**JOURNAL OF**
**BUSINESS AND MANAGEMENT**
***Vol. 2, No.1, 2013: 39-49***

# AGRICULTURE RISK COMPONENT ANALYSIS FOR RICE CULTIVATION IN CIGOMBONG AND CIBAGO

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**Abstract:**

*Rice cultivation has a lot of risks associated with it. Hardaker et. Al (2004) says that there are five main dimensions in any agricultural activities: production risk, finance risk, market risk, technological risk, and institutional risk. These five risks are the main reference in this research. The research focuses on Cigombong and Cibago which are located near Bogor and Subang respectively. The focus in this research is to find risk components that are essential in rice cultivation in both Cigombong and Cibago. Also, this research tries to analyze the difference in the place of cultivation has on the agriculture risk. The research will depend on exploratory research methodologies such as literature review, interviews, and focus group discussion as well as using descriptive research methodologies in the form of questionnaires. The data that has been gathered will be analyzed using two statistical tools the Principal Component Analysis (PCA) and the Discriminant Analysis (DA). PCA will be used to identify the essential risks, while DA will be used to discriminate. The result that was found in both Cigombong and Cibago that production risk is the most significant risk according to the respondents. While marketing and financial risk are at the bottom two. Statistically, all of the data gathered are valid and reliable. While through the PCA it was found that there are 12 components that could be considered essential. These components represent 76.455% of the whole risk variables associated in agriculture risks. Furthermore, it was found that the DA statistically proves that the place where cultivation activities are done has an affect upon the overall agricultural risk.*

*Keywords: agricultural risk, risk components, variables*

## Introduction

Agriculture is a pivotal and strategic sector for Indonesia. This sector employs more than 39% of the total Indonesian workforce. Agriculture is also a multi-billion dollar industry contributing a staggering 15% of the total GDP of Indonesia. The strategical importance of agriculture is its role in food security and economic development plans. Currently, Indonesia still imports many agriculture produce to fulfill its domestic demands. Produces such as rice, soya beans, corns, and beef are still being imported. Albeit Indonesia has been known to be a very fertile and suited for growing crops.

In Cigombong, where the villagers are mostly dependent on rice crops for their livelihoods, maximum efficiency of their production is needed. Located 20 km from Bogor, it has great weather and water is at a plenty which is suitable for planting rice. However, there are also occasions that harvest has been poor and income also declines for these farmers. Most of the time it is because of pests and viruses but weather and operational flaws are also possible.

On the other hand, Subang as the champion of rice producing in Indonesia still has a pocket of land that poorly produces their rice. Kampung Cibago in Desa Mayang is a perfect example. The desa is surrounded by geographical and geological marvels. Even though it attracts tourist, it also proves to be the main obstacle for rice farming. Furthermore, the farmers in this village is very isolated from Subang. Because of the governments goal to become independently capable of fulfilling their domestic demand for rice, they have to be able to maximize every 'pocket' of land producing rice in Indonesia. Places such as Cigombong and Cibago are the concrete places that needs extensive attention.

These two places have surprising resemblance in geographic condition, in that it is cold, humid, and has a limited space of land. However, on a current level of production, Cibago is hundrends time below the production of Cigombong. What this research will try to do is to actually identify and calculate the risks that significantly affect the farming communities in these two cities.

There are also the bigger picture of importance for Agriculture in Indonesia, that it may provide hundreds even thousands of jobs for Indonesian living below the poverty line. Indonesia still has massive potential in increasing the effect of agriculture in the country's income because there are approximately still 101 million ha of land that hasn't been used.

These lands is spread all over Indonesia even in to Papua. Also, from an economic point of view agriculture still has potential to even further grow. With Indonesia's population ever growing – statistically at a rate of 1,25% food supply is at the forefront of priority for domestic market. Specifically agriculture products that has become staple foods for Indonesians: rice, sagoo, cassava, corn, and soy beans. Furthermore, these domestic market is still growing, and has a net spending that also continue to grow by the year.

