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## Effect of Farmers' Characteristics, Information Sources, and Information Quality on Agriculture Risk Communication

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### Abstract

Risk communication is the exchange of information to increase the weight of managed farms. The weak ability of risk communication is influenced by the weak information received by farmers. This research was conducted in two districts of Banyuasin and Ogan Ilir in South Sumatra Province with a gradual sampling technique. The data in this sample amounted to 294 respondents. Respondents taken were respondents who were members of farmer groups. Data analysis was performed by frequency distribution and using SmartPLS software version 3.2.9. The results showed that farmers are categorized as 47<sup>th</sup> years old young adult farmers with 12 years of compulsory education level, ownership area of less than 2 ha, and employment status are farmers. As for those who influence the ability of farmers to communicate risk is the characteristics of farmers, information sources, and information quality. The importance of farmer groups and the role of extension workers can improve farmers' risk communication skills.

**Keywords:** Information sources; information quality; risk communication.

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## **1. Introduction**

Swamp rice farming management has a high vulnerability to farm production, so it requires the ability of farmers who are able to manage information-based farming. The low ability of risk communication to farmers in the management of cultivated food commodities has an impact on the success of managed farming. Risk communication in agriculture is a process of exchanging messages on problems faced by farmers by involving farmers and their communities so that decisions on managed land can continue. The level of primary communication that occurs between farmers is able to make farmers adopt technology and increase production capacity to increase [1]. Socialization in communication in dealing with problems caused by the impact of bird flu requires understanding from users in realizing their exposure to circulating viruses [2]. Information assistance through risk communication and group approaches is able to minimize the uncertainty of farmers so that they have the capacity to adapt to climate change and reduce the vulnerability that impacts on managed farms [3]. Risk communication in farm management can proceed well if there are primary communication, outreach, and direct information assistance to farmers. Information messages that answer problems faced by farmers in rice farming management. The problem in handling risks in agriculture is the dissemination of policies that are not intensive and climate change that cannot be controlled so that it is necessary to develop alternatives to the socialization of farmer protection programs and farmer empowerment which are regulated in law number 19 of 2013 [4]. The agricultural insurance socialization initiated by the government has not been able to attract farmers to be involved in the rice farming insurance program. This is due to the lack of information and knowledge of farmers about the insurance and benefits received and the administrative complexity that farmers have to take care of. In fact, farming that is carried out has various risks of farming losses. The failure of socialization is caused by the lack of readiness of the government for the design of insurance products, the lack of insurance experts who understand and are able to explain the position of insurance to farmers, the lack of socialization of insurance media, and the minimal information approach to farmers without involving local actors. Several related research results stated that the ability of farmers to socialize mass media was very low [5]. Farmers experience more direct exposure through group meetings and meetings during outreach and this has a good effect on farmer cultivation behavior [1]. Farmers' awareness of the outside world can increase awareness of the farm they are working on so that they can have an impact on their attitudes, and subsequent planning [6]. The ability of the extension worker to provide assistance and agricultural extension is the spearhead of the success of risk communication. The ability to search for information through internet media for extension workers still lacks answers to the problems faced by farmers so that it has an impact on the well-being of farms managed by farmers [7]. Risk communication in onion is influenced by group administrators, as well as the actors connected between them [8]. Risk communication that often becomes an obstacle in farming is risk management, production, marketing, and price. Extension agents have a big role in providing understanding to farmers through groups with actor-based approaches. Group dynamics in communication need to be part of the communication process because exchanging information can increase farmer capacity and maintain group integrity. Risk communication is built on the basis of the magnitude of the risk of farming carried out by individuals, groups, and communities [9]. Communication that is made deliberately raises the intention to provide information, educate, and assist in making decisions about what happens. A person's risk communication ability is influenced by the knowledge and perceptions that are

formed so that it affects how to communicate and carry out mitigation management [10]. Farmer risk communication skills are influenced by farmer characteristics, information sources, and quality of information [1, 2, 5]. Research on agricultural information to farmers is able to increase knowledge related to agriculture so that farmers have alternative abilities in rice farming management. This study aims to (1) describe the characteristics of farmers, information sources, information quality, and risk communication, (2) look at the factors that influence risk communication.

