2013 International Conference on Sustainable Environment and Agriculture
IPCBEE vol.57 (2013) © (2013) IACSIT Press, Singapore
DOI: 10.7763/IPCBEE. 2013. V57. 13

The Problems and Constraints in Managing Tidal Swamp Land for Sustainable Food Crop Farming (A Case Study of Trasmigration Area of Tanjung Jabung Timur Regency, Jambi Province, Indonesia)

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Abstract. This study is conducted to reveal the problems and constraints of farming in wetlands (lowlands), particularly tidal wetlands which have an impact on the extent of reduction in agricultural areas and low crop production of 2-3 tons / ha. The research was conducted with a qualitative approach by observation, FGD and interviews using questionnaires. The statistical data obtained from Tanjung Jabung Timur Regency of the period 2005 - 2011 show that there has been a reduction in harvested area of 10,205 ha and a decrease in the amount of crop production amounts to 43,660 tonnes. The low production is also due to the lack of water system management, unavailability of means of agricultural production support like seeds, fertilizers, and lack of education and training. The high value of the selling price of commodity crops also has an impact on the growing interest and willingness of the farmers to cultivation of paddy plant.

Keywords: Lowland, reduction, production, price, crops

1. Introduction

Increasing growth of Indonesian population from year to year has become serious attention of the Indonesian Government, because the effect that can result from population growth is an increasing need for food and housing for the community. Population growth has also indirectly resulted in more conversion of productive agricultural land into different functions such as for residential and industrial purposes. One of the government's efforts to replace the loss of productive agricultural area in the island of Java is to utilize the tidal marsh land outside Java as agricultural land. It is estimated that Indonesia has a total 33,393,570 ha of marsh land area consisting of 20,096,800 ha (60.2%) of tidal wetlands and 13,296,770 ha (39.8%) of non-tidal wetlands. The total area of wetlands which has been developed by the government to date is about 1.8 million ha consisting of 1,452,569 ha of tidal marsh and 347,431 ha of non-tidal marshes [1]. The total area of wetlands developed spontaneously by the public and private sectors so far has reached 2.4 million ha. The overall area of wetlands which has been developed reaches 4.2 million ha and the area is mostly found outside the island of Java, Bali and Madura [2]. Tidal wetland is an appropriate alternative to be used as a food crop farming with all its advantages and disadvantages. The maximum potential of tidal marsh management such as that in Banyuasin Regency, South Sumatra Province, has been achieved in the form of 3 planting seasons in one year. In the first planting season (*MT I*) production of *GKP* reaches 5-7 tonnes / ha, in the second planting season II (*MT II*) *GKP* production amounts to 3-4 tonnes / ha, and in the planting season III (*MT III*) the result amounts to 2-3 tons of shelled corn / ha [3].

Tanjung Jabung Timur Regency is one of the major rice producing areas in Jambi province. However, the condition is increasingly threatened by intensive conversion of paddy fields into oil palm and rubber

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plantations. Average production of rice reaches 2-3 tonnes of *GKP* / ha in one growing season in a year. According to the statistics of 2005, the paddy crop harvested area reached 39, 932 ha with a production of 147,671 tonnes of rice and in 2011 the harvested area reached only 29,727 ha with a production of 104,011 tonnes of rice. A reduction in the production area and a decrease of land productivity resulted in a decline in rice production [4]. The reduction in acreage planted is caused by the degradation of land from paddy fields to plantations. The following Table 1 shows the area of planting and production during the period of 2006 to 2011.

Table 1: The Area of Planting and Production during the Period of 2005 to 2011

No	Description	Year						
		2005	2006	2007	2008	2009	2010	2011
1	Area of Production	39.932	31.959	32.524	33.458	32.989	31.005	29.727
2	Rice Production	147.671	108.866	112.329	115.591	113.956	108. 052	104.011

Source : *BPS* of Tanjung Jabung Timur Regency (2012)

The rate of land conversion from rice fields to plantation crops will increase each year and the rice will continue to decrease with low income derived from farming rice. And so will the rice production every year will tend to decrease which in turn will affect the availability of food supply. The area of farming and land productivity tend to decrease year after year which causes the crop acreage and farm production to decline.