In conclusion, this research will use literature review from various sources including expert academic writers and farmers alike to obtain data for this research. This research will be comprehensive and unbiased. For Indonesia, increasing rice productivity is a necessity. Therefore this research will try, even though in a very insignificant manner, to help Indonesia achieve independent rice supply. The research will focus in Cigombong and Cibago to empirically deduct conclusions regarding what variables and factors are actually important to be monitored.
With this, it is hoped that the findings in this research will aid the production rate of Cigombong and Cibago.

**Literature Review**

According to Hardaker et al.(2004) risk management is an approach to systematically manages risk through risk identification and risk analysis. Risk Identification is a step in the risk management process to identify all possible events or factors that may have a negative influence on the outcome. This includes analyzing the magnitude of such risk possibility.

The Risk Identification process can be seen in Figure 1.

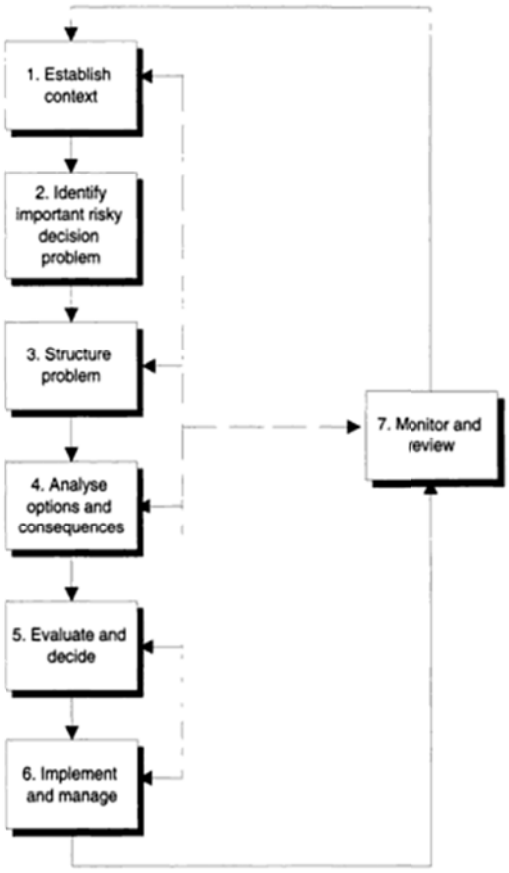


**Figure 1 Risk Management Process**

In risk identification stage (shown in step 2 in figure 1). the most important thing is risk identification. This is important because risks that are not identified properly could well become a hazardous problem in the future. Hence the aim of this stage is to list all possible risk events that could be important to the performance of the organization. This could mean risks that are in the current time frame or ones that we need to predict would happen by seeing historical data or through trends.

## Methodology

This research uses two approach towards solving the research problem, first is exploratory research and the second is descriptive research. Exploratory research is done by analyzing and referencing to literature reviews. Secondly it also uses in-depth interview to obtain data from the participants. A focus group discussion is also used to obtain information about the topic in this research. The topic for this research is illustrated in the table below:

**Table 1: Interview Topics**

| Category | Topics |
|---|---|
| Production Risk | Implications of weather and climate in rice cultivation |
| | Pest and the related damages |
| | Treatment of seeds and grains |
| Market Risk | The influence of pricing in rice commodities |
| | Howe price is determined |
| | Marginal gains from different distribution channels |
| Financial Risk | Liquidity of the farm |
| | Farm cash flow condition and impact |
| | Sources of capital for the farm |
| Technology Risk | Owners approach towards technology |
| | Financing of new technology |
| Institutional Risk | Advantages and disadvatages from joining farmers union |
| | Relationship between the nuclear family and farming |

*a)* ***Exploratory Research***

The first step of data gathering is in-depth interview with the farm owners. By definition the in-depth interview is a technique to probe information regarding a certain topic. In this case the topic is agricultural risks. The writer hopes to obtain information regarding the farmers perspective on the topic. Furthermore, the writer would like to get an understanding how these farmers respond to agriculture risks. The in-depth interview was used because it will give answers that are 'personal' from the participants. The participants are not restricted to a certain set of answers that they have to choose like in the quantitative data gathering method. Hence the answer of the participants will be more 'rich' in quality.

