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Livelihoods System and Level of Vulnerability of Rice Farmer Households Due to Climate Change at Swampy Lowland in Sungai Pinang Village Banyuasin Regency

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***Abstract*— The main problems in the development of swampy lowland are floods during the rainy season and drought in the dry season which cannot yet be predicted accurately. Climate change causes problems in swampy lowland farming. Farmers find it difficult to run their farming, especially in terms of determining cropping patterns and planting time. This situation inevitably affects the livelihood systems of farm households. The purpose of this study was to determine the livelihood systems and to determine the level of vulnerability experienced by households of swampy lowland farmers in Sungai Pinang village. The study was conducted in Sungai Pinang Village, Rambutan District, Banyuasin Regency. This location is determined intentionally. The method used is a survey research method, with a simple random sampling method. Data obtained from the results of field surveys are processed by tabulation and followed by mathematical calculations.**

The results showed that the livelihood system of Sungai Pinang Village community was quite varied. Education respondents above 80 percent are only elementary school graduates with livelihoods as farmers; natural resources are sufficient so that they use swampy lowland to cultivate rice; Financial assets are also sufficient because there are no other sources of income and savings; physical resource assets are well available in the village; and social resources are the highest assets owned due to close family relations between citizens. Level of vulnerability in Burai Village: indicators of human and natural resources are vulnerable, indicators of financial resources, physical resources and social resources are moderate.

Keywords : Rice Farmer, global warming, climate change

I. INTRODUCTION

The human livelihood system is inseparable from the ecology on which the livelihood system is built. The livelihood system of the people who live on swamp typology will be influenced by the environment in which they live. Swamp ecosystems are vulnerable to climate change which can be in the form of drought / fire and flooding impacts. Based on Palembang BMKG climatology station data, rainfall in the last ten years (2008-2018) in Sungai Pinang Village, namely the highest rainfall in 2010 amounted to 3631 mm and the lowest rainfall occurred in 2014 amounted to 1744.5mm. This means that the weather cycle tends to change and increase the ecological crisis. The production of agricultural products has become unpredictable with a decrease in food availability.

This climate change causes the threat of vulnerability of farm households. Vulnerability is the inability of a family or community unit to cope with loss, damage and disturbance arising from the occurrence of a threat or ability to recover from those losses (Boli et al., 2004)[1]. Vulnerability of an area is also related to the biological, geographical, social, economic, political, cultural and technological conditions of a community in a region for a certain period of time which reduces the ability of the

community to prevent, mitigate, and respond to certain impacts. The above background underpins researchers to find out the livelihood systems of farmers' households, and to determine the level of vulnerability experienced by households of swampy rice farmers in Sungai Pinang Village.

II. METHOD

This research is a survey conducted in Sungai Pinang Village, Rambutan District, Banyuasin Regency. The choice of location was done deliberately based on the consideration that in Sungai Pinang Village the majority of the population worked as rice farmers affected by climate change. The sampling method used in this study is a simple random method by taking samples of 31 swampy rice farmers from 166 populations. The data used in the form of primary data obtained through surveys, in-depth interviews, questionnaires, and group discussions and secondary data obtained from BPS, Palembang Class 1 BMKG climatology station, journals, and documents fromrelated agencies. The data is processed by tabulation followed by mathematical calculations as needed. The data that has been collected by tabulation is then processed by means of data analysis using descriptive-qualitative analysis.

III. RESULTS

Climate Variability in Sungai Pinang Village

Sungai Pinang Village is a tropical region, with a dry season ranging from May to October and a rainy season ranging from November to April, temperatures ranging from 23 ° C-32 ° C, rainfall ranges from 1000 mm-3000 mm.

The criteria for annual rainfall distribution state that 0-1500 mm of rainfall is categorized as very low, 1500-2000 mm of rainfall is categorized as low, 2000-2500 mm of rainfall is categorized as medium, 2500-3000 mm of rainfall is categorized as high, and rainfall is more than 3000 mm is considered very high. Based on these criteria, it can be said that rainfall in Sungai Pinang Village in 2013 was categorized high, in 2018, rainfall was categorized as moderate. In 2014 the rainfall was categorized as low, in 2015 and 2018 categorized as moderate, in 2017 it was categorized as high and in 2013 and 2016 the rainfall was categorized as very high.

