



# Management of Ex-Tin Mining Land for Rice Cultivation as an Effort to Achieve Food Security

Syahbudin<sup>1</sup> Pan Budi Marwoto<sup>2</sup> Darol Arkum<sup>3,\*</sup> Pitoyo<sup>4</sup> Elius Gani<sup>5</sup> Muhammad Defrianto<sup>6</sup>

<sup>1</sup> Government of Bangka Regency, Indonesia

<sup>2</sup> Regional Development Planning Agency (Bappeda) of Bangka Regency, Indonesia

<sup>3</sup> School of Social and Political Science (Stisipol) Pahlawan 12 Bangka, Indonesia

<sup>4</sup> Perbanas Institute, Jakarta, Indonesia

<sup>5</sup> Food Crop and Agriculture Office of Bangka Regency, Indonesia

<sup>6</sup> Regional Development Planning Agency (Bappeda) of Bangka Regency, Indonesia

\*Corresponding author. Email: [darolarkumugm@gmail.com](mailto:darolarkumugm@gmail.com)

## ABSTRACT

The innovation of ex-tin mining land management is an activity of managing ex-mining land for the purpose of rice cultivation. The activity takes place in Sinar Jaya Jelutung Village, Sungailiat District, Bangka Regency, Bangka Belitung Islands Province. The rice field is an area of land developed as a result of collaboration of the Bangka Regency Government, represented by the Bangka Regency Agriculture Service, and local farmers who are members of the Mekar Farmer Group. The management of the former tin mining land into rice fields began in 2015. The area of land that has been successfully managed is currently  $\pm$  7 ha. At the beginning of this activity, 4 hectares of land was successfully processed. The passion of the local farmers had encouraged the Bangka Regency Government to provide assistance and guidance through the Bangka Regency Agriculture Office to the farmers who manage the rice fields. In 2016, the rice fields were able to produce 17.2 tons of GKP rice. The production was increased the following year and the amount reached 48 tons of GKP. This was a wonderful achievement considering the land was a former tin mining area. The success of this activity was attributed to the hard work of all parties involved and the application of rice cultivation technology accompanied by the proper implementation of SOPs. The land is an area that integrates rice fields and cow farming with a profit sharing system. The cow dung is a source of organic matter that can be utilized to improve soil structure in the former tin mining land. The utilization of the ex-tin mining land has also been adopted by farmer groups and individual farmers in several villages in Bangka Regency for the cultivation of other food crops such as corn and cassava, important horticultural crops such as chili, and plantation crops. This activity has an impact on the fulfilment of food needs and increasing food security in Bangka Regency.

**Keywords:** Innovation, Ex-Mining Land, Food, Rice

## 1. INTRODUCTION

The phenomenon of Resource Curse and population growth that exceeds the agricultural production leading to a food disaster (“Malthusian Crisis”) will occur if the management of environmental resources and fulfilment of food needs in the long term is not performed with innovative breakthroughs. The poor management of natural tin resources in Bangka Belitung has caused a lot

of environmental damage problems. The critical land area due to mining activities in Bangka Belitung is 200,000 hectares, and reclamation can only be performed in an area of 2,200 hectares or only 1.1% of the land. Reclamation of the tin mining land by 128 companies was only a “dream” and ultimately failed [1]. The failure of reclamation has caused 12,607 gigantic gaping land holes as a result of mining which pose a huge risk of disaster. It was recorded that during April-

August 2007, 24 people died because they drowned in the former tin fields [2].

Most of the ex-tin mining lands on the islands of Bangka and Belitung are lands that have experienced severe biophysical damages and degradation in terms of morphological, physical and chemical properties. The damages in physical properties are shown especially in the structure of the crushed soil (loose or massive), which has a consistency of firm-very firm, and a coarse texture. Almost all of the nutrient contents and reserves that are needed for plants to grow in the soil are also classified as very low. To repair the damaged lands, it is necessary to improve their physical and chemical properties. The use of organic matter seems to be a key treatment needed to improve the physical and chemical properties of the soil [3].

A long-term great disaster will occur if the Bangka Regency Government did not implement any innovative breakthrough to address the condition of the former tin mining areas. The biggest threat is the danger of starvation due to food shortages. The food crisis can lead to malnutrition and increase the number stunting cases which, in turn, will lower the quality of human resources. Bangka Regency will be trapped in a lost generation even though the demographic bonus is being looked at. The food crisis will also have an impact on poverty which will cause escalation of social conflict and socio-economic instability in the community, which ultimately will disrupt the development stability.