The in-depth interview was conducted by informal conversation situations which takes place in the farmers' house or the local shacks. This is to create a relaxed atmosphere for these farmers. Often the conversation would also be accompanied by coffee or snacks. Because not many of the farmers can actually speak proper Indonesian, the writer also brought a translator from Cigombong. His name was Haji Jaka, and he could speak Indonesian and also Sundanese well. Haji Jaka helped the writer as a translator in both Cigombong and Cibago. In cigombong since he was the local chief of the local farmers union, it was easy for the writer to obtain access to the farmers. He also helped in Cibago by accompanying the writer to the local farmers houses and also rice paddies.

Haji Jaka has plenty of experience in rice cultivation. So, when there were words that the farmers or the writer could not understand, Haji Jaka can translate it for the writer and the participants. Haji Jaka did all of the work without asking to be paid.

The questions asked were open-ended questions. From the answer that the participants gave the writer simply is following the conversation. In this case there will be a follow up question or a probing question if the writer feels that the statement or respond that the participants gave has a relevance towards agricultural risks. However, the conversation needs to be still in the topic of the interview.

The writer acknowledges that the participants may have difficulties in this process. However the writer has set techniques that may help the interview process:

1. The writer will ask a question in a clear straight-forward manner.
2. The writer will only ask one question at a time.
3. The writer will use visual aid if necessary to explain the questions.
4. The participants may answer in Basa Sunda, if it seems to hard to answer in Bahasa Indonesia. The translator will translate for the writer.

*b)* ***Descriptive Research***

Descriptive research will be done through questionnaires that has been formulated with the information that was obtained and screened from the interviews and focus group discussion. The questionnaire will be used to obtain data that can be processed as quantitative data. It is not the questionnaires itself but rather the respond from the participants that are transformed into quantitative data. Quantitative data is basically values or number associated to a certain respond from the participants.

In this research, questionnaires are needed for two objectives in this research. First, the questionnaire is used because it can be distributed to more people in a short period of time. The questionnaire is a faster way of obtaining information regarding a certain topic compared to the interview and focus group discussion. By having standardized questions, and also a standardized set of answer (i.e. Likert Scale), the writer can quickly interpret the result and come to a conclusion for a certain topic. Secondly, the result from the questionnaire will contain materials regarding the agricultural risk variables and how the farmers actually agree towards the questions. As one of the objectives of this research was to find the most significant risk that exists in agricultural risks, it is important to know the respond from the farmers regarding risks. Using statistical tools such as principal component analysis, these quantitative data from the participants are arranged in such a way, and put through a series of mathematical tests so that it can mathematically prove and show which risks are actually the most influential for these farmers living in Cigombong and Cibago.

The questions in this questionnaire is based on the topic from the interview section. The questionnaire will have more of a specific type of questions compared to that of the interview. The question will be a closed-ended question, meaning that the questions themselves are asking for a specific response ftypes of rom the participants. The participants will then answer the questions by marking their preferred answer in a likert scale column. The likert scale is used because it gives a certain degree of freedom for the participants to actually decide how they would like to answer the question. This also gives the opportunity for the participants to give their 'significance' towards a certain question. This 'significance' that the participants are able to give is what the writer would like to gather. An illustration of the questionnaire process is given below:

