Supporting food security with rice farming insurance: the farmers' perceptions (case study in Cinta Damai Village, Percut Sei Tuan Subdistrict, Deli Serdang District)

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Abstract. Rice, as the main food commodity in Indonesia, is expected to be fulfilled from national production. The Rice Farmers Business Insurance (AUTP) is one of the government programs to support national food production. The purpose of conducting this research was to analyse farmers' perceptions of the Rice Farming Insurance (AUTP) program and to analyse the impact of farmers' perceptions on farmers' participation in the AUTP program. Analyses were performed with the statistical descriptions, the Mann-Whitney Test, and the Kruskal-Wallis Test. The test results showed that rice farmers who were the AUTP program participants had very good perceptions of the program objectives, benefits, and implementation. Meanwhile, rice farmers who were not the AUTP program participants had moderate perceptions of the program objectives, benefits, and implementation. The perceptions of lowland rice farmers had a significant impact on the participation of lowland rice farmers in the AUTP program. Farmers who did not participate in the AUTP program tended to have worse perceptions of the program, while farmers who participated in the AUTP program tended to have better perceptions. Suggestions had been compiled so that the AUTP program can better support farmers in stabilizing and increasing rice production to maintain national food security.

1. Introduction
Rice is the main food commodity in Indonesia which is expected to be fulfilled from national production [1,2]. National food security is one of the main goals of national development [3]. Socio-economic and political turmoil often occurs when there is a shortage in the supply of staple foods such as rice [4]. The high potential in the agricultural sector has become an impetus for the government to carry out more intensive development and continuously increase food production through technological innovation and the implementation of farm management improvement programs [5].

Considering a large number of farmers in rural areas who still rely on the weather and climate to cultivate rice [6], rice farming is one of the farm businesses most vulnerable to the negative impacts of climate changes [7]. Climate changes result in an increase in the incidence and intensity of floods or droughts, resulting in an escalation of crop damage [8]. Extreme climatic behaviours also often result in suboptimality or damage to irrigation networks, farm roads, and other agricultural infrastructures, resulting in increased risks and uncertainty in rice farming [9]. One of the most worrying threats today is the impact of the global warming threat which results in erratic changes to the global climate [10].
In addition, global warming also results in changes in ecosystems and disrupts the ecological balance [11]. So, in general, risks and uncertainty in farming have increased and so far farmers have been bearing the risks themselves [12]. Rice farmers need policies in the form of systematic and institutional efforts to minimize the risks of loss due to threats that occur in the agricultural sector [13].

One alternative of the risks management instruments that deserves to be considered, especially to tackle losses due to global climate changes, is the existence of agricultural insurance, one of which is the Rice Farming Insurance (AUTP) program [14,15]. Insurance is offered as one of the financing schemes to share risks such as crop failure [16]. Agricultural insurance deals with the financing of farming by a third party (insurance companies or government agencies) by paying a certain amount for premium payments [17]. The agricultural insurance trial was carried out by the Ministry of Agriculture from 2012 to 2013 for Rice Farming Insurance (AUTP) [14]. But unfortunately, after several years of implementation, this government policy has failed in various regions in Indonesia [15,18].

The purposes of conducting this research were to analyse farmers' perceptions of the Rice Farming Insurance (AUTP) program and to analyse the impact of farmers' perceptions on farmers' participation in the AUTP program. Through the results of this research, it is hoped that stakeholders can formulate better policies to support rice farmers in stabilizing and increasing their rice production in order to maintain national food security.

2. Methods
The research location was determined purposively (intentionally) in Cinta Damai Village, Percut Sei Tuan Subdistrict, Deli Serdang District because it was the area with the largest farm land area that participates in the Rice Farming Insurance (AUTP) in Deli Serdang District, which was 1,160 ha. Deli Serdang District is an area in North Sumatera, where the Rice Farming Insurance (AUTP) is the most popular to farmers [19]. The research was conducted from August to September 2019.