## 2. Research Methods

### 2.1. Research Object and Place

The research was conducted in Banyuasin Regency and Ogan Ilir Regency, South Sumatra Province. The research approach used a survey that was supported by qualitative data. Withdrawing samples from the population in stages starting from determining the province to the sample of farmer groups. used with multistep random sampling technique. Multistep random sampling, population data is taken from provincial data then the sample data is taken from the two selected districts, namely Banyuasin Regency and Ogan Ilir Regency. Furthermore, the sample was retrieved data in 2 sub-districts in each district and in 2 selected sub-district villages. Furthermore, sampling in each village was taken from the farmers who were members of the farmer groups which were selected consisting of farmers' group administrators and members of farmer groups who were taken randomly. The number of samples used was 294 farmers who were members of the farmer groups. The sub-districts taken were Rantau Panjang and Sungai Pinang Districts for Ogan Ilir Regency, while for Banyuasin District were Muara Sugihan District and Pulau Rimau District.

### 2.2. Data and Information Collection Techniques

Data were collected by visiting respondents by visiting each of the 98 farmer groups and being interviewed with the help of a questionnaire. The respondents selected were all farmer group administrators and two randomly selected group members.

### 2.3. Data Analysis

Data have been collected through questionnaires were tabulated through the percentage of times and continued with the analysis of the effect using SmartPLS software version 3.2.9 to generate models. The model results obtained are complemented by the results of observations, interviews and literature studies.

### 2.4. Hypothesis

There is an effect of farmer characteristics, information sources, and information quality on risk communication. The equation of the mathematical research notation is:

$$\text{Risk communication} = Py1 * \text{farmer characteristics} + Py2 * \text{Information source} + Py3 * \text{Information quality} + \zeta_2, R2 \dots\dots\dots \text{(Equation 1)}$$

### **3. Results and Discussion**

#### **3.1. Description of research respondents**

Respondents of the study were rice farmers who were members of the farmer groups. The results of tabulated data (Table 1) show that farmers in the two districts are dominant in young adults (less than 48 years). This shows that the age of the farmers is classified as productive and able to manage agricultural land well. The majority of farmers have formal education and are 12 years of basic education. This level of education shows that the government's efforts to provide a formal 12-year basic education level have been quite successful in involving farmers. The intensity of non-formal education in the form of training, workshops, farmer counseling is low. Farmers in Banyuasin District have a high training intensity of 26 percent, while in Ogan Ilir District, 5 percent. The intensity of training from extension workers and other institutions such as universities that rarely disseminate technology. This means a lack of agricultural information for farmers in terms of managed farm management. Farming experience is more dominant in less than 28 years. Only a few farmers in Banyuasin Regency are 29 percent old and in Ogan Ilir Regency 15 percent. Farming experience is obtained from the following parents (descendants) and receiving information from extension agents and television and radio media. The majority of the scale of farms managed is less than 2 ha, only in a few villages in Banyuasin Regency which are classified as having an area of more than 2 ha with 28 percent of farmers. In Ogan Ilir District, only 8 percent of farmers have a land area of more than 2 ha. The majority of agricultural land ownership belongs to farmers. For farmers who have excess agricultural capital, they will rent agricultural land with a rental system at a price of 2 million per square meter (0.2 ha), a pawn system by pawning agricultural products that have been planted in accordance with mutual agreement with a value of 10 million per ha. The sakap system where the system profit sharing between landowners and land cultivators with the rule of 60 percent cultivators and 40 percent landowners after deducting the cost of rice production. Farmers in the two districts have a majority of family members of more than 3 people, consisting of their wives and more than 2 children). The existence of a family that is covered not only in one village area but also in children who are migrating to Palembang City, Pangkalan Balai City, or outside the province or island. The peasant community in the two districts is more cosmopolitan with the intensity of interaction from outside the village and migration to the city is more frequent. Ogan Ilir District has 81 percent of farmers who can afford to go to the district and provincial capitals. This is the location of the topography that is easily accessible and good vehicle access. In contrast to Banyuasin District, only 54 percent are cosmopolitan who migrate outside the village when selling crops or buying household needs or taking care of administrative matters to the district capital. The employment status is a farmer of more than 50 percent. Only 20 percent of Banyuasin District are farmers and non-farmers (traders and services) and 48 percent of Ogan Ilir District are non-farmers (traders, services, construction workers). It is important to recognize farmer characteristics as part of mapping the use of information for farmers in utilizing media information sources [11]. Farmers' characteristics show great influence on farmer capacity in farm management [12]. Characteristics of weak farmers are marked by age into old adulthood, low formal education, low intensity of non-formal education and farming capital, and insufficient and difficult access to farming capital resulting in difficulties for farmers in developing their agriculture [13]. Characteristics of capable farmers are farmers who utilize communication media consisting of productive age, good education, cosmopolitan, and ownership of communication media in accessing information [14]. Good characteristics are