2. Methods and Research Areas

The study was carried out during the period from December 2012 to February 2013, with the method of Focus Group Discussion (FGD), observation and interviews using questionnaires to obtain data about the existing conditions, problems and obstacles in the management of tidal wetlands for rice farming. The study involves 71 respondents from the two sub-districts (Rantau Rasau Sub-district and Berbak Sub-district) which were randomly selected from eight villages (Rantau Rasau I, Rantau Rasau II, Bandar Jaya, Pematang Mayang, Bangun Karya, Rantau Makmur, Simpang Village and Telago Limo).

3. Results and Discussion

3.3.1 Environmental Condition and Land Ownership Submitting

Administrative area of Tanjung Jabung Timur Regency is about 5,445.0 km^2 with an altitude ranging from 1 to 5 m above sea level, consisting of an area of 44,100 ha of rain-fed land, low tidal wetlands and marshy land. In terms of the system of management and use of land, the area of low-tide marshy land is prevailing as shown in the following Table 2.

Table 2: The Area of Paddy Fields by its Utilization

No	Land Type	Acreage of land	Percentage (%) Total acreage of paddy fileds	Percentage (%) Total area of land
1	Rainfed land	1.165	2.64.	0.21.
2	Low-tide land	28.620	64.89	5. 26
3	Low land folder	15	0.034	0.00
4	Temperarily uncultivated	14.300	32.43.	2.63
	Total acreage	44.100	100	8.10

Source: Department of Agriculture and Plantation Office of Tanjung Jabung Timur Regency 2010

Table 2 shows that available paddy field reaches a total area of 44,100 ha (8:10%) of the total land area of Tanjung Jabung Timur Regency. The paddy field mostly consists of low-tide swamp amounting to 28,620 ha (64.89%) of the total land area of paddy fields in the administrative area of Tanjung Jabung Timur Regency. The low-tide swamp is generally scattered in some reclaimed areas which serve as the transmigration sites such as in the Sub-district Rantau Rasau and Sub-district of Berbak, which was originally intended for the development of food crop farming. Over the years the vast estate intended for agricultural land decreases due to the rampant conversion by farmers to use the land for plantation crop

farming. Much of the acreage of land of the present food crop farming has been intercropped with oil palm and rubber plant, so in reality, the land area utilized for rice farming is much lower than its reality. The acreage of land area used for rice farming, oil palm and rubber plantations in the two regencies can be seen in the following Fig. 1.

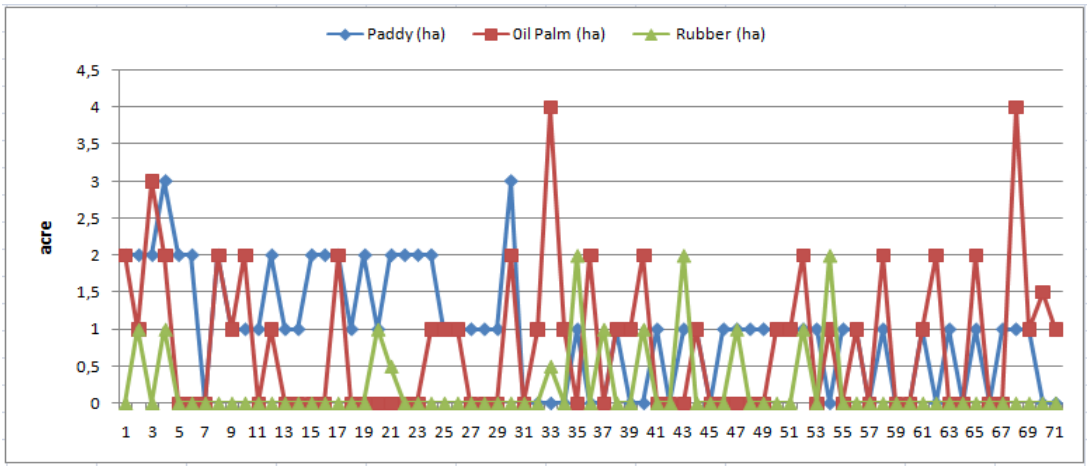

Fig 1: The Acreage of ownership of agricultural land by commodity (Sept 2012 to February 2013) in the study site