The population in this study were all lowland rice farmers in Cinta Damai Village, which were 1,500 people. The sample size was determined by the Slovin's Formula [20] as follows.

\[ n = \frac{N}{1+N(e)^2} = \frac{1,500}{1+1,500 (10\%)^2} = 93.75 \]

Descriptions:
\( n \) = The Sample Size
\( N \) = The Population Size
\( e \) = The Error (\( \alpha = 10\% \))

The sample size of 93.75 was then fulfilled by 94 rice farmers. Then the number was divided into 47 respondents who participated in the AUTP program and 47 respondents who did not participate in the AUTP program. The respondents were determined by the Simple Random Sampling method [21].

Farmers' perceptions of the AUTP program were measured from the AUTP program objectives through 4 aspects, the AUTP program benefits through 6 aspects, and AUTP program implementation through 10 aspects. Each farmer's response was given a score from 1 to 5, and then the total score for each aspect was used to measure farmers' perceptions of the AUTP program objectives, benefits, and implementation [22]. Data validity and reliability tests were conducted to measure the ability of each of these aspects to measure the AUTP program objectives, benefits, and implementation. The One-Sample Kolmogorov-Smirnov Test was conducted to test the normality of the data distribution. If the data are distributed normally, the Independent Sample t-Test can be used to analyse the impact of farmers' perceptions on farmers' participation in the AUTP program [23]. However, if the data are not distributed normally, the Mann-Whitney Test and the Kruskal-Wallis Test can be used [24]. All statistical tests were carried out with IBM SPSS Statistics 24 software. The hypotheses tested in this study were:
H0: There are insignificant differences between the perceptions of farmers who participate in the AUTP program and the perceptions of farmers who do not participate in the AUTP program (accepted if $\alpha > 5\%$).

H1: There are significant differences between the perceptions of farmers who participate in the AUTP program and the perceptions of farmers who do not participate in the AUTP program (accepted if $\alpha \leq 5\%$).

3. Results and discussion

The results of the Reliability Statistics Test on the data showed that the data of the aspects of the AUTP program objectives, benefits, and implementation were reliable with values of Cronbach's Alpha Based on Standardized Items $> 0.900$ (0.918 for the objectives aspects, 0.963 for the benefits aspects, and 0.934 for the implementation aspects). The results of the data validity test with the Pearson Correlation Test showed that the data for each aspect of the AUTP program objectives, benefits, and implementation were significantly related to the total score of the aspects of the AUTP program objectives, benefits, and implementation, with significance values (2-tailed) of Test Statistic $< 0.05$ ($\alpha = 5\%$) (0.000 for all aspects of the objectives, 0.000 for all aspects of the benefits, and 0.000 for all aspects of implementation). So it could be concluded that the data of the aspects of the AUTP program objectives, benefits, and implementation were valid.

| Aspects of AUTP Program Objectives | Participants of AUTP Program | Non-Participants of AUTP Program |
|-----------------------------------|-----------------------------|---------------------------------|
| Total Score of Each Aspect of Objectives | Rank | Total Score of Each Aspect of Objectives | Rank |
| 1. Providing protection in the event of crop failure | 223 1 | 156 1 |
| 2. Diverting losses due to the risks of farming | 220 2 | 152 2 |
| 3. Stimulating to do rice farming | 196 4 | 95 4 |
| 4. Encouraging to improve farming skills | 191 3 | 109 3 |
| **Total Score of Aspects of Objectives** | **830** | **512** |
| **Total of Respondents** | 47 |
| **Mean Total Score of Aspects of Objectives** | 17.66 (Very Good) | 10.89 (Moderate) |

Then the results of the data distribution test with the One-Sample Kolmogorov-Smirnov Test showed that the total score data for the aspects of the AUTP program objectives, benefits, and implementation were significantly different from the normal distribution so that the data were not distributed normally, with significance values (2-tailed) of Test Statistic $< 0.05$ ($\alpha = 5\%$) (0.000 for the objectives aspects, 0.000 for the benefits aspects, and 0.000 for the implementation aspects). So it was
decided to conduct the Non-Parametric Statistical Tests, namely the Mann-Whitney Test and the Kruskal-Wallis Test to analyse the impact of farmers' perceptions on farmers' participation in the AUTP program.