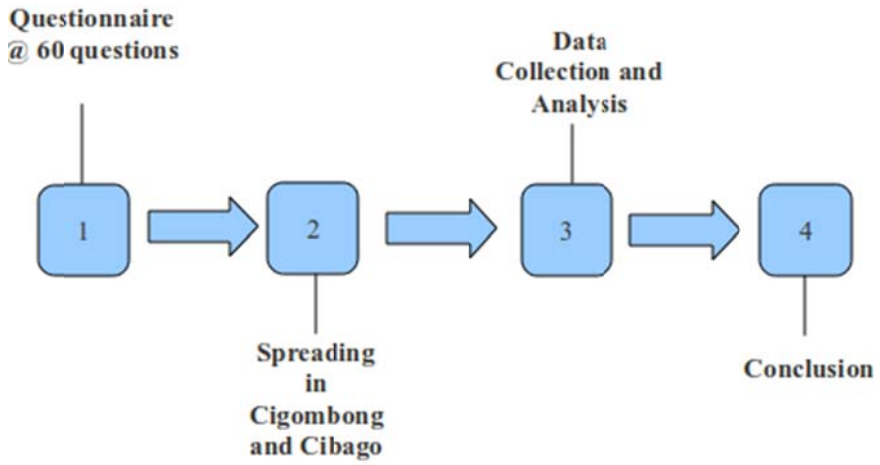


**Figure 2. Questionnaire Process**

*c)* ***Questionnaire Design***

The questionnaire will have 60 questions which is comprised of 18 questions from production risk, 15 question from marketing risk, 12 questions from financial risk, 8 questions from technology risk, and 7 question from institutional risk. The number of questions is determined by the researcher. It is also

determined from the information that has been gathered in the exploratory research step. Production risk has more questions than the other because of two reasons. Firstly because in theory it has more sub-dimensions or the most compared to the other factors. Secondly, it was found from the interview that production risk are perceived to be the most significant compared to the other risks. Especially for weather and pests, there are a lot of different aspects that has to be asked to the participants. The questions themselves will be divided into different dimensions, shown by the heading above it. The heading will be type in bold and has a coloured background so just to remind the participants what the questions they answer will talk about. The questions will be in basic Bahasa Indonesia to ease the participants in answering it.

The individual questions in this research is such that it is confirmatory. It seeks to ask whether the participant agrees or does not agree upon a question being asked. For example a question regarding rain as a factor of the production risk, "Musim hujan berdampak buruk bagi pertanian". The participants need to give their view towards the question and according to their own experience and perspective of the question. If the participants answered for example, 4 which corresponds to 'cukup setuju' the participants are saying that the question is accordance to what they have faced or experienced. The latter part, is the interpretation of the researcher. The questionnaire also tries to test significance by formulating questions that are similar, but with different subjects. For example, in the pest dimensions there will be five questions each representing a different type of pest or diseases. The researcher wants to know which of these pests or diseases are actually the most affecting. This is done by formulating same questions with different subject. Hence, the questions will be like so:

- Tungro berdampak buruk pada pertanian saya
- Hama wereng berdampak buruk pada pertanian saya
- Keong Emas berdampak buruk pada pertanian saya

The set of question is arranged so that the participants would be able to compare which pests or diseases are actually the most influential. This will be reflected through the likert scale value for each questions. There two possible outcome, one is that all answers are homogeneous and two there are significant difference for each answers. These two possibilities reflects the attitude of the participants.

The questionnaire uses Likert scale for the respondents to respond. The likert scale is important because it shows the tendency or attitude of the participants towards a certain question. This is also important because one of the importance of this research is finding the significance of the risk associated with agriculture cultivation for rice. Furthermore, the likert scale is still a valid option as a quantitative research (Gliem & Gliem, 2003).

Even though the likert scale is an ordinal scale it still can be used for statistic computation, even though a ratio scale would be more appropriate. However, because the ordinal scale gives 'richness' towards the research, it is better to use ordinal than ratio.

The questionnaire will use Likert Scale to capture value in regards to the questions being asked. With a range of 1-6, this scale is purposely used so that there are no bias towards the central value (i.e. 5 would have been the central value in a 5 scale range).

In this scale there two extreme points: 1 would represent "Disagree Totally" and 6 would be "Totally Agree". While the other 4 numbers would represent a tendency of the participants in regards to the two extremes. The questionnaire is divided into two parts. The first will capture the demographical information of the participants (i.e. the age and domicile). The second part will be concerning Agriculture Risk, what risk variables actually have an effect in their farms.

An example of the questionnaire can be seen in table 2. Table 2 is only a part of the questionnaire to show how the connection between the Likert Scale and questions.

