. Technological innovation can be in the form of using tools or methods to simplify the agricultural production process.

Paddy Soil Test Kit is one of the appropriate technological instruments to determine the nutrient status of paddy fields and the preparation of site-specific fertilization recommendations to increase productivity and increase the efficiency of N, P, and K fertilization for lowland rice. Dissemination of technology in the form of using paddy soil test kit can be done through Technical Guidance to increase user knowledge and abilities [4].

Agricultural extension have a strategic role as agents in the dissemination of role technology innovations. Agricultural extension act as motivators, educators, and technology facilitators to farmers [5]. Technical guidance for agricultural extension means to improve competence in the technology transfer process to farmers is essential to support agricultural development [6], especially to encourage the application of location-specific lowland rice cultivation technology [7].

The knowledge level of agricultural extension about the use of paddy soil test kit in the preparation of site-specific fertilization recommendations is still low, therefore technical guidance is needed to increase the knowledge of agricultural extension [8]. Knowledge of agricultural extension about the usage of paddy soil test kit can be used to change the behavior of farmers in the application of site-specific fertilizer doses for lowland rice. This is because farmers in general have not applied site-specific fertilization doses due to limited information on soil fertility status [9]. Fertilization that is not based on nutrient status; plant needs; as well as continuous usage of inorganic fertilizers with high doses will cause an imbalance of nutrients in the soil [10] which results in a decrease in rice farming efficiency [11]. This phenomenon often occurs in the field, especially in the areas of intensively managed irrigated rice production.

South Bengkulu Regency is one of the main rice producer in Bengkulu Province which is supported by irrigated rice fields covering an area of 6.150.3 ha. However, the productivity of lowland rice in Bengkulu Selatan Regency only 4.3 t/ha [12] which is still under the national average for rice productivity. The low productivity of rice is partly due to the lack fertilizer doses, especially macro nutrients [13]. This condition is inseparable from the performance of agricultural extension including the communication skills of the extension [14].

South Bengkulu Regency is one of 10 regencies/city in Bengkulu Province which had 114 agricultural extension spread over 10 Agricultural Extension Offices. The knowledge level agriculture extension about usage of paddy soil test kit is still low, proved by the fact that paddy soil test kit has not been utilized as an extension tool, even though based on information the tool was once available at Agricultural Extension Offices. Therefore, it is necessary to increase the knowledge of agriculture extension through technical guidance on the use of paddy soil test kit in Bengkulu Selatan Regency.

2 Method

This study was conducted in May 2022 in South Bengkulu Regency. Respondents were determined intentionally (purposive sampling) which is 31 extension agriculture appointed to attend Technical Guidance on the use of Paddy Soil Test Kit.

Data was collected through interviews directly to the participants with a questionnaire guide. Participants' knowledge of paddy soil test kit was measured by 20 questions. Data
analysis used descriptive statistics on the level of knowledge and characteristics of respondents. The value of the respondent's knowledge level interpretation using the Index % formula. Index % = Total Score/Y x 100 [15], where Y = maximum score. The level of knowledge is divided into three categories: High (index = 76-100%), Moderate (index = 61-75%), Low (index = <60%) [16].

The significance of increasing knowledge of technical and technical training participants was analyzed using non-parametric statistical analysis, the Wilcoxon Match Pairs Test. The relationship between knowledge and the characteristics of respondents (age, education, and experience), was analyzed using the Spearman Rank statistical test to see its significance. Decision-making guidelines in the Spearman Rank Test are based on significant values with SPSS 2022. If the probability value or Sig. (2-tailed) <0.05, then there is a significant relationship. Conversely, if the probability value or Sig. (2-tailed) > 0.05, then the relationship is not significant.

3 Result and discussions

3.1 Agriculture extension performance in South Bengkulu Regency

Based on data from the South Bengkulu Regency Agriculture Office, South Bengkulu Regency has 114 extension workers in 2021. The number consists of 65 people with civil servant status and 49 people with contract status. The extension workers are spread across 10 Agricultural Extension Centers, 11 sub-districts and 158 villages/kelurahan [17].

The number of extension workers in Bengkulu Selatan Regency is between 10-16 persons. The ratio of the number of extension workers compared to the number of villages is relatively low, namely 0.72, so that there are extension workers who have 2 villages as working area [18]. The lack of agriculture extension is one of the obstacles in the implementation of agriculture extension. The high workload due to the wide target area and the large number of fostered farmer groups causes the performance of the extension workers to be less than optimal [19]. The number of extension workers in Bengkulu Selatan Regency is 114 persons who foster 158 villages/subdistrict, causing 44 agriculture extension has 2 villages as working area.