characteristics that support farmers to be able to develop suitable farms by looking at the various alternative solutions faced [15]. The results of the tabulation analysis in Table 1 show that the characteristics of the farmers are classified as good and are able to build a better farm. Table 1 shows the percentage distribution of the characteristics of rice farmers.

**Table 1:** Distribution of the percentage of characteristics of rice farmers in South Sumatra Province, 2019

Characteristics of farmers	Measurement	Banyuasin Regency (%)	Ogan Ilir Regency (%)	Total (%)
Age (Years)	Young Adults (<48 years)	60	56	59
	Old Adult (≥ 48 years)	40	44	41
Formal Education Level (Years)	Basic Level (<12 years)	93	96	94
	High Height (≥ 12 years)	7	4	6
Nonformal Education Intensity (Frequency)	Low (<3 times per month)	74	95	80
	High (≥ 3 times per month)	26	5	20
Farming Experience (Years)	New (<28 years)	71	85	74
	Old (≥ 28 years)	29	15	26
Farming Scale (Ha)	Narrow < 2 ha	72	92	77
	Wide ≥ 2 ha	28	8	23
Number of Family Members (Person)	Small (< 3 people)	22	15	20
	Large (≥ 3 people)	78	85	80
Cosmopolite Level	Localite (< 32)	46	19	39
	Cosmopolite (≥32)	54	81	61
Main occupation status	Farmer	80	52	73
	Farmers and Non-Farmers	20	48	27

Sources of information for farmers consist of non-conventional, conventional media, farmer groups, innovation institutions, and innovator farmers. Two sources that have high value for farmers are innovator farmers more than 85 percent and farmer groups 58 percent. Information sources are a reference for farmers in assessing information because there is a relationship between farmer characteristics and the way farmers communicate based on the sources of information received [11]. Conventional media such as print media in the form of posters, banners, billboards, newspapers, and communication technology (cell phones, internet, radio, television, social media) are less of a concern to farmers and have no effect on individual characteristics and the way farmers communicate [11]. The use of information technology in Central Kenya has been able to increase productivity and support farmer management [16]. The main challenges for farmers in finding information are the lack of infrastructure, lack of information technology and costly service fees, lack of interest, and insufficient user skills and knowledge and complicated messages. The more information sources received by farmers, the better it is to determine steps in anticipating losses received by farmers [17]. Extension agents are agricultural agents who are able to provide agricultural information in accordance with the conditions of agricultural business managed by farmers. The problem is the low intensity of extension services in each

district, which means that extension workers attend only once a month in group meetings. This is due to the limited number of extension workers and a large number of villages and groups. Therefore, extension workers need to have appropriate and effective communication techniques in conveying agricultural messages directly to farmers. Extension workers need to pay attention to and repackage agricultural information into various formats such as layers, brochures, leaflets, booklets, and the like in order to assist farmers in finding agricultural information. The ability to access agricultural production information is carried out by farmers using techniques through interpersonal communication and internet media so that it is closely related to the ability of farmers in terms of agricultural literacy [18]. So to increase the ability of farmers, the participation of innovator farmers and farmer groups should be encouraged to be able to persuade farmers. Table 2 is the source of information for rice farmers in South Sumatra Province.