**Table 2: Questionnaire Example**

| Pertanyaan | STS | TS | CTS | CS | S | SS |
|---|---|---|---|---|---|---|
| **Resiko Cuaca dan Iklim** | | | | | | |
| Musim hujan berdampak buruk bagi pertanian | | | | | | |
| Musim kemarau berdampak buruk bagi pertanian | | | | | | |
| Angin kencang berdampak buruk bagi pertanian | | | | | | |
| **Resiko Pembibitan** | | | | | | |
| Bibit Indica memberikan hasil terbanyak | | | | | | |
| **Resiko Hama dan Penyakit** | | | | | | |
| Hama wereng berdampak buruk bagi pertanian | | | | | | |
| Virus Tungro berdampak buruk bagi pertanian | | | | | | |
| **Resiko Harga** | | | | | | |

## Sampling

In this process the researcher has identified and determined which set of population is going to be used to take a sample from. The Cigombong and Cibago have one thing in common and is that all are rice farmers. This is what underlies the two villages. The population are only restricted to only rice cultivating farmers in Cigombong and Cibago because this research has its focus or scope only in these two cities. Hence even though there are many rice farmers in Indonesia, only from these two villages are picked.

It was further found that in these two villages there are insufficient data regarding the number of farmers in around the area. Especially in Cibago, where the terrain is challenging and communication is hard, the data regarding the whereabouts of the population are not easily gathered. In total there are around 55 rice cultivating farmers in Cibago that can be accessed by the researcher. Simultaneously, there were around 150 farmers in around Cigombong that could be considered to be rice cultivators which could be considered as population.

If the research had no interest in the difference in place of rice cultivation, both population in Cigombong and Cibago could be easily summed up and then the sampling could be from there. However, as one of the research objective of this research was to find out the difference in rice cultavation risk in Cigombong and Cibago using discriminant analysis, hence the writer implements a quota for both population. The quota implies that the total population must be in the ratio of 50:50 – 50 percent of the sample in this research will come from Cigombong and another 50 percent will come from Cibago.

From the quota the writer choses randomly between the available farmers in that population. This was done by coming to the houses of the farmers in around the area to enquire about the likelihood of their participation in the research. These farmers that has been chosen are the samples. And they will be used to answer the questionnaires.
The population and the sample of the respondents are as summarized in table 3

- Rice farmers in Cigombong **AND** Cibago.
- Works **OR** owns a rice farm

**Figure 3 Percentage Dimensions**


| Population Size | Cigombong | Cibago |
|---|---|---|
| Total Rice Farmers | 150 farmers | 55 farmers |
| Sample taken | **50 farmers** | **50 farmers** |
| Total Sample | | **100 farmers** |
| Method: Krejcie & Morgan (1970) Sample Table | | |

The table above is a summary of the Cigombong and Cibago area population. However in this research the total number of sample is the one that will be used to determine the number of questionnaires that will be spread out.

*1) Sampling Design*

From the population it needs to be reduced to a certain number that would be representative of the whole population. This is called the sample. A simple random sampling technique was used to choose which farmers to be included into the sampling group. This was done by obtaining a list of all the farmers whereabouts, and choosing randomly between the farmers. The farmers are first asked whether they are willing to become one of the participants in the research, if they are willing then they are included into the research. The sampling technique was done in both Cigombong and Cibago.

*2) Sampling Size*

This research uses Krejcie & Morgan (1970) table in determining sample size for this research activity. The table could be viewed in the appendix. This technique was used for convenience of the researcher in determining the sample size.

In this research the confidence level used is 95% with a margin of error in the range of 0.05.
The confidence level is used so that the results gathered will be accurate and reliable. Hence Krejcie and Morgan table gives the sample size to be 100. Because of the previous step of the researcher implementing a quota of 50% from Cigombong and 50%

## Data Processing and Analysis

To measure the effect and significance of risks in each dimensions, the answer for each question will be scored by score multiplied by the number of participants:

$$\sum S \times n = Variable\ score\ \square Vs \square$$

With
S = The answer given by the respondents
n = The number of respondents
Vs = Variable Score

Also the total score from each variable will be translated into a percentage by dividing with the maximum possible score for the variable which is calculated by using the same formula above .