3.2 Characteristics of respondents

The characteristics of agriculture extension in this study include age, formal education, and experience. The age distribution of the extension workers in the study area showed that 12.90% of the extension workers were under the age of 40 years while the rest were above the age of 40 years (Figure 1). A total of 45.16% of extension workers are in the age range of 51-60 years. Based on the retirement age of civil servants, for Functional Positions of Skilled agriculture extension aged 56 years and Senior agriculture extension aged 60 years, it can be estimated that in the next five to ten years the number of extension workers will decrease by about 45 percent. This condition can be taken into consideration for the Government to recruit and regenerate agriculture extension. Agriculture extension are the first liaison between the government and farmers who are expected to nurture the independence of farmers to develop themselves on effective farming methods in order to obtain optimal yields and income [20].
Most of the agriculture extension have completed formal education at the undergraduate or master’s level (Figure 2). Formal education for agriculture extension can improve their performance in accordance with their main duties and functions. Formal education followed by agriculture extension will facilitate career advancement and accommodate information from various sources so that extension workers who have higher education levels in general will more quickly master and apply accepted technology [21]. The level of education has a positive and significant effect on the performance of agricultural instructors [22]. The higher the level of education, agriculture extension has, it will have better knowledge, skills and attitudes and will find it easier to carry out their duties. agriculture extension who are highly educated will have expertise and can thinks critically.

The agriculture extension at the study sites are quite experienced as agriculture extension (Figure 3). On average, agriculture extension have a working period of 17.16 years. The working period is one of the important factors that support the performance of the agriculture extension. The longer the working period, the more the agriculture extension will master the
field of work that is his/her responsibility. The experience of the agriculture extension also has a significant positive effect on the performance level [20]. This is supported by the research of Talisman [23] who reported that experience plays a significant role in a person's performance. According to [20] farmers tend to have more confidence in extension workers who have long working experience compared to those who are fresh graduate. Agriculture extension workers who have worked for a long time are considered to have more experienced, develop in-depth relation into world of agriculture.

3.3 Increased knowledge of agriculture extension

The results of this study showed that technical guidance was able to increase the knowledge of agriculture extension about paddy soil test kit (Figure 4). The average knowledge of the technical guidance participants increased by 32.25%. The knowledge index value of the technical guidance participants at the time of the pretest was 52.58% (low category). The results of the post-test showed an increase in the index value to 84.83% (high category). As many as 80.64% of participants of technical guidance have a high index score for posttest. In fact, none of the participants achieved a high index score at the time of the pretest.

Fig. 4. Changes in the knowledge level index of the instructor before and after the technical guidance

The average index of knowledge improvement of the participants of technical guidance is 32.25%. In fact, 48.38% of participants were able to achieve a knowledge index of above 90% after the implementation of the technical guidance (post-test). The increase in the knowledge of the technical guidance participants is thought to be closely related to the method of implementing the technical guidance. The implementation of technical guidance is also supported by competent presenter that deliver the material. The presenter who delivered the material was an agronomy researcher who mastered soil science (fertilization). Resource persons who are competent in providing material are factors that contribute to the success of a training [24]. Participants gain a better understanding of paddy soil test kit after conducting questions and answers and discussions with presenters.

Analysis of the Wilcoxon test by comparing participants' knowledge through pre-test and post-test showed that technical guidance significantly increased participants' knowledge. The test results obtained a value of \(Z = -4.833\) with a significance value \(p\) of 0.000. This means that there is a significant difference in the level of knowledge of participants between the pretest and posttest \((Z = -4.833; p<0.05)\).

Data analysis with the Wilcoxon Matchs Pairs Test is an analysis of effectiveness testing by comparing the values of the pretest and posttest results to test the significance of two research subjects in pairs. The calculated Z value in the Wilcoxon test is -4.833 which is the absolute value. When this value is compared with the Z table value at an error rate of 5%,
which is 1.96, it means that the calculated Z value is greater than the Z table value. This shows that technical guidance is effective in increasing participants' knowledge.

3.4 Correlation of agriculture extension characteristics with increased knowledge about paddy soil test kit

The results of the Spearman rank statistical test showed that the characteristics (age, education and experience) were not correlated with an increase in knowledge of Agriculture Extension Officers about paddy soil test kit. All probability values or Sig. (2-tailed) Characteristics of extension workers are > 0.05. The probability value or Sig. (2-tailed) for age, education, experience is 0.571; 0.130; 0.661, respectively. This showed that there are no significant relation between extension characteristic and increased knowledge.

Although most of the extension workers have completed formal education at the bachelor's or master's level, 22 participants (70.96%) are graduates of agronomy, agricultural technology and agribusiness. paddy soil test kit is one of the tools used to measure the status of soil nutrient levels which can then be used as the basis for preparing site-specific P and K fertilizer recommendations for lowland rice plants.

The use of paddy soil test kit requires basic knowledge of nutrients and fertilization knowledge. Due to agriculture extension came from various scientific background, technical guidance on the use of paddy soil test kit in Bengkulu Selatan Regency considered effective way for agriculture extension in Bengkulu Selatan regency. Low utilization of paddy soil test kit as an extension tool could be due to the lack of knowledge of the agriculture extension about the tool even though the average shelf life of the product is 17,16 years.

4 Conclusions

Results of the analysis showed that there was significant increase (<0.05) in the knowledge of agriculture extension after the implementation of technical guidance from an index of 52.58% (low category) to 84.83% (high category). There is no correlation between increasing knowledge about Paddy Soil Test Kit with age (sig > 0.05) which is 0.571, education 0.130 and experience 0.661.

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