Original Research Article

THE CLIMATE CONSIDERATIONS IN REVITALIZING AGRICULTURAL SECTOR IN THE PROVINCE OF EAST KALIMANTAN

ABSTRACTS

The purpose of this study is to identify the concept of food estate which placed on the basis of integration sectors and sub-sector accordingly to an agribusiness system in order to utilize the resources optimally and sustainably. Furthermore, professionally managed, supported by qualified human resources, appropriate technology as well as environmentally qualified referred to the existence climate data (especially on the rainfall and its temperature) using agro-based approaches. Knowledge and capacity of the farmers need to be improved so that available technology can be applied properly. In lack of synergy among authorized agencies, the establishment of Food Estate Management Authority is also recommended. A set of action plans as recommendations for the policy makers in the province of East Kalimantan has been formulated.

Keynote: *Food estate, agriculture, climate, crops, farming,*

1. INTRODUCTION

Agriculture plays an important role in East Kalimantan's economy but since the 1990s the sector has been characterized by stagnation and low productivity due to years of declining private and public sector investment. The recent increase (in real terms) in public spending on agriculture is largely a reflection of poorly targeted subsidies. There is a vital need for a rural income and employment strategy based on the promotion of agricultural diversification into high value commodities, coupled with efforts to raise productivity and stimulate the growth of non-farm rural enterprises to create jobs and reduce poverty.

Despite this, agriculture remains however, a key sector of the economy, providing not only income and work opportunities for a large share of the population living in rural and peripheral areas but also makes a major contribution to household food security. In accordance to realize the vision of The Province of East Kalimantan whereas its theme is to develop The East Kalimantan to become the center of agro-industry and the leading energy producer for the welfare of its community. East Kalimantan provincial government decided to change the strategy of its regional economy which is currently based on oil and coal towards local economic development based on industrialization and agri-business. To be able to develop the agriculture commodities in the future, it is important to no longer practising the conventional way but perhaps should be done through the industrialization emphasising on the increased of productivity. By doing this way, the value added will rise through an integrated approach together with the industrial cluster which range from the upstream industries up to downstream industries, including the complementary industry and other related industries.

2. METHODOLOGY

This research was conducted in East Kalimantan and focused on Food Estate area. In the study area, there are three farming systems practiced in the food Estate; they are rice, second crops and oil palm. Existing farmer actions related to climate change mitigation action by farmers in their farming system were reviewed through a farm household questionnaire. Focus Group Discussion was conducted to identify the main variables related to climate change mitigation. Based on the FGD, infrastructure, technology and institutional knowledge and experiences in climate change are predicted as the main variables or key

driving variable for mitigation of climate change. Then, specific actions and strategies were determined based on the most relevant variables under a given future condition.

3. RESULT AND DISCUSSION

3.1. Agricultural Sector Policy

The agricultural sector is undoubtedly will become a superior economic commodity of the future, it is proved that capable of absorb high labour requirement at the same time it is also a strategic way in order to reduce the unemployment and poverty push. Though its role in the economy has declined, agriculture is still a very important source of livelihood for people in rural areas who account for around 40% of the total population. Moreover, East Kalimantan still has the availability of land spacious that suits to agro-ecological agricultural development. Thus, East Kalimantan province has adopted certain policies whereby undertake its strategic measures. Agricultural development future is now directed to a "System and Agribusinesses Effort".

Therefore, East Kalimantan has been preparing a new economic locomotive that is based on renewable natural resources, where the approach is no longer exporting raw materials, but an exporter of processed materials with competitiveness, value added and can provide a significant multiplier effect for a sustainable welfare. Two major strategies adopted is to develop industry existing and to build and develop agriculture-based industries with economies of scale and cluster approaches to industry. The performance of agricultural sector in East Kalimantan currently is showing improvement, but not optimal yet (Table 1), due to the population continues to grow while the agricultural land conversion for plantations and mining still occurs.