Table 1 shows the results of the analysis of farmers' perceptions of the AUTP program objectives. The mean total score for the aspects of objectives for respondents who were the AUTP program participants was 17.66 (included in the interval 16.81 to 20.00), indicating that lowland rice farmers who were the AUTP program participants had a very good perception of the AUTP program objectives. The factor that most influenced this perception was because farmers felt that the AUTP program was able to provide them with protection in the event of crop failure with the highest total score of all aspects of the objectives of 223. The mean total score for the aspects of objectives for respondents who were not the AUTP program participants was 10.89 (included in the interval 10.41 to 13.60), indicating that lowland rice farmers who were not the AUTP program participants had a moderate perception of the AUTP program objectives. The factor that most influenced this perception was because farmers felt that the AUTP program was unable to stimulate them to do rice farming with the lowest total score of all aspects of the objectives of 95.

Table 2. The results of the analysis of farmers' perceptions of the AUTP program benefits.

| Aspects of AUTP Program Benefits                                                                 | Participants of AUTP Program | Non-Participants of AUTP Program |
|-------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------|
|                                                                                                 | Total Score of Each Aspect of Benefits | Rank | Total Score of Each Aspect of Benefits | Rank |
| 1. Bearing the losses in the event of crop failure                                              | 223                           | 1    | 141                                 | 1    |
| 2. Protecting the psychological side related to the impact of crop failure                      | 199                           | 4    | 133                                 | 3    |
| 3. Helping to stabilize income                                                                  | 207                           | 3    | 127                                 | 4    |
| 4. Contributing to be able to run rice farming in a sustainable manner                           | 197                           | 5    | 135                                 | 2    |
| 5. Making aware of the risks of rice farming                                                   | 219                           | 2    | 117                                 | 5    |
| 6. Helping to improve the efficiency of farming security and supervision                        | 195                           | 6    | 106                                 | 6    |
| Total Score of Aspects of Benefits                                                               | 1240                          |      |                                      |      |
| Total of Respondents                                                                            | 47                            |      | 47                                  |      |
| Mean Total Score of Aspects of Benefits                                                          | 26.38 (Very Good)             |      | 16.15 (Moderate)                    |      |

Table 2 shows the results of the analysis of farmers' perceptions of the AUTP program benefits. The mean total score for the aspects of benefits for respondents who were the AUTP program participants was 26.38 (Very Good), indicating a very good perception of the AUTP program benefits. For respondents who were not the AUTP program participants, the mean total score was 16.15 (Moderate), indicating a moderate perception of the AUTP program benefits.
participants was 26.38 (included in the interval 25.21 to 30.00), indicating that lowland rice farmers who were the AUTP program participants had a very good perception of the AUTP program benefits.

Table 3. The results of the analysis of farmers' perceptions of the AUTP program implementation.