**Table 2:** Distribution of percentage of information sources for rice farmers in South Sumatra Province, 2019

Information Sources of Rice Farmers	Category	Banyuasin Regency (%)	Ogan Ilir Regency (%)	Total (%)
Unconventional Media	High	4	0	3
	Low	96	100	97
Conventional Media	High	0	0	0
	Low	100	100	100
Farmer Group	High	58	100	68
	Low	42	0	32
Innovation Institute	High	0	0	0
	Low	100	100	100
Innovator Farmers	High	85	100	89
	Low	15	0	11

Information: n Banyuasin Regency = 219; n Ogan Ilir District = 75; Total n = 294

Average index score: Low = 0-59; Height = 60-100

level of quality of agricultural information is the farmer's perspective of seeing the information received as part of the consideration in making decisions. Farmers' perceptions exist where messages are not always swallowed raw but through a long process of cognition. This process is influenced by the interest of the farmer as well as the relative advantage for the farmer so that it can be copied or tried. The most important value for farmers is that the level of quality of agricultural information can be used, reached, and accepted, although the credibility and quality of the information still need to be re-confirmed. This means that the existence of agricultural information for farmers is considered quite important for farmers, but not all information received by farmers can be followed up. This requires additional costs for farmers. The same is true in the South Teso area, Kenya, where the quality of information obtained by farmers from the use of communication technology does not have an immediate impact on farmers [19]. This is due to the low level of quality of agricultural information but it is

still able to be used by farmers as a reference. In addition, the affordability of information sources is still difficult due to the information infrastructure that is difficult to signal and the location is still lacking in access to agricultural support and weak extension support. The distribution of the perception of information dissemination can be seen in Table 3.

**Table 3:** Percent distribution of perceptions of the level of quality of agricultural information in South Sumatra Province, 2019

Level of quality of agricultural information	Category	Banyuasin Regency (%)	Ogan Ilir Regency (%)	Total (%)
Credibility of information	High	2	13	5
	Low	98	87	95
Quality of information	High	0	0	0
	Low	100	100	100
Utilization of information	High	93	100	95
	Low	7	0	5
Affordability of information sources	High	23	37	27
	Low	77	63	73

Information: n Banyuasin Regency = 219; n Ogan Ilir District = 75; Total n = 294

Average index score: Low = 0-59; Height = 60-100

Risk communication is the farmer's ability to minimize the risk of loss experienced by farmers by communicating both with information sources and with farmers themselves. Farmers' knowledge is limited in the life of farmers and groups, resulting in high scores. Persuasion from outside the farmers is high because the cosmopolitical value of farmers is quite well connected with parties outside the village. The condition of the remote topographical area and minimal vehicle access makes it difficult for the farming community to move but several partners have been established so that they are able to sell agricultural products on the spot. Perceptions of participation, the ability to cooperate, and dialogue have high scores in which farmers have the ability to actualize themselves. Farmers take advantage of the opportunity for farmers to gain experience and non-formal education as well as involvement in government programs when they participate in field school activities, counseling, village meetings and work on village development with village residents. Farmers are able to reduce the risk of farming failure when the information collected through interpersonal communication in private and in groups is developed openly and equally [8]. Risk communication is an effort to learn the farmer's learning process in knowing farming which is managed through social learning supported by farmer community institutions [20]. High-value dialogue indicators, which are defined as openness and equality of communication in the village, are quite high and good. Table 4 is the distribution of risk communication perceptions of rice farmers in South Sumatra Province.

**Table 4:** Distribution of the percentage of farmers' risk communication perceptions in South Sumatra Province, 2019

Perceptions of farmer risk communication	Category	Banyuasin			Total (%)
		Regency (%)	Ogan Regency (%)	Ilir	
Knowledge	High	85	100	89	
	Low	15	0	11	
Persuasion	High	100	100	100	
	Low	0	0	0	
Participation	High	100	100	100	
	Low	0	0	0	
Level of cooperation ability	High	100	100	100	
	Low	0	0	0	
Dialog	High	100	100	100	
	Low	0	0	0	

Information: n Banyuasin Regency = 219; n Ogan Ilir District = 75; Total n = 294

Average index score: Low = 0-59; Height = 60-100

**3.2. The Influence of Farmer Characteristics, quality of agricultural information and Information Sources on Agricultural Risk Communication**