3.3.2 Tidal Swamp Land Management

The tidal marsh land management in Tanjung Jabung Timur Regency was started in the 1970s by bringing in farmers from the island of Java. In the 1980s the agricultural production tends to decline as a result of the lack of reliable infrastructure support (water gates at the tertiary canals, farm and village roads), lack of understanding and knowledge of farmers on the physical condition of tidal marsh wetlands, low selling price of grain or rice at the farmer's level (5,000-6,000 / kg). In an effort to increase revenues or income from food crop farming, the farmers should look for alternatives in addition to rice farming to increase their incomes or revenue**.** During the period of 2011 to 2012 there was a reduction in the rice planting area of 625 ha (-15%) which is certainly going to have an impact on the amount of production [5]. The opposite condition occurs to rubber and palm oil plantation as shown in the following Table 3:

Table 3: The Condition of Land Allocation and Development

No	Description	Year of 2011 (ha)	Year of 2012 (ha)	Percentage
1	Land for Food Crops	5.254.5	5.130.5	(-7%)
	• Rice	4.226	3.601.5	(-15%)
	• Crops	628.5	1.040.5	(+40%)
	• Hortikultura	670	484.5	(-28%)
2	Land for Plantation	7.828	8.290	(+6%)
	• Oil palm	4.300	4.500	(+4%)
	• Rubber	1.984	2.174	(+40%)
	• Mixed Crops	1.580	1.616	(-2%)

Source : BP3K Rantau Rasau Subdistrict Tanjung Jabung Timur Regency **(**2013)

Table 3 show that in 2012 the rate of reduction of arable land for crops totaled 7%, while the reduction of rice field acreage reached 15%. Whereas the area of oil palm plantations has increased as much as 4%, that of rubber plantations reached 40% in 2012. The conversion of agricultural land into plantations continues to occur each year. The area of farm land owned by the farmers in the 8 villages which become the subjects of this study has declined due to the conversion of function or commodities from rice crops to oil palm and rubber. If this condition persists, it will slowly reduce the acreage of planting and harvesting. This condition shows that the majority of the farmers in the study area prefer to grow oil palm to rice. Whereas that from rice farming with the production of 2-3 tons / ha only produces 7 to 10.5 million rupiah / ha / year at the price of grain of 3,200 rupiah / kg.

3.3.3 Technical and Non – Technical Agronomic Condition of Tidal Swamp Land Management

3.3.4 Condition of Water Networks

The results of field observation on the hydrological network condition at the secondary canal level (macro), floodgate is still in good condition. At the tertiary and quaternary level (micro), not all channels are equipped with floodgates that serves to regulate the availability of water for farming. The data obtained through questionnaires reveal that 82% of the respondents agree that land management is not supported by good management of irrigation, and 82% agree that the condition of infrastructure of irrigation does not function properly**.** Until now after approximately 33 years since the start of the program of tidal marsh development in Tanjung Jabung Timur Regency, both the micro and macro network infrastructure of water system have not been functioning optimally to improve Cropping Index (IP) per year. Whereas the existence of water management infrastructure is the key to success in the management of low-tide land [6]. The management of the water system can be useful in removing excess water and keep the water table as needed by the plants**.** The purpose of controlling or water management, among others, are to ensure adequate water for crops, to prevent deterioration of water quality, and to prevent saltwater intrusion in tidal land [7].

3.3.5 Farming System

The frequency of rice cultivation in the Subdistrict of Rantau Rasau and Berbak on the average is once (MT1) in one year. The average production of rice planted in tidal marsh areas without proper management can only be done once a year with a production of 2 to 3 tons of the GKP / ha [2]. Eighty seven (87) % of the respondents say that the availability of fertilizer is not at the planting time. The availability of fertilizer at the farmers' is very necessary to improve soil fertility. The use of the means of production should be in accordance with the condition and circumstances, both in terms of time and dosage. Readiness of means of production such as fertilizers, seeds, and pesticides is very important [8]. Seventy four (74) % of the respondents say that labor for farming food crops is limited. Lacking of labor at both the pre-harvest and post-harvest period becomes an obstacle in the tidal marsh land management.