The climate change observed in this study was climate change that occurred in 2013 and 2018. Based on BMKG Climatology Office Class 1 Palembanng City Variability of rainfall in Sungai Pinang Village can be seen in Figure 1 temperatures ranging from 23 ° C-32 ° C, rainfall ranges from 1000 mm-3000 mm.

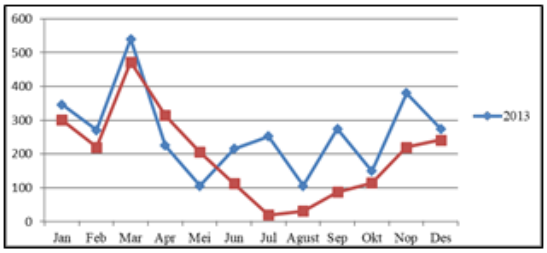

Figure 1. Variability of rainfall in Sungai Pinang Village 2008-2018

Respondents stated that climate change was characterized by rainfall intensity, changes in air temperature and conditions of puddle in the rice fields. Before the climate change, the rainy season occurs from November to April and the dry season occurs from May to October. However, the time is changes, the dry season occurs in May to September and the rainy season occurs in October to April.

The hydrological conditions in the Sungai Pinang Village generally originate from tributaries originating from the musi river. With the current climate change conditions and farming conditions that are in the middle swampy lowland so farmers often get into trouble, both when rainfall is very high or when rainfall is very low.

Livelihood System of the Farmers

Livelihood can be interpreted as a strategy; various efforts made by someone to utilize various resources they have to get income so that they are able to maintain their survival (Saragih et. al, 2007) [2]. Livelihood strategies relate to how people manage or combine livelihood assets that are available or owned, respond to changes that occur, and determine priorities for maintaining or improving livelihoods (Scoones, 1999) [3]. The livelihood system can describe how the household livelihood system interacts with the external environment, both the natural environment, institutional and the policies that surround it (FAO, 2007)[4].

Livelihood Assets. Five livelihood assets can be simplified in the form of a pentagon (FAO, 2007) [4]. Here are the five assets that affect livelihood in Sungai Pinang Village, namely human capital, social capital, physical capital, financial capital and natural resources.

Human capital.

Sulistiyanto (2013) said that the availability of human resources can be in the form of farming experience, farmers' skills in managing agricultural products, farmers' health and farmers' skills. The experience of farmers in the research location averaged 8 years, has good skills in agriculture, this is because there is an active extension institution in disseminating agricultural information and also the experience of previous generations. Most respondents' education is in the low criteria (primary school). This has an impact on not many job choices other than being a farmer or day laborer. While for health conditions, respondents were in good condition. The disease that is often suffered is just a cold cough so they can still do their farming well.

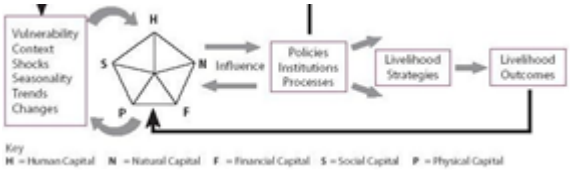

Figure 2.
Sustainable Livelihoods Framework Analysis System (FAO, 2003)

Natural Resource Capital.

According to Scones (1999)[3], Natural resources are resources derived from natural resources: land, water, air, genetic resources, and environmental conditions: cycles, hydrological pollution sinking. The land owned by the respondents is swampy land that is used to cultivate rice. With sufficient water conditions for farming activities. With an adequate condition of natural resources, it is expected that respondents can continue to make a living from their business.

Financial assets.