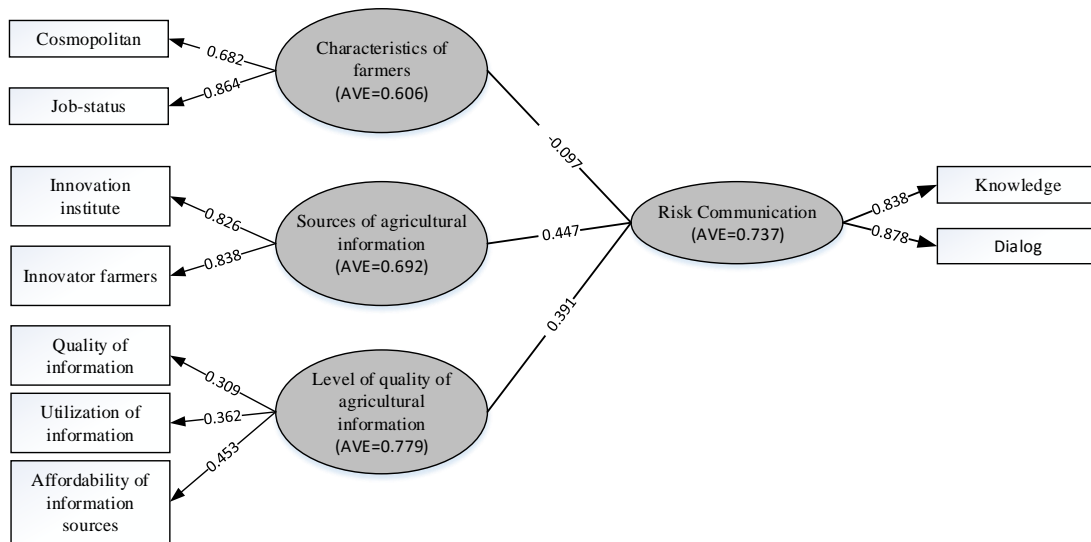
The hypothesis of this research is that farmer characteristics, information sources, information quality have an effect on risk communication. The first step is to look at these factors by choosing the Smart PLS 3.2.9 statistical program. Some of the requirements for using this program are (1) AVE (Average variance extracted) is a control tool for the fit and absence of a model built into an equation, thereby reducing the indicator value seen from  $\lambda$  (loading factor) ( $> 0.5$ ) and t-value ( $> 1.96$ ) [21]. The feasibility of a model refers to  $Q^2 > 0$  or to use R2 values where R2 is at 2 percent (small effect), 13 (moderate effect), and 26 percent (broad effect) in representing the effect [22]. Based on this rule, the initial p-value and t-value are obtained in Table 5.



**Table 5:** Value distribution of indicators,  $\lambda$  (loading factor), *t*-value and AVE

Latent variable	Variable Indicators	$\lambda$ (Loading Factor)	t- Value	Average Variance Extracted (AVE)
Characteristics of farmers	Age	-0.054	0.335	0.162
	Level of formal education	-0.167	1.442	
	The intensity of formal education	0.007	0.048	
	Experience in farming	-0.230	1.263	
	Farming scale	-0.552	2.459	
	Number of family members	0.077	0.433	
	Cosmopolitan	0.645	2.756	
	Job-status	0.699	2.814	
Sources information	Unconventional media	0.113	0.945	0.325
	Conventional media	-0.487	12.628	
	Farmers	0.267	1.613	
	Innovation institute	0.879	13.912	
	Innovator farmers	0.742	7.712	
level of quality of agricultural information	Credibility of Information	0.313	8.336	0.601
	Quality of information	0.798	29.676	
	Utilization of information	0.890	55.309	
	Affordability of information sources	0.936	149.132	
Risk communication	Knowledge	0.806	23.399	0.329
	Persuasion	-0.116	0.923	
	Participation	-0.403	4.692	
	Level of cooperation ability	0.285	3.252	
	Dialog	0.847	34.371	

The value of  $\lambda$  (loading factor) ( $> 0.5$ ) and *t*-value ( $> 1.96$ ) means that the eliminated indicators are values that are less than these provisions to increase the AVE level. The results obtained are shown in Figure 1.