Food independence to fulfil community food needs is an urgent thing to achieve, and efforts should be made to improve food security, especially in rice production. The need for rice in Bangka Regency is  $\pm 39,600$  tons per year, while the rice production is only  $\pm 6,470$  tons or only fulfil about 16.3% of the total rice need. To meet the demand for rice, it is necessary to make some innovations in an effort to increase rice production. In addition to optimizing existing paddy fields, the critical land used for tin mining activities should be utilized so it can contribute some productive and economic values towards sustainable agricultural development.

## 2. IMPLEMENTATION PROCEDURE

The implementation of Utilization of Ex-Tin Mining Land for Rice Field Cultivation) innovation by farmers in Mekar Farmer Group in Sinar Jaya Jelutung Village, Sungailiat District, Bangka Regency, was carried out by clearing a former tin mining area which was filled with water as high as  $\pm 2$  meters. To prepare the land, a circular embankment is made as a barrier and a channel for water disposal. One of the success factors in this activity was the appropriate application of rice cultivation technology accompanied by integrating the fields and proper implementation the correct Standard Operating Procedures (SOPs). According to the results of the evaluation by BPK (Audit Board of the Republic

of Indonesia), the companies' failure in managing the former tin mining areas was due to the lack of a concrete and holistic-systemic approach to overcome the complexity of the problems in managing former tin mining areas [4]. The innovation succeeded in converting critical land of the former tin mine into potential land by using a concrete and holistic-systemic approach that 128 tin companies had previously failed to do.

The former tin mine managed by the Mekar Farmer Group has now reached an area of 8 hectares. This innovation develops the integration of rice fields with cow farming. The profit-sharing program implemented on the ex-mining land has improved the texture and structure of the soil through the provision of organic fertilizer produced by the cow farming. In addition, through the use of organic fertilizers, lowland rice farming on ex-tin mining land can be operated as organic agriculture so that the rice produced is healthier, free of chemicals and has a higher selling price.

## 3. RESULTS AND DISCUSSION

This change has brought a very significant impact, which can be seen from agricultural activities which are increasing over time in terms of the use of former tin mining critical land by the community. The increase in cultivation area on the ex-mining land has reached 575.3 hectares, with various plants such as rice, corn, sorghum, cassava, sweet potatoes, various fruit and vegetable crops, biopharmaceutical plants and plantation crops grown on the land.

There is another impact on the one of the macroeconomic indicators in Bangka Regency, namely the increase in farmers' income by IDR 3.7 million/month. If this innovation continues to be developed in the next 5-10 years, it is projected that the rice cultivation area alone can reach around 400 hectares, and it is assumed that the rice production may increase by 1,025 tons and it can boost the rice self-sufficiency rate by 3.1 percent.



**Figure 1** The Ex-tin mining land is overgrown with bushes and pits (left) and the ex-tin mining land has been processed into ricefields (right).

In terms of effectiveness, rice productivity can be increased significantly with an average productivity of 4.8 tons/hectare. The average revenue per cost ratio (R/C Ratio) is 1.9. Meanwhile, regular lowland rice cultivation that does not utilize ex-mining land has an

average productivity of 3.9 tons/hectare with an R/C Ratio of 1.5.

Reclamation activities should not only focus on improving the environmental aspect of the former tin mine, but should also consider the socio-economic aspects of the local community's life. Utilization of the former tin mining land for agricultural activities does not only improve the environmental aspects (biodiversity, flora and fauna) of the land, but also support the recovery of the socio-economic life of the community. Therefore, the benefits provided for the local community, i.e., the ability to cultivate crops on the former tin mining land, can be considered as an indicator of the success of post-mining reclamation. If the aforementioned aspects have been considered in a reclamation effort, it means that the reclamation activities of former tin mining land have considered environmental, social, and economic aspects for the community [5].

Before innovation was implemented, the ex-mining land had a lot of gaping holes and an irregular contour, which pose risks of disaster, as the land became a breeding ground for malaria mosquitoes, and there were no crops that could be cultivated there due to the poor soil nutrients and the land became unproductive for farming and agricultural cultivation. This was a threat to food security which in turn can lead to famine, food insecurity, malnutrition, stunting, poverty and social conflict.

Special appreciation was given by the Governor of the Bangka Belitung Islands Province because the rice production in this ex-mining area has exceeded the average yield of Bangka Belitung, producing 4.82 tons of rice per hectare. This achievement has become a pilot model within and outside the region, as well as being developed into an integrated sustainable agricultural system model, and a model for developing other food crops that is expected to increase food security in Bangka Regency.

This innovation can also support the achievement of several agendas of Sustainable Development Goals in Indonesia stated by the United Nations such as Reducing Poverty (Goal 1), Ending Hunger (Goal 2), Good Health and Well-Being (Goal 3), Decent Work and Economic Growth (Goal 8), Infrastructure, Agricultural Industry and Innovation (Goal 9), Reducing Inequalities (Goal 10), Responsible Consumption and Production (Goal 12), Addressing Climate Change (Goal 13), Protecting Land Ecosystems (Goal 15), and Partnerships to Achieve the Goals (Goal 17).