3.3.6 Institutional Condition

The successful management of tidal swamp land for rice farming is inseparable from the role of existing institutions at the farmers' level. Ninety one (91) % of the respondents agree that a financial institution is not yet available at the farmers' level. The Farmers who do not have the capital are forced to seek a loan from the owners of capital with burdensome requirements to the farmers. At harvest time, the price of grain and rice depends on the buyers. Eighty three (83) % of the respondents say that the price of unhusked rice at harvest time is very dependent on the buyers. When selling is done at the harvest season the price will be relatively cheaper than when it is done outside the harvest season. The success of the cultivation of food crops cannot be separated from the interference of the Government in providing support facilities to encourage the creation of institutions at the farmers' level which provide guidance and technical assistance and strengthen the venture capital for the farmer groups [9].

3.3.7 Technology

The development of agricultural technology cannot automatically be felt by the farmers at the tidal marsh land. The lack of technological input in the management of the tidal marsh land has affected the development and improvement of land productivity. Eighty Eight (88%) respondents agree that the availability of tools and agricultural machines (*alsintan*) for farming activities (tractors, power thresher, and grain dryers) is insufficient. Not all of the technology used for technically irrigated land suitable for tidal wetlands to increase planting acreage and production. The development and utilization of power thresher and grain dryers are part of the ways to reduce yield loss, both in quality and quantity of production. Availability of equipment for harvesting and post-harvesting is important in supporting the success of rice farming at the tidal marsh. The production of rice farming in wetlands can still be improved by the application of technology [10]. Another technological component which is not less in importance to be improved is the use

of varieties from local rice varieties to the superior (local) varieties which age early maturing and produce higher yielding.

3.3.8 Social, Economic, and Cultural Condition of the Society

The farmers working at the tidal swamp generally have a low level of education with poor economic condition. In Tanjung Jabung Timur Regency, the majority of the farmers are from the island of Java in which the farming is carried out on the technically irrigated land with relatively more fertile soil. The data obtained through the questionnaires show that 65% of the respondents are the farmers of elementary school (SD) educational background. Their lack of understanding and knowledge will quickly make them adopt new things which are actually less or not suitable to be adopted for the development of tidal marsh farming. Eighty eight (88) % of the respondents agree that the production of farm crops (rice) is still low and tends to decline. Improving understanding and providing guidance to the farmers should be done to widen their knowledge and horizon about the cultivation system at the tidal marsh. The lower production of rice has triggered farmers to look for alternative farming which can provide them with income and prosperity for their families. One of the ways is by transfering the function of land for food crop to tree crops.

4. Conclusions

After a period of approximately 33 years, the farming activity of food crops (rice) in the tidal swamp land in Tanjung Jabung Timur Regency continues to experience degradation both in the amount of acreage of planting and the amount of production. Land degradation process cannot be prevented if the farmers' income from cultivating rice crops cannot improve the welfare of the farmers. There should be an effort to ensure reasonable selling price of grain or rice at the farmers' level to prevent the fluctuating of prices during the harvest season; There should be adequate facilities and infrastructure to establish the control system of water governance. The availability of improved varieties is extremely important to the success of farming. The availability of fertilizers at the right amount and time is crucial to the success of crop farming in tidal wetlands. Not all technologies commonly used in technically irrigated land are suitable for tidal wetlands. Improved understanding and knowledge of the farmers about the physical condition of tidal wetlands environment will greatly assist the farmers in managing their land for rice farming. In an effort to improve understanding and knowledge, the farmers need training or mentoring and coaching by research institutions and universities. All efforts are made to increase the productivity of the land and the amount of production, in order to maintain the agricultural land and prevent its conversion into a different function or change of commodities.

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