Financial assets are financial sources that can be used and utilized by the community in achieving their livelihood goals, including savings or supplies either owned by themselves or financial institutions, and in the form of regular funds flow (DFID, 2001)[5]. Farmers used to save money in the form of gold and livestock and were not accustomed to saving at the bank. The loans they usually do at the bank are only for the purpose of increasing the farm's capital if it is felt very urgent. For poor people, financial capital can be in the form of government assistance such as: BLT, Raskin, health insurance cards, and BOS education funding assistance.

Physical assets.

These resources include basic infrastructure such as: roads and transportation, markets / places of sale and irrigation / waters. These facilities are available in this village and are very supportive of their livelihoods.

Social assets.

The spirit of kinship and community cooperation in this village community is still very much felt. Good social relations between residents and community activities that are routinely carried out, such as: routine recitation, social gathering, community service, routine sports, youth, and farmer groups. As stated by Kusumastuti (2015)[6], social capital consists of mutual assistance, recitation, social security, and visiting the sick. A well-established kinship network can reduce a person's or community's vulnerability to the threat of danger. The livelihood system of Sungai Pinang Village community is quite varied. The education of respondents amounted to 80.64 percent only graduated from elementary school and made a living from the swampy land farming; natural resources are sufficiently available so that they use middle swampy land to cultivate rice; Financial assets are weak because there are no other sources of income and savings; physical resource assets are well available in the village; and social resources are the biggest assets owned by the local community because of the close family relations in this village.

IV. DISCUSSION

The Vulnerability Level of Swampy Land Farmers' Households Due to Climate Change

According to Sunarti et.al (2010) [7], one of the first steps in building the resilience of the nation and society to disasters is the development and analysis of the state and society against disasters. Losses also deny human ability to protect themselves and the ability to cope with outside safety responsibilities (Habibi and Buchori, 2013)[8]

The level of vulnerability in this study was conducted to see how much the impact of climate change on the lives of farmers households, this is measured through five indicators namely human resources, natural resources, financial

resources, physical resources and social resources.

Human Capital

Human capital is related to the ability of farmers to access skills in order to improve their living conditions. For this reason, there needs to be an increase in abilities such as education, training and skills. The level of vulnerability of human resources in this village is in the vulnerable criteria (2.59). The following can be seen in Table 1. the following:

TABLE 1
Vulnerability of Human Resources due to Climate Change

No	Component Measurement	Score	Criteria
1	Experience in Rice Farming	2,06	Moderate
2	Skill in Rice Farming	1,90	Moderate
3	Other skill beside rice farming	3,10	Vulnerable
4	Benefit of other skill (beside rice farming)	3,19	Vulnerable
	Average	2,56	Vulnerable

The average experience of respondent's rice farming was 18.7 years. This means that the experience of farmers is enough to run their farming. Farming skills are acquired by generation and their personal experience in rice farming. Farmers' successes and failures are valuable lessons for them. Besides that, in this village, the extension officers are ready to assist farmers in dealing with farming problems that cannot be solved.

More than 80 percent of respondents have formal education limited to primary school. This affects the ability of respondents to access information. Respondents only rely on information from agricultural extension officers and from the head of the farmer group. For information outside the farm is very minimal skills and knowledge so they tend not to dare to try new things.

Natural Resource

Natural resource vulnerability is seen from the availability of other natural resources as an alternative income. Average score More details can be seen in the table 2.

TABLE 2
Level of Natural Resource Vulnerability Due to Climate Change

No	Component Measure	Score	Criteria
1	The effect of climate change on the demands of finding another job	1,74	Moderate
2	Availability of savings as financial reserves	1,70	Low
3	The level of savings control	1,66	Low
4	Frequency of savings utilization	1,93	Moderate
	Average	1,76	Moderate

Most types of soil in Sungai Pinang Village are classified as wetlands included in the Humley Gley. The level of soil acidity (pH) for tidal land affected by tides is low (less than 6), so there is little chance of respondents to be able to

use other land resources. Utilizing the land requires effort because it must be cultivated and treated specifically so that it can be planted, so that natural resources can be categorized in vulnerable criteria.

When there is excessive rainfall or long drought, this makes the resilience of farmer households vulnerable. While they depend almost entirely on paddy fields. According to Lamusa (2010)[9], during a drought, farmers' yields and incomes decline. At the same time, consumption needs remain even increasing, pushing prices up, making it difficult for those on low incomes to reach.