To ensure sustainability, there are a number of strategic steps that have been implemented: (1) Preparation of the draft of Regional Regulations on Sustainable Agricultural Land Development (2) Stipulation of Regent's Regulation Number 73 of 2018

on Management of Ex-Mining Land for Agriculture (3) Decree of the Head of the Agricultural Service Number 39 of 2018 on Implementation of Standard Operating Procedures for Ex-Mining Land Utilization for Cultivation of Food Crops and Horticulture (4) Implementation of Memorandum of Understanding with academic institutions (UGM, UNS, STPP, ITB, IPB, UBB, POLMAN) regarding the implementation of the Tri Dharma of Higher Education (5) MoU with LIPI, BPPT, and BPTP on the application of agricultural technology (6) MoU with PT. Persada Pupuk Indonesia, PT. INHUTANI, and PT. Timah Tbk regarding the Implementation of Agricultural Production Facilities and Land Resources (7) Provision of assistance by the Regional Government through the Department of Agriculture in form of programs or activities through the Regency Revenue and Expenditure Budget (APBD II), Province Revenue and Expenditure Budget (APBD I) and State Budget (APBN).

This innovation's success has also been implemented in several regencies in the Bangka Belitung Islands Province. Some of the regencies that have implemented this innovation are Central Bangka Regency (23 hectares), South Bangka Regency (37 hectares), and West Bangka (16 hectares). In addition, it also inspires regencies outside the province, including Jepara Regency.

Furthermore, it has inspired universities, both in Indonesia and abroad, to develop field research laboratories in various countries that have similar characters with Bangka Regency, including Universität für Bodenkultur Wien Department für Wald-und Bodenwissenschaften / University of Natural Resources and Life Sciences, Vienna Department of Forest and Soil Sciences AUSTRIA, Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) / Federal Institute for Geosciences and Natural Resources GERMAN, Forum of Deans of Agriculture at state universities in SUMATERA, and Universitas Gadjah Mada.

#### 4. CONCLUSION

The ex-tin mining area can be a threat when it is not managed properly. There are many negative consequences that may only happen after a long period of time in the future. The loss of soil nutrients will limit the productivity of the land which will then have an impact on the production in the agricultural sector. This will impact not only agriculture, but in a series of events, this will also lead to a decline in economic growth, and a rise of inflation, which in turn can lower the growth and development of human resources.

Utilization of Ex-Tin Mining Land for Rice Field Cultivation is an innovation that can be implemented easily because it makes use of simple technology, so it

is easy to replicate. It only requires a high degree of commitment from the Regional Head. This innovation has inspired farmers in Bangka Regency to develop commodities other than rice, such as corn, sorghum, cassava, sweet potato, chili, eggplant, peanuts, long beans, cucumber, watermelon, melon, shallots, fruits, and biopharmaceutical plants. Certainly, it is implemented on a wider scale, the land that was damaged by tin mining can be fully optimized in order to maintain food security, economic stability, and the survival of the community.

## REFERENCES

- [1] R. Ferdiansyah, September 2<sup>nd</sup>). Media Indonesia. Retrieved from Media Indonesia: <https://mediaindonesia.com/nusantara/256949/mimpi-reklamasi-sulit-terwujud>, 2019.
- [2] R. Ferdiansyah, August 1<sup>st</sup>). Media Indonesia. Retrieved from Media Indonesia: <https://mediaindonesia.com/nusantara/250541/hingga-juli-ada-12-penambang-ilegal-tertimbun-longsor>, 2019.
- [3] Sukarman and R.A. Gani, “Lahan Bekas Tambang Timah di Pulau Bangka dan Belitung, Indonesia dan Kesesuaiannya untuk Komoditas Pertanian (*Ex-Tin Mining Land in Bangka and Belitung Islands, Indonesia and Its Suitability for Agricultural Commodities*)”, *Jurnal Tanah dan Iklim* 41(2) (2017) 101-114.
- [4] Audit Board of the Republic of Indonesia, *Laporan Badan Pemeriksa Keuangan 2007-2013 (2007-2013 Report of Audit Board of the Republic of Indonesia)*. Jakarta, Badan Pemeriksa Keuangan, 2013.
- [5] Asmarhansyah and R. Hasan, “Reklamasi Lahan Bekas Tambang Timah Berpotensi sebagai Lahan Pertanian di Kepulauan Bangka Belitung (*The Potential of Land Reclamation of Ex-Tin Mining Land into Agricultural Land in the Bangka Belitung Islands*)”, *Jurnal Sumberdaya Lahan* 12(2) (2019) 73-82.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