| Aspects of AUTP Program Implementation | Participants of AUTP Program | Non-Participants of AUTP Program |
|---------------------------------------|-----------------------------|---------------------------------|
|                                       | Total Score of Each Aspect of Implementation | Rank | Total Score of Each Aspect of Implementation | Rank |
| 1. Obtaining good socialization about the AUTP Program | 208 | 5 | 203 | 1 |
| 2. Obtaining good direction or coordination from the farmer group management | 210 | 3 | 156 | 2 |
| 3. Obtaining good support from the Agricultural Extension Centre (BPP) or Agricultural Extension Officers (PPL) to join the AUTP Program | 216 | 2 | 134 | 5 |
| 4. Having to submit to farmer groups to join the AUTP Program | 201 | 7 | 94 | 9 |
| 5. Insurance officers provide good services when registering | 209 | 4 | 141 | 3 |
| 6. Receiving subsidy or reduction in premium payments | 172 | 10 | 117 | 8 |
| 7. Receiving an insurance policy not too long from the time of registration | 190 | 8 | 141 | 3 |
| 8. Obtaining good service when submitting a claim | 205 | 6 | 132 | 6 |
| 9. Receiving compensation before the next planting season | 187 | 9 | 124 | 7 |
| 10. Receiving compensation according to the crop damage or failure | 225 | 1 | 137 | 4 |
| Total Score of Aspects of Implementation | 2023 | 1379 |
| Total of Respondents | 47 | 47 |
| Mean Total Score of Aspects of Implementation | 43.04 | 29.34 |
| (Very Good) | (Moderate) |
| Score Interval of Aspects of Implementation (10.00 to 50.00) | Perceptions | Perceptions |
| 10.00 to 18.00 | Very Bad | Very Bad |
| 18.01 to 26.00 | Bad | Bad |
| 26.01 to 34.00 | Moderate | Moderate |
| 34.01 to 42.00 | Good | Good |
| 42.01 to 50.00 | Very Good | Very Good |
From table 2, the factor that most influenced this perception was because farmers felt that the AUTP program was beneficial in bearing their losses in the event of crop failure with the highest total score of 223. The mean total score for the aspects of benefits for respondents who were not the AUTP program participants was 16.15 (included in the interval 15.61 to 20.40), indicating that lowland rice farmers who were not the AUTP program participants had a moderate perception of the AUTP program benefits. The factor that most influenced this perception was because farmers felt that the AUTP program was not beneficial in helping them to improve the efficiency of farming security and supervision with the lowest total score of all aspects of the benefits of 106.

Table 3 shows the results of the analysis of farmers' perceptions of the AUTP program implementation. The mean total score for the aspects of implementation for respondents who were the AUTP program participants was 43.04 (included in the interval 42.01 to 50.00), indicating that lowland rice farmers who were the AUTP program participants had a very good perception of the AUTP program implementation. The factor that most influenced this perception was because farmers felt that in the AUTP program implementation, they would receive compensation according to the crop damage or failure with the highest total score of all aspects of the implementation of 225. The mean total score for the aspects of implementation for respondents who were not the AUTP program participants was 29.34 (included in the interval 26.01 to 34.00), indicating that lowland rice farmers who were not the AUTP program participants had a moderate perception of the AUTP program implementation. The factor that most influenced this perception was because farmers felt that in the AUTP program implementation, they would have to submit to farmer groups to join the AUTP Program with the lowest total score of all aspects of the implementation of 94.

Table 4 shows the results of the analysis of the impact of farmers' perceptions on farmers' participation in the AUTP program. The test results with the Mann-Whitney Test and the Kruskal-Wallis Test showed that the perceptions of farmers who participated in the AUTP program were significantly different from the perceptions of farmers who did not participate in the AUTP program, with significance values (2-tailed) of the Mann-Whitney Test < 0.05 (α = 5%) (0.000 for the objectives aspects, 0.000 for the benefits aspects, and 0.000 for the implementation aspects); and significance values of the Kruskal-Wallis Test < 0.05 (α = 5%) (0.000 for the objectives aspects, 0.000 for the benefits aspects, and 0.000 for the implementation aspects). So it could be concluded that the perceptions of lowland rice farmers had a significant impact on the participation of lowland rice farmers in the AUTP program. The Mean Rank scores of the Mann-Whitney Test and the Kruskal-Wallis Test showed that the perception scores of farmers who did not participate in the AUTP program on the AUTP program objectives, benefits, and implementation were lower than those who participated in the AUTP program. So it could be concluded that farmers who did not participate in the AUTP program tended to have worse perceptions of the AUTP program, while farmers who participated in the AUTP program tended to have better perceptions.