$$\frac{Variable\ Score}{Maximum\ Possible\ Score}\ X\ 100$$

Furthermore, the total score from each variable is summed to get the Total Variable Score and then compared by the Total Maximum Score for all variables in that dimension:

$$\frac{\sum \left[ Variable\ Score \right]}{\sum \left[ Maximum\ Score \right]}\ X\ 100$$

The comparison will then be translated into percentage to show how important the variables are for rice cultivation in both cities. Also the total score of the variables, will be assessed through a scale shown below:

The result from this step is under the heading of Percentage Analysis. The next step is to look for factors that are considered to be essential. This will be done through Principal Component Analysis (PCA). The component analysis will be able to determine the essential components of the risk factors through statistical analysis. The PCA uses eigen values of the variables. The critical value for Eigen value is 0.5. Thus all variables that are above 0.5 are essential for rice cultivation. These variables are then grouped, to create a component.
The second statistical analysis that will be used is Discriminant Analysis (DA). The DA will test the hypothesis whether there is a significant difference for agriculture risk in Cigombong and Cibago.
The hypothesis that will be tested is given below:

H0: There are no significant difference caused by different place of cultivation.
H1: There is a significant difference caused by different place of cultivation.

The test used to test the hypothesis is F-Test. Using SPSS the result for F-value for this test can be obtained. If the data is found to have a significant difference then the coefficient variance will be find using Canonical Discriminant Function. Then, an equation can be deduced from the Canonical Discriminant Function process. This will show the equation that discriminate the result for agricultural risk in Cigombong and Cibago.

*1) Principal Component Analysis*

The essence of principal component analysis is to find a new group of variables that could represent the current variables but in a relatively smaller number of items. These new variables will be called components, and each component will represent several variables from the previous set. The new components are calculated using a series of different tests in SPSS 13. The result will show new components with a certain value of eigenvalues and the ones that has an eigen value of above 1 will be chosen as the new components of the risk associated with rice cultivation.

Basically why the principal component analysis or PCA is used in this research is because there will be too many variables that could have significant effects on rice cultivation. Hence why it is better to have a certain set of components that could represent all of the other variables in the context. Furthermore, for the farmers later on it will be easier for them to control and manage their farms because there are only several main components to be managed.

These new components are obtained by undergoing several steps for the data collected in the questionnaire. Firstly, the data from the questionnaire is calculated their mean and also standard deviation values for each variables. Secondly, the Keiser Mayer Olkin value (KMO value) of the whole set of data is measured. Essentially, the KMO is a measure to determine whether the variables in this research are correlated enough so that a new component can be founded. The KMO value that is good is are those above 0.5.

In this stage other than calculation of the KMO, there is also the calculation for Bartlett's Test of Spehericity. This test looks for significance of the variables when they are plotted in an identity matrix. Next up is a calculation for the communalities of the set of data. The expected value for this calculation is a high value, which would suggest that each variables could 'represent' the other variables. The next step will be to measure the eigen values of each variables. Any variables that has an eigen value above one have enough 'total variance' explained to represent a unique new factor. On the other hand the variables that does not have an eigen value of above one does not, hence it is regarded. After this step it could be initially seen how many new components are created.

The last two steps of Principal component analysis is rotation and determining the name of the components. The rotation process is done by using varimax procedures in SPSS 13. It consolidates and confirms a variables to a certain component that is newly made, so that it does not create an ambiguity for the end components. The last step of the PCA process is to name the newly constructed components. This step will be done by taking the 'topic' of each variable that makes up one component and figuring a common name that would represent all of the variables in that component.

*2) Discriminant Analysis*

Discriminant analysis is the act of classification, it groups and distribute things similar groups or categories. However, it is different from Principal Component Analysis, because the discriminant analysis tries to find what *discriminates* these set of data, and not finding the *correlations* of these data as in PCA. The discriminant analysis involves deriving a linear combination of two or more independent variables that will discriminate best between the groups.