**Figure 1:** Path diagram accompanied by loading factor and AVE values

Figure 1 shows the results where there are 9 indicators that are still attached representing the latent variables of the 22 indicators. This shows that many of the instruments that were built did not meet the standardized quality standards. Answering the first hypothesis question, then equation one is built.

$$Risk\ communication = Py1 * farmer\ characteristics + Py2 * Source\ of\ information + Py3 * Quality\ of\ information + \zeta_2, R_2, \dots \dots \dots$$

(Equation 1)

$$Risk\ communication = -0.097 * farmer\ characteristics + 0.447 * sources\ of\ information + 0.391 * level\ of\ quality\ of\ agricultural\ information + 0.414; R_2 = 0.586; \dots \dots \dots$$

(Equation 1)

The magnitude of the model is  $f^2$ : 0.078 and  $Q^2$ : 0.426 ( $Q^2 > 0$ ) this means that the effective value of the model is small and acceptable because it represents the model, while the GoF (Goodness of fit) size is 0.35 which means it has a good value to explain the communication model. risk. The indicator value of this model is cosmopolitan ( $\lambda = 0.682$ ) and employment status ( $\lambda = 0.864$ ) variables of farmer characteristics. Information sources are built by reflective variables from innovation institutions ( $\lambda = 0.826$ ) and innovator farmers ( $\lambda = 0.838$ ). level of quality of agricultural information consists of information quality ( $\lambda = 0.813$ ), usefulness of information ( $\lambda = 0.894$ ), affordability with sources ( $\lambda = 0.937$ ), while risk communication consists of reflective variables of knowledge ( $\lambda = 0.838$ ) and dialogue ( $\lambda = 0.878$ ). Each observed variable has a significant value that is positive for the latent variable. Thus the variables of farmer characteristics, farmer information sources, and level of quality of agricultural information have a significant and positive effect on risk communication. The percentage of the amount of influence is 58.6 percent and the rest is influenced by other factors. Agricultural information is needed by farmers at the beginning of the growing season, planting, observing plant pests, harvesting, processing crops, and marketing. Information needs are obtained from peers, groups, extension agents, and social media. The information needed by farmers is adjusted to the conditions of cultivated

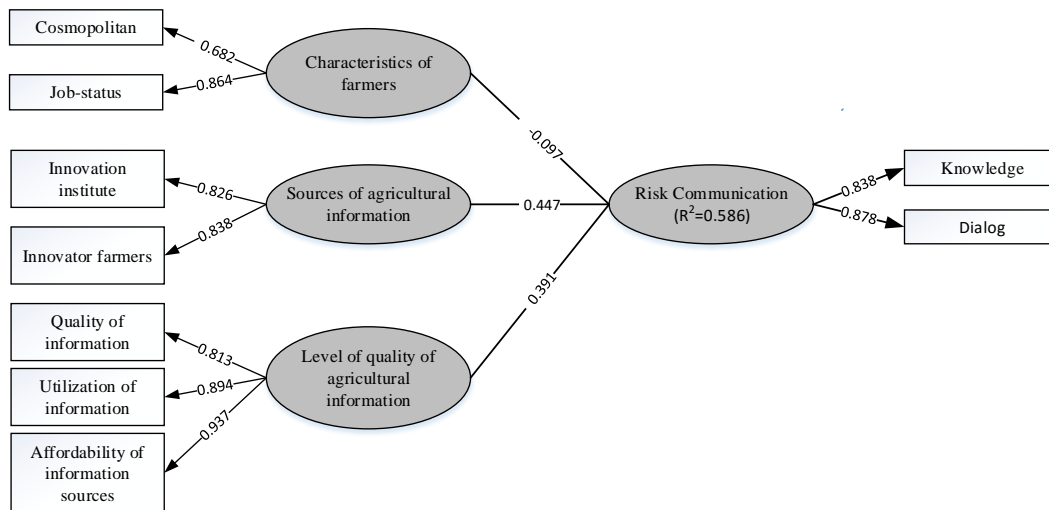
agricultural land. The ability to obtain this information requires communication skills in receiving and interpreting information messages. The role of innovator farmers and farmer groups is able to become the dominant source of information in delivering agricultural messages. Farmers' need for information is very high, especially in managing the area of land planted by farmers so that farmers' perceptions of extension workers are very high and can help farmers [23]. The role of innovation institutions is needed in increasing the capacity of farmers so that they are able to answer the problems faced by farmers in villages [24]. The model of the influence of farmer characteristics, information sources, level of quality of agricultural information on risk communication is directly described in Table 6. Farmers' characteristics are negative, which means they have little influence on risk communication. The characteristics of farmers are represented by the level of cosmopolitanism and the status of the farmers' work. Next, the sources of information were represented by innovation institutes and innovator farmers. The innovation institute is an institution that is expected by farmers to be able to assist farmers in delivering innovative swampland management technology. Swampland has high acidity, especially tidal swamps. Therefore we need technology that can increase swampland production. Innovator farmers are farmers who are considered capable of providing direction and advice to refer to their farming procedures. Furthermore, level of quality of agricultural information is emphasized on the quality of information, utilization of information, and information affordability. Although the quality and accessibility of information are still weak, the utilization of the information received are quite good for farmers. Next risk communication is represented by knowledge and dialogue. The value of farmers' perceptions of the two indicators of knowledge regarding high-value farming and high farmer dialogue. This means that agricultural risk communication which is managed by farmers is quite well represented by the risk communication model shown in Figure 2.