Financial Capital

Indicators of financial resources illustrate the condition of the ability of households to ease the fulfillment of life needs in material terms due to climate change. To solve the economic problems of production and consumption, what needs to be done is to change behavior, such as living frugally, saving, utilizing credit facilities provided by the government or other microfinance institutions, and forming a forum with other farmers to solve economic problems of production and consumption (Septiawan, 2014)[10]. The level of financial capital vulnerability due to climate change in Sungai Pinang Village can be seen in the table 3.

TABLE 3
Level of Financial Capital Vulnerability Due to Climate Change

No	Component Measure	Score	Criteria
1	the availability of alternative natural resources besides rice fields	2,90	Vulnerable
2	Ease of utilizing alternative natural resources	3,0	Vulnerable
3	Ease of controlling the existence of alternative natural resources	3,19	Vulnerable
4	Frequency of utilizing alternative natural resources	3,16	Vulnerable
	Average	3,06	Vulnerable

Financial capital is quite vulnerable in the criteria with an average score of 1.76. Respondents are accustomed to a simple life. So that the limited income does not greatly affect their lives and persists in their work as swampy lowland farmers.

Savings owned by respondents in the form of gold jewelry and livestock. They will sell their savings for urgent needs, while to meet household needs, they will survive and try to make enough income for their daily needs. Rice needs are fulfilled by setting aside rice yields, vegetable needs are met by planting in the yard of the house and protein needs are met from catching fish or buying from neighbours at low price.

Physical Capital

Physical capital can be seen from the use of goods and technology in helping farmers meet their needs. For more details, see Table 4.

TABLE 4
Level of Physical Capital Vulnerability Due to Climate Change

No	Component Measure	Score	Criteria
1	The intensity of selling valuables	1,33	Not Vulnerable
2	Technology availability	2,39	Moderate
3	Ease of coping with the effects of climate change	2,38	Moderate
4	ease of accessing technology	2,74	Vulnerable
	Average	2,21	Moderate

Savings owned by respondents are usually in the form of gold and livestock. Other assets include household appliances and motorized vehicles. They are usually not used to sell these items for their daily needs. Gold and livestock are only sold when there are very important needs, such as when they celebrate weddings, circumcision or school needs, while household equipment, are usually no longer suitable for sale. Motorized vehicles are an important asset for farmers, usually used as transportation to go to the fields so they are not sold.

Technology has also begun to be applied by respondents, the technology in question is the cultivation system in dealing with climate change. Farmers make efforts to mitigate methane gas by regulating water, which is making drainage and floodgates; selecting varieties; and replace the farming system.

Social Capital

Social capital shows how households have interactions with other communities in their social environment. The respondent's relationship with the surrounding community is very good, it can be seen from the ongoing mutual cooperation recitation, and mutual assistance when there is a celebration at each neighbor's house. However, they very rarely ask for help materially with neighbors, this is because living conditions are almost the same.The government provides routine assistance for poor communities, so that people are socially in the category of not vulnerable. The community felt very helped by the assistance in the form of money, health insurance and free school facilities. While the Gapoktan Institution really helps them in meeting their farming needs. Loans that can be accessed by respondents include seeds, fertilizers, herbicides, pesticides and others, then after the harvest they will return the debt in the form of money.

V. CONCLUSION

The livelihood system of Sungai Pinang Village community is quite varied. The education level of respondents is relatively low, as much as 80.64 percent are elementary school graduates with livelihoods as farmers; Natural resources are sufficiently available so that they use middle swampy lowland to cultivate rice; Financial assets are categorized as weak / vulnerable due to lack of other sources of income and saving habits; Physical resource assets are sufficiently available in the village; and Social resources are the highest assets owned due to close family relations between citizens.

Vulnerability level of Burai Village: In the indicators of human resources and natural resources classified as vulnerable criteria, while indicators of financial resources, physical resources and social resources are quite vulnerable

VI. ACKNOWLEDGMENT

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