To be able to succeed the AUTP program, stakeholders must be able to convince farmers that the AUTP program is able to provide them with protection in the event of crop failure and divert their losses due to the risks of farming. Furthermore, stakeholders must be able to prove to farmers that the AUTP program is beneficial in bearing their losses in the event of crop failure and making them aware of the risks of rice farming. Then, in implementing the AUTP program, stakeholders must be able to provide farmers with compensation according to the crop damage or failure, good support from the Agricultural Extension Centre (BPP) or Agricultural Extension Officers (PPL) to join the AUTP Program, and good direction or coordination from the farmer group management.

To be able to improve farmers' perceptions of the AUTP program and increase farmers' participation in the AUTP program, stakeholders must be able to convince farmers that the AUTP program is able to stimulate them to do rice farming and encourage them to improve their farming skills. Furthermore, stakeholders must be able to prove to farmers that the AUTP program is beneficial in helping them to improve the efficiency of farming security and supervision and making them aware of the risks of rice farming. Then, in implementing the AUTP program, stakeholders must be able to
provide farmers with convenience in registering to join the AUTP program without having to wait for them submitting to farmer groups, subsidy or reduction in premium payments, and compensation before the next planting season.

Table 4. The results of the analysis of the impact of farmers' perceptions on farmers' participation in the AUTP program.

| Ranks                  | Participation in the AUTP Program | N  | Mean Rank | Sum of Ranks |
|------------------------|----------------------------------|----|-----------|--------------|
| Total Score of         | Non-Participants                 | 47 | 24.09     | 1132.00      |
| Aspects of Objectives  | Participants                     | 47 | 70.91     | 3333.00      |
| Total                  | Total                            | 94 |           |              |
| Total Score of         | Non-Participants                 | 47 | 24.00     | 1128.00      |
| Aspects of Benefits    | Participants                     | 47 | 71.00     | 3337.00      |
| Total                  | Total                            | 94 |           |              |
| Total Score of         | Non-Participants                 | 47 | 24.00     | 1128.00      |
| Aspects of Implementation | Participants               | 47 | 71.00     | 3337.00      |
| Total                  | Total                            | 94 |           |              |

**Test Statistics**

| Mann-Whitney Test | Total Score of Aspects of Objectives | Total Score of Aspects of Benefits | Total Score of Aspects of Implementation |
|-------------------|--------------------------------------|-----------------------------------|------------------------------------------|
| Mann-Whitney U    | 4.000                                | 0.000                             | 0.000                                    |
| Asymp. Sig. (2-tailed) | 0.000                            | 0.000                             | 0.000                                    |

| Kruskal-Wallis Test | Total Score of Aspects of Objectives | Total Score of Aspects of Benefits | Total Score of Aspects of Implementation |
|---------------------|--------------------------------------|-----------------------------------|------------------------------------------|
| Chi-Square          | 70.751                               | 71.105                            | 70.851                                   |
| Asymp. Sig.         | 0.000                                | 0.000                             | 0.000                                    |

4. Conclusions and suggestions

Based on the results of the study, it could be concluded that rice farmers who were the AUTP program participants had very good perceptions of the AUTP program objectives, benefits, and implementation. Meanwhile, rice farmers who were not the AUTP program participants had moderate perceptions of the AUTP program objectives, benefits, and implementation. The perceptions of lowland rice farmers had a significant impact on the participation of lowland rice farmers in the AUTP program. Farmers who did not participate in the AUTP program tended to have worse perceptions of the AUTP program, while farmers who participated in the AUTP program tended to have better perceptions.

Based on the conclusions, it can be suggested to stakeholders to improve farmers' perceptions of the AUTP program and increase farmers' participation in the AUTP program by convincing farmers that the AUTP program is able to stimulate them to do rice farming and encourage them to improve their farming skills; proving to farmers that the AUTP program is beneficial in helping them to improve the efficiency of farming security and supervision and making them aware of the risks of rice farming; as well as providing farmers with convenience in registering to join the AUTP program without having to wait for them submitting to farmer groups, subsidy or reduction in premium payments, and compensation before the next planting season.

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