Table 1. Rate of Rice Production and Consumption in East Kalimantan (tons / year)

Indicator	2018	2019	2020
Paddy	755.561	788.111	752.616
Rice	560.195	577.390	546.771
Total Consumption	620.918	672.568	690.219
Deficit / surplus	-60.723	-95.178	-143.441

Source: Anonimous (2021)

3.2. Rice-Food Estate Program

The concept of food estate is placed on the basis of integration of sector and sub-sector in an agribusiness system to utilize resources optimally and sustainably, professionally managed, supported by qualified human resources, appropriate technology and environmentally sound solid institutional. Food estate directed to a deeply rooted system of agro-based rural empowerment in indigenous / local which is a basis for development of the region.

Accordingly, to the Government of East Kalimantan through East Kalimantan Rise Programme 2013 revitalizing agriculture in the broad meaning to ever provide a greater contribution to national and regional economic growth and improve the welfare of the community. One out of which is the development of large-scale cultivation of food (Food Estate) whereby part of the mandate of the Presidential Decree No. 5 of the year of 2008 on Economic and Instruction Program Focus on the first year which is the year of 2010 on Accelerating Implementation of Priority National Development in the year of 2010.

East Kalimantan Provincial Government, examine it carefully and fully aware that East Kalimantan has huge area possible to be utilized for agricultural development. To be able to support such determination is currently the available land area is about 343,461 hectares spread across among 10 districts ready to be at disposal of the Investor (Table 2).

Table 2. Available land area estate for Rice-Food Programme

District / City	Indication of Potential Land (Ha)	Availability of Land *	Remark
Berau	11.,901	62,751	
Bulungan	73,977	50,000	Delta Kayan Estate
Kutai Barat	56,942	71,000	
Kutai Kartanegara	76,827	36,347	
Kutai Timur	39,546	62,630	
Malinau	1,306	1,933	
Nunukan	12,434	46,700	
Penajam Paser Utara	9,474	1,400	
Paser	15,159	5,500	
Tanah Tidung	4,917	6,200	
Total	302,484	344,461	

Remark: Anonimous (2013)

Food Estate should be realized integrated by both central and regional governments together with private roles in the way to support each other. Furthermore, East Kalimantan currently is into the program of integrated with the other three other provinces in the island of Borneo. Its aim is to achieve an accelerated development of Kalimantan as the National Economic Corridor. Besides, Rice-Food is as well very suitable to the enactment of East Kalimantan going into the role part of the Master-Plan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI).

With the MP3EI estimating investment or capital investment in various development fields in East Kalimantan will rapidly develop. The Government's promised to support with its further enhanced, especially on the agricultural sector or food in accordance with its agreement that East Kalimantan provincial government is willing to support the national food with food estate program in East Borneo (Suswono. 2011). Prepared ground currently is less than 344 461 hectares, not yet meet with the needs of the central government whereby as much as 500 thousand hectares needed, with an estimate investment of approximately IDR.9 Trillion. Overall this food development program will ultimately developed East Kalimantan turning itself to become a new barns of Indonesia. East Kalimantan definitely will encourage food security for itself and as the whole national.

Negative's impact of the development of Food Estate may be happen on the marginalization of the role of farmers that may threatened by the expansion of large-scale agricultural enterprises as well as large-scale land acquisition by the foreign investors and this should be in charge wisely through institutional arrangements. Rice-Food Estate managed by the concepts of modern agriculture based on science and technology, as well as the capital of the modern organization and management. Management was set up in partnership between investors and indigenous peoples to address the notion of equality and it is also to answer wisely the public opinions on Food Estate that will make people as labourers on their own land. Accelerating the realization of investments with ease of licensing both at the central or local government and district government support in ensuring clear and clean land and design a partnership between investors, local communities and local governments to avoid social and cultural conflict in the future.

Seriousness and commitment of The East Kalimantan Government in realizing the Food Estate has attracted major investors to synergistically manage this program. To this day a total of 18 state-owned enterprises have expressed their willingness to invest to be able them to ever execute the Food Estate program (Table 3).