In this research the objective of Discriminant Analysis (DA) is to determine whether statistically significant differences exist between the average score profiles on a set of variables for different places of cultivation (i.e. Cigombong and Cibago). The discriminant analysis will use the five dimensions from the agricultural risk theories to discriminate between Cibago and Cigombong. Our interest in this research is to whether different places of cultivation actually creates a different data distribution for each of the five dimensions. The end product of this calculation is a linear equation that will discriminate data between Cigombong and Cibago.

**Table 4: New Component 'Farming Operational'**

| Questions | Risk Variables | Variance Explained % | Cumultative Variance Explained % | Component Factor |
|---|---|---|---|---|
| | | | | On farm condition |
| 7 | Tingginya lokasi pertanian berdampak Buruk bagi pertanian | 19.503% | 19.503% | 0.727 |
| 8 | Kelembaban tinggi berdampak buruk Bagi pertanian | | | 0.774 |
| 11 | Bibit Varietas unggul memberikan hasil Terbanyak | | | 0.822 |
| 12 | Bibit IRRI memberikan hasil terbanyak | | | 0.780 |
| 20 | Saya rugi jika menjual padi ke Tengkulak desa | | | 0.578 |
| 25 | Beras organik memberikan keuntungan Besar jika dijual | | | 0.670 |
| 50 | Alat pembenih mempercepat pekerjaan Saya | | | 0.590 |

## Data Analysis and Processing

*1) Validity and Reliability*

The validity test for all questions to be valid and non was excluded. According to reliability test all questions passed the Cronbach 0.5 critical value. Hence all questions are valid and reliable.

*2) Respondents Data*

The result from the questionnaire uses 50 respondents in Cibago and 50 respondents in Cigombong hence the total respondents is 100. The respondents data also suffice the quota determined beforehand.

*3) Percentage Analysis*

Production Risk was to be 74.9% for the respondents. The score for production risk is 8092 out of the total
10880. Thus given in the scale below it shows in the significant.

For marketing risk the result of the percentage analysis is 51.7% from the total variable score of 5137 out of 9000 possible. Next, the financial risk score 4216 out of a possible 7200. This means a 58.6% and in the overall continuum it is in the region of considerable
with a percentage of 58.6%. Which means that farmers view market risk as having considerable impact.

For technology risk the participants score 3411 out of the maximum of 5400. Thus the percentage is equal to 71.1% which also means that it considerable but close to significant

Lastly, the institutional risk scores 3058 out of the overall 4200. The percentage is 71.1%. Hence it is considered to have considerable significance.

*1) Principal Component Analysis*

Principal Component analysis is a technique used to identify a relatively small number of factors that can represent the relationships of many interrelated variables. Table 4-6 shows 3 out of the 12 components. These tables individually show the components that are constructed and the variables that are related to that component.

- On farm condition

The first factor created is the On Farm Condition component. This component represents 19.503% of the whole variables from the initial set. The highest contributor of the component is question 11 about '*varietas unggul*' which accounts with 0.822 in the Kaizer Normalization value. There are 7 variables in the component which derives from majority of production risk.

- Farming operation

The second highest factor is farming operation component. This factor accounts for 13.387% and has 8 variables from the initial set of variables. The highest of the variables is question 55 with 0.813 in the Kaizer Normalization value.

- Financial management

The third factor created is Financial Management Component with 9.66% which cumulatively is 42.58% of the whole initial variable can be explained. While the highest variable that contributes to the component is question 47 with 0.737, question 31 and 44 has a negative value, it still contributes to the component. The Principal Components that are constructed does not take into account the negative sign in a Kaizer Normalization value, the sign just suggests that it is in the negative quadrant if plotted in a x-y graph.

- Pest damage component

The fourth factor created is Pest Damage Component. This component accounts for 7.26% which accumulates to 49.806% of the whole variance explained.

- External threat component

The fifth component is External Threat Component which has 4.76% variance explained. The highest contributor is question 21 with 0.682. In total, the first five components could explain 54.57% of the initial 60 variables. The last analysis is the Discriminant Analysis (DA). The hypothesis was first tested using the F-test to see whether there is a difference caused by the different place of cultivation:

Ho: There are no significant difference caused by different place of cultivation.

