# Validity And Reliability Of The Adoption Questionnaire Of Agricultural Mechanization In The Food Estate Area Of Central Kalimantan Indonesia

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***Abstract***.

*The use of agricultural mechanization has greatly contributed to the modernization of agricultural systems in many developing countries, including Indonesia. One implementation of agricultural modernization is the application of agricultural mechanization in the food estate program in Central Kalimantan, Indonesia. The adoption of agricultural mechanization is a determinant of the implementation of agricultural mechanization in the food estate area. However, the problem is that the speed of adoption of agricultural mechanization by farmers in the food estate area is still varied. The purpose of this research is to test the validity and reliability of the questionnaire in the study of agricultural mechanization adoption to support agricultural modernization in the food estate area of Central Kalimantan. This research was conducted using a quantitative research design with rice farmers who received the food estate program as the unit of analysis in the Pulang Pisau and Kapuas districts, Central Kalimantan. Data was collected purposively from 42 rice farmers in the food estate area by providing a questionnaire containing five indicators of agricultural mechanization adoption. The results showed that the questionnaires were valid and reliable with correlation values (Pearson Correlation) for the five indicators of awareness, interest, evaluation, trial, and adoption with fifteen questions showing the value of R count > R table and declared valid. While Cronbach's Alpha value is 0.794-0.951. Meanwhile, Cronbach's Alpha value was 0.794-0.951. Based on the discussion, it can be concluded that the questionnaire is valid and reliable.*

***Keywords:*** *Validity, Reliability, Adoption, Agricultural Mechanization and Food Estate.*

## I. INTRODUCTION

Mechanization in agriculture is one of the important components in the modernization of farming that utilizes agricultural tools and machinery as instruments to enhance farming efficiency and increase agricultural productivity [1, 2]. As an agrarian country, the use of agricultural mechanization in rice farming in Indonesia is one form of agricultural modernization implementation. [3, 4, 5]. In general, agricultural mechanization aims to increase labor productivity, increase land productivity, and reduce production costs. The use of tools and machines is also intended to increase efficiency, effectiveness, productivity, quality of results, and reduce the workload of farmers [6].The government has supported the provision of agricultural tools and machinery (alsintan) to increase agricultural production. This is done in order to realize advanced, independent, and modern agriculture in Indonesia. [7]. Based on various monitoring and evaluation results, many agricultural machinery assistance programs have stagnated or been less optimal due to various reasons. Some of them are caused by the mismatch of agricultural machinery with the local agroecosystem, social conflicts resulting from labor displacement, as well as inadequate socialization, coaching, and reporting [8].The food estate program, which began in 2020 in Central Kalimantan, focuses on rice cultivation activities on 30,000 hectares of land by implementing agricultural mechanization. The location of the food estate program is in the Kapuas and Pulang Pisau districts, which are the former one million hectares of peatland development (PLG) with marginal tidal swamp land typology. According to research, the development of agricultural areas in swampy lands is considered one of the potential alternatives for agricultural expansion [9].As evidenced by the research conducted by Brown et al. in Nepal, the adoption of agricultural machinery innovation requires a long process to be adopted by farmers. This process starts from the introduction of the innovation until its suitability with the farmers' goals [10].

The adoption of agricultural technology is also a fundamental driving force for economic development [11, 12]. According to Rogers' theory of adoption, the adoption of innovation goes through several stages until farmers actually confirm to continue adopting agricultural mechanization after

experiencing the benefits obtained. The socio-economic conditions of farmers are one of the factors that also influence the adoption process. [13]. In addition, the adoption process can be influenced by various factors, including the characteristics of the innovation, the characteristics of the adopters, and the social system of the local community [14]. In the field, it is found that many farmers have adopted the use of agricultural mechanization such as hand tractors, four-wheel tractors, and combine harvesters. However, the use of rice transplanters is still rarely used by farmers. The use of rice transplanters is not very profitable due to the expensive machine prices and the benefits that do not meet expectations [15].Studies related to the adoption of agricultural mechanization in Indonesia have not shown evidence of validity and reliability testing for the questionnaire used in measuring the adoption of agricultural mechanization. [16,17,18]. Similarly, studies conducted outside of Indonesia that examine the adoption of agricultural mechanization have also not included the results of validation and reliability testing for the questionnaires used in the research [19,20,21]Therefore, no validated questionnaire is currently available for measuring the adoption of agricultural mechanization. It is crucial, therefore, to develop and test the validity and reliability of a questionnaire specifically designed for agricultural mechanization. Validity describes how correctly the data collected covers the actual area of the study [22].