Table 3. Investors and Commodity Type

Investor	**Land (Ha)**	**Commodity type**	**Location (District)**

PT SHS	32 000	Paddy	Berau, East Kutai, Bulungan
PT PERTANI	30 000	Paddy and Maize	Paser
PT PUSRI Holding	30 000	Food Industry	West Kutai, Tana Tidung
Solaria Group	5 000	Paddy, Maize, Soya, and Fish	Bulungan
PT MIWON	5 000	Maize	Bulungan
PT Berau Jagung Raya	10 000	Maize	Berau
PT Anugerah	2 000	Soya, Maize	Berau
PT INTRACO Penta	10 000	Maize, Livestock	Kutai barat, Nunukan
PT Bangun Desa Pangan	25 745	Paddy, Maize	Penajam Paser Utara, Kutai Kartanegara
PT Bosowa	15 000	Maize, Paddy	Nunukan, Berau
KADINEast Kalimantan	33 400		East Kutai
PT Harim	11 000	Maize, Livestock	Still review locations

Source: Anonimous (2013)

3.3. Consideration of Agro-climatology

Food Estate Development in East Kalimantan was not without obstacles. When looking at the data yields productivity (Figure 1) below, it was obviously difference between the four main of rice production's provinces namely; (East Java, Central Java, West Java and South Sulawesi) with the other 2 main of rice production in Kalimantan (South Kalimantan and East Kalimantan).

The condition may occur when looking at climate factor between the two regions. Why? Because this main 4 rice production's province is generally included in the monsoon rainfall pattern. These areas have a clear distinction between the period of the rainy season and the dry season period then grouped in Zone Season (ZOM), the type of precipitation that is Unimodial or single wave type/A rainy model (the peak of the rainy season and a performance peak season). While the other 2 provinces in Kalimantan is the type of rain equatorial region, whereas the area is dominated by Bimodial monthly rainfall patterns (double wave/C rainy model) with a maximum of two peak rainy season (March and October) and most of the year is in the criteria for the rainy season (Figure 2) below.

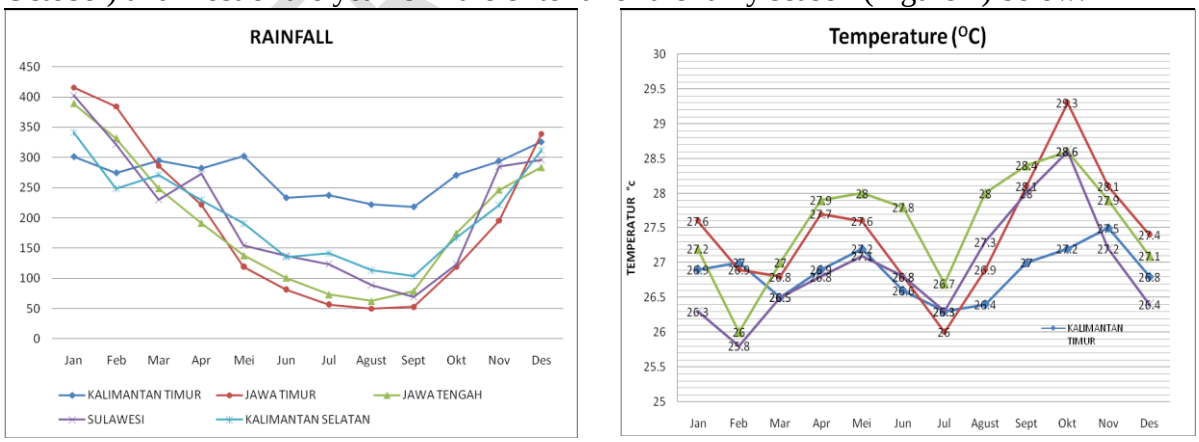

Figure 2. Graph average Rainfall and Temperature on 5 Provinces Rice Production in Indonesia (Sujalu, 2015)

Observation decades suggests that disruption to availability and food security in East Kalimantan caused by the changes in the bulk of the 42%, while the natural disasters and nuisance organisms and other factors reaching out up to 58%. One confounding factor for the

decline in agricultural production in East Kalimantan is dominated by upland rain especially the fluctuating climatic elements.

Soil fertility as the factors of inhibiting is increasing in land's productivity it is relatively easy to overcome with fertilization treatments. However, the climate of the elements inhibitory factor is very difficult to increase land productivity by using technology that exists today. It will be more obvious when studying data on average monthly temperature. Conditions on monthly average temperature basis in a region is also showed the availability Heat Unit (heat units). Heat units can be used to estimate the age of the plants and also the quality of the harvest of grain. Graph average temperature of 6 rice production centers, can be seen in Figure 2, it can be assured that the age and quality of rice and second crops of grain in Java and Sulawesi is in the same field conditions relatively shorter than in is East Kalimantan.