**Table 6:** Effect of farmer characteristics, information sources, and quality of information on risk communication

Latent Variable	Risk Communication	
	(Direct Effect)	Total
Characteristics of farmers	-0.097	-0.097
Sources of agricultural information	0.447	0.447
level of quality of agricultural information	0.391	0.391
total		0.741

The risk communication model that is formed is influenced by the level of quality of agricultural information, information sources, and farmer characteristics (Figure 2). Each of them simultaneously explains the risk communication model of 58.6 percent. Increasing the ability of farmers in terms of risk communication is enhanced by increasing knowledge and opening up space for dialogue in every meeting activity. This is reinforced by the fact that farmer activity in groups by frequently gathering and sharing information is able to increase farmers' adaptation in risk management for the commodities they cultivate [8]. The support of innovative farmers and demonstration plots as well as products from innovation institutions can provide information to farmers and make alternative decisions. This is congruent with the finding that the intensity of

extension workers is able to encourage farmers to utilize managed land more intensively [23]. Support from extension workers as facilitators is needed as an introduction to information and commodity consultation to farmers. The communication network on agricultural information is able to increase farmers' commodity references in managing managed farms. An extensive communication network has good quality information in building competitive commodities [25]. Communication skills are needed for the ability of farmers to be literate towards information technology by providing training through extension services and information systems that guide farmers in answering their problems [26].



**Figure 2:** Risk communication model and the factors that influence it

#### 4. Conclusions and Recommendations

The characteristics of farmers are dominated by young adults, low formal education (less than 12 years), less intensive in attending non-formal education, less than 28 years of farming experience, with a farming scale of less than 2 ha, the number of family members is more than 3 people, relatively cosmopolitan, and the main occupational status is farming. The ability to access more sources of information through farmer groups and innovator farmers by considering the utilization of information, as well as the need to consider the credibility of information, quality of information, and affordability of information. The ability to communicate risk is more dominated by farmer knowledge, persuasion, participation, the level of cooperation, and dialogue skills from outside the farmer. Risk communication is influenced by the characteristics of farmers which consist of cosmopolitan and employment status. The sources of information consist of innovation institutes and innovator farmers. Level of quality of agricultural information is emphasized on the quality of information, utilization of information, and information affordability. Risk communication consists of knowledge and dialogue. Together, the risk communication model was able to increase the farmer's ability by 58.6 percent. This explains that the characteristics of farmers, sources of information, Level of quality of agricultural information have not been optimal in increasing the risk communication skills of swamp rice farmers. Increasing the risk communication model can be done, first, building information in accordance with the needs of managed rice farming. Second, increasing the role of agricultural institutions as providers of information sources in improving the quality of information, the utilization of information, and affordability of information sources for farmers. Third, increase

the capacity of extension workers in providing information so that they can create space for dialogue, cooperation, and increase direct knowledge skills of farmers.

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