Validity testing also aims to determine whether there are statements that need to be discarded or replaced because they are considered irrelevant. Essentially, validity means measuring what is intended to be measured [23]. There are four types of validity: face validity, content validity, construct validity, and criterion validity [24]. Face validity is a subjective assessment of the operationalization of a construct. This means that face validity refers to the researcher's subjective assessment of the presentation and relevance of the measuring instrument, whether the items in the instrument appear relevant, sensible, unambiguous, and clear [25]. Content validity can be interpreted to what extent the items in an instrument reflect ideas that will be generalized to the instruments used in research [26]. Construct validity refers to the extent to which the assessment complies with existing knowledge and theory of the measured concept. Construct validity is usually established experimentally by translating concepts, ideas, or behaviors that are constructed into reality. Meanwhile, criterion validity is used to measure how well one measure predicts the outcome for another measure used as a comparison [27].Reliability is the consistency of the value of measurement results on the instruments used in research [28]. According to Mehrens & Lehmann, reliability is the degree of consistency between two measurement results on the same object [29]. A reliable instrument can maintain the consistency of measurement results within a certain range [30]. The quality of a research instrument is determined by its validity and reliability [31]. Appropriate or accurate assessment of the reliability and validity of research is a key indicator of the quality of measurement or assessment [32]. A questionnaire that has been tested for its validity and reliability greatly assists future researchers in identifying the level of adoption of agricultural mechanization.

## II. METHODS

The research design used in this study is quantitative with a survey method. The study aims to identify the validity and reliability of the questionnaire for measuring the adoption of agricultural mechanization in the Central Kalimantan food estate area. The study was conducted in two locations, namely Pulang Pisau and Kapuas districts in Central Kalimantan Province, considering that these two districts are the implementation areas of the food estate program based on Presidential Regulation No. 109 of 2020. The study was conducted in April 2023. The research sample was determined using a purposive sampling method with a total of 42 respondents. The data scale used was a Likert scale with an ordinal data type with four answer choices. Each answer was given a score of 1 to 4. To test the validity of the study, the SPSS program was used. The testing technique used was Pearson Bivariate correlation. This analysis was carried out by correlating each question score with the total score of each indicator [33]. Each question that correlates significantly with the total score is able to provide support in revealing data validly if the obtained R-value is higher than the R table value. Meanwhile, reliability testing uses the correlation of each question item. The interpretation of reliability refers to the obtained alpha value. If alpha > 0.90, then the reliability is considered perfect. If the alpha is between 0.70-0.90, then the reliability is considered high. If alpha is

between 0.50-0.70, then the reliability is considered moderate. If alpha < 0.50, then the reliability is considered low. With an alpha value above 0.70, it can be said to be sufficiently adequate and reliable for research [34].

In this study, a questionnaire was used according to Tables 1, 2, 3, 4, and 5, which contained questions about the innovation process until it is accepted by an individual, which goes through a mental process within the individual that can be grouped into five stages:

1. Awareness is the stage where an individual first becomes aware of the innovation idea.
2. Interest is the stage where an individual actively seeks broad and detailed information related to the innovation idea in order to explore its potential usefulness and application.
3. Evaluation is the stage where an individual carefully considers and investigates the innovation idea, gathering information and facts from various perspectives and existing conditions.
4. Trial is the stage where an individual tentatively tries out the idea to gain additional information through experimentation.
5. Adoption is the stage where an individual practically applies new ideas in operational activities.

## III. RESULT AND DISCUSSION

The first phase of this research was conducted by preparing a list of questionnaire questions that would be used for the study. The questionnaire used in the study consists of 5 indicators (awareness, interest, evaluation, trial, and adoption) with 20 questions related to the adoption of agricultural mechanization in the food estate area of Central Kalimantan. The questionnaire was then tested on 42 rice farmers in the food estate areas of Pulang Pisau Regency and Kapuas Regency. The validation test for each questionnaire item was conducted using the product-moment correlation method between the scores of each questionnaire item and the total score (the sum of each questionnaire score). Subsequently, the reliability test was conducted using Cronbach's Alpha method.

**Table 1.**The correlation values for each question of the awareness stage

| No | Question | Correlation Coefficient | Conclusion |
|---|---|---|---|
| 1 | Do you know the benefits of using agricultural tools and machines in rice farming? | 0,873 | Valid |
| 2 | Who provided you with information about the agricultural tools and machinery used in your rice farming? | 0,924 | Valid |
| 3 | Please mention one type of media that extension workers use to convey information about agricultural tools and machinery to you? | 0,876 | Valid |
| N = 42; Significant level =5%; R table = 0,2973 | | | |