In some cases, certain temperature level increased in temperature caused by an increase of transpiration further may reduce the productivity of food crops, increased of water consumption, accelerates ripening fruits / seeds, lowering the quality of results and develop of variety of pests and diseases (OPT). IRRI (2007) stated that at the certain temperature level, any increase in temperature will $1^{o}C$ cause lower its rice production by 8-10%. The result shows that there has been a decline in agricultural output of more than 20% when the temperature rises of more than $4^{o}C$ (IRRI, 2007 and FAO, 2005).

Using a simulation model of the plant, John Sheehy (IRRI, 2007) states that the increase in rice yield due to increase of CO_2 concentration of 75 ppm is 0.5 tons/ha and yield reduction due to increase temperature of 1°C is 0.6 tons / ha. According to Peng et al. (2014), any increase in minimum temperature of 1°C will automatically reduce rice yields by 10%. Central Java; Yogyakarta, West Java and other areas, especially in the lowlands, it will decrease food production although this opinion still needs to be studied in more depth.

4. CONCLUSION

Despite fulfilment of precondition for successful food estate, the high hope, and spirit, as well as efforts that have been made, the program has not shown encouraging results after six years of its commencement. A number of problems have been identified, including the overlapping land tenures, salt water intrusion, acid sulphuric soils, ineffective irrigation infrastructure, insufficient production factors, pest infestation, and lack of access to the neighbouring community activity centres. Although farmers have adequate experience in Food Estate farming system, not all farmers have knowledge and understanding of climate change and sources of climate change. Otherwise, there are farmer's existing practices which have been done for mitigating climate change in their farming system such as:

1. The increasing of crop production where it is only possible through the addition of cultivated area
2. Further research is definitely needed in order to get tolerant rice with the environment of East Kalimantan's climate

REFERENCES.

Anonimous. 2013. Regional Development Planning Agency report in January 2012. BAPPEDA The Provinve of East Kalimantan

Anonimous. 2021. East Kalimantan Province in Figures 2021**.** Central Bureau of Statistics the Province of East kalimantan

Food and Agriculture Organization of United Nations [FAO]. 2005. Impact of climate change and diseases on food security and proverty reduction. Special event background document for the 31 st session of the committee on world food security. Rome, 23-26 May 2005

International Rice Research Institute *(*IRRI*)*. 2007. Water management in irrigated rice: coping with water scarcity. Philippines

Jong, H.N. 2023. Report: Indonesia's 'food estate' program repeating failures of past projects. Mongabay Series: Indonesian Forests

McCarthy J F and K Obidzinski. 2015. Responding to food security and land questions: Policy principles and policy choices in Kalimantan, Indonesia. Conference Paper No. 47. Land grabbing, conflict and agrarian-environmental transformations: perspectives from East and Southeast Asia. An international academic conference, 5-6 June 2015, Chiang Mai University

Nurmawati. 2015. Implementation of Delta Kayan Food Estate (DeKaFE) Development Policy in Tanjung Buka Village, Bulungan Regency.

Peng, S, Rebecca C. Laza, Romeo M. Visperas, Gurdev S. Khush, Parminder Virk and Defeng Zhu. 2004. Rice: Progress in Breaking the Yield Ceiling. Proceedings of the 4th International Crop Science Congress, Brisbane, Australia

Regional Development Planning Board (BAPPEDA). 2012. East Kalimantan Rice-Food Estate Program.

Sujalu, A.P. 2015. Study of Changes in Forest Cover and Characteristics of Climate in The Province of East Kalimantan. Doctoral Research at Faculty of Forest the Mulawarman University

Suswono. 2011. The Indonesian Food Security in the Perspective of Global Economy and National Sovereignty. Paper presented at the International Conference on "The Future of Global Food Security and Safety: Issues and Justification", IPB International Convention Center, Bogor.

Wardis G. 2014. Food Security Systems in Indonesia: Challenges and Implications to Food Security in Maluku Occasional Paper No. 54 (Kagoshima University Research Center for the Pacific Islands)