H1: There is a significant difference caused by different place of cultivation.

The critical value used for the F-test is 3.938, with F-value < F-Critical Value; Ho is accepted F-value ≥ F- Critical value; H1 is accepted. The result for the F-test is:

**Test Results**

| | | |
|---|---|---|
| Box's M | | 117.479 |
| F | Approx. | 7.403 |
| | df1 | 15 |
| | df2 | 38668.737 |
| | Sig. | .000 |

Tests null hypothesis of equal population covariance matrices.

The result of the F-test is 7.403. This means that the F-value of this research is above the F-critical value. Hence H1 is accepted.

The second step of the DA is Canonical Discriminant Function:

**Eigenvalues**

| Function | Eigenvalue | % of Variance | Cumulative % | Canonical Correlation |
|---|---|---|---|---|
| 1 | 1.755[a] | 100.0 | 100.0 | .798 |

a. First 1 canonical discriminant functions were used in th analysis.

The table above shows that the agricultural risk function that will be formulated is able to represent 100% of the total variance. It also means that there is only one function that will discriminate agricultural risk in both Cigombong and Cibago. The last in Canonical Discriminant Function calculaitons is determining the coefficient values for each variabels. Using SPSS 13 it is found to be:

**Canonical Discriminant Function Coefficients**

| | Function |
|---|---|
| | 1 |
| Resiko Produksi | -.087 |
| Resiko Pasar | .122 |
| Resiko Keuangan | .116 |
| Resiko Teknologi | -.099 |
| Resiko Kelembagaan | -.121 |
| (Constant) | 3.042 |

Unstandardized coefficients

Thus the discriminant equation for agricultural risk in Cigombong and Cibago is:

$D = 3.042 - 0.087 X_1 + 0.122 X_2 + 0.116 X_3 - 0.099 X_4 - 0.121 X_5$

X1 = Production Risk
X2 = Marketing Risk
X3 = Financial Risk
X4 = Technology Risk
X5 = Institutional Risk

The equation above discriminates the values that will be obtained from Cibago and Cigombong for their agricultural risk. The equation will show a straight line. There are 5 different independent variable in the equation. These independent variables cannot be used at the same time (i.e. In one calculation) because this graph is a straight line. The line has a constant of 3.042 which means that it is elevated in the Y-axis as much as 3.042. For Production Risk the line will be a downward shaped line. It will start with a high value and then goes down until it intersects the X-axis at . For marketing risk the graph will be a positive trend graph. It will start from a lower value to a higher value. The same can also be said about Financial risk. The value will be low at the start and start to rise according to its gradient. While the last two graph from Technology risk and Institutional risk respectively will show negative trends because of the coefficient having a negative value.

**Conclusions and Recommendation**

From this research the writer can conclude the following:

1. Production risks proves to be the most significant risk according to farmers.
2. From 5 risk dimensions there are 12 risk components with supply-demand suitability having the highest eigenvalue.
3. That there is an influence of risk dimensions to the place where rice is being cultivated.
4. Weather and pests are found to be the most profound problem according to farmers in both Cigombong and Cibago.
5. Distribution channel for rice offers different pricing.
6. Small farmers in Cibago and Cigombong uses cash and is not able to use banking transaction.
7. Prices of rice goes down when it is harvesting season in Cibago.

There are many limitation to this research and also possibility for future research. Hence the writer recommends:

1. It was found that there are two types of farmers in Indonesia: the land owner and the laborer. The land owner could be passive, meaning that they hire a farm labor to do all the cultivation,

and there's the land owner who cultivates for themselves. These two different set of population were not put into account in this research. For future research regarding agricultural risks these population segmentation should be taken into account.

2. In this research it needs to be improved in terms sampling design techniques. This research uses a quota that the researcher himself implements. The purpose was to minimize bias towards the answers, but many challenges came because of using that quota. It is better that if the number of population is actually the same. This could be done with more time and human resource for this research. To have a more comprehensive and elaborate test for risk management in agriculture risk.
3. Questions in the questionnaire needs to be pre-tested. Also, it needs to be better phrased and more focused on the topic.

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