**Table 2.** The correlation values for each question of the interest stage

| No | Question | Correlation Coefficient | Conclusion |
|---|---|---|---|
| 1 | Do you want additional information about the use of agricultural tools and machinery? | 0,978 | Valid |
| 2 | Is the explanation provided by the extension worker regarding agricultural tools and machinery clear to you? | 0,978 | Valid |
| 3 | How often does the extension worker explain the use of agricultural tools and machinery in one year? | 0,907 | Valid |
| N = 42; Significant level =5%; R table = 0,2973 | | | |

**Table 3.** The correlation values for each question of the evaluation stage

| No | Question | Correlation Coefficient | Conclusion |
|---|---|---|---|
| 1 | Can the use of agricultural mechanization provide added value compared to before using agricultural mechanization? | 0,814 | Valid |
| 2 | Is there a willingness from you to apply the use of agricultural tools and machinery to your farming business? | 0,866 | Valid |
| 3 | According to you, can the use of agricultural tools and | 0,750 | Valid |

| | | | |
|---|---|---|---|
| | machinery be applied for the sustainability of your farming practices? | | |
| N = 42; Significant level =5%; R table = 0,2973 | | | |

**Table 4.** The correlation values of each question of the trial stages

| No | Question | Correlation Coefficient | Conclusion |
|---|---|---|---|
| 1 | Have you tried using the following agricultural tools and machinery on your own land? | 0,818 | Valid |
| 2 | Does the implementation of agricultural tools and machinery align with the recommendations given by the extension worker? | 0,836 | Valid |
| 3 | Does the agricultural extension worker provide solutions to the problems encountered in using agricultural mechanization? | 0,861 | Valid |
| N = 42; Significant level =5%; R table = 0,2973 | | | |

**Table 5.** The correlation values for each question of the adoption stages

| No | Question | Correlation Coefficient | Conclusion |
|---|---|---|---|
| 1 | Do you always use agricultural mechanization in your rice cultivation? | 0,839 | Valid |
| 2 | Has there been an increase in production yield after you applied agricultural mechanization? | 0,940 | Valid |
| 3 | Have you evaluated the benefits of using agricultural mechanization? | 0,856 | Valid |
| N = 42; Significant level =5%; R table = 0,2973 | | | |

Validity testing is a measurement technique aimed at determining the accuracy and precision of a measuring instrument [35]. Validity testing can be seen by comparing the calculated R-value with the R-table. The result is declared valid if the calculated R-value is greater than the R-tabled.Based on the validity testing results in Tables 1, 2, 3, 4, and 5, for the adoption variable in the five indicators, namely awareness, interest, evaluation, trial, and adoption, it can be concluded that all three questions in each indicator are valid and can be used for research purposes. The Pearson correlation coefficients for these questions are greater than 0.05, indicating significant correlations at the 0.01 level. The validation criteria can be categorized into five categories, where if the calculated correlation coefficient (R-value) is between 0.8-1, the validity is considered very high. If the R-value is between 0.6-0.799, the validity is high. If the R-value is between 0.4-0.599, the validity is considered moderately high. If the R-value is between 0.2-0.399, the validity is low. If the R-value is between 0-0.199, the validity is very low or considered invalid [36]. Out of the fifteen questions related to the adoption of agricultural mechanization, fourteen questions obtained correlation coefficient values greater than 0.8, indicating that these questions have very high validity. However, there is one question, specifically the third question in the evaluation indicator, which obtained a correlation coefficient of 0.750, indicating high validity.

**Table 6.** The reliability values for each indicator

| No | Indicator | Cronbach's Alpha value | Conclusion |
|---|---|---|---|
| 1 | Awareness | 0,839 | Reliable |
| 2 | Interest | 0,951 | Reliable |
| 3 | Evaluation | 0,740 | Reliable |
| 4 | Trial | 0,788 | Reliable |
| 5 | Adoption | 0,848 | Reliable |

The reliability test of a research instrument is a test used to determine whether a questionnaire used for data collection in a study can be considered reliable or not. In the reliability test, Cronbach's Alpha analysis is used. If Cronbach's Alpha value is greater than 0.70, it can be concluded that the variable is reliable or consistent in measurement [37]. In Table 6, the Reliability Statistics section shows that the Cronbach's Alpha values for the item questions in all indicators are obtained to be greater than 0.7. The highest value is obtained for the Interest indicator, which is 0.951, and the lowest Cronbach's Alpha value is obtained for the Evaluation indicator, which is 0.740. Therefore, it can be concluded that all the questionnaires in the five indicators are considered reliable.

## IV. CONCLUSION

Based on the results of the validity and reliability testing of the questionnaire on the adoption of agricultural mechanization in the food estate area of Central Kalimantan, it can be concluded that the tested questionnaire is valid and reliable for use as a measurement tool or research instrument to assess the level of agricultural mechanization adoption by rice farmers in the food estate area of Central Kalimantan.

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