The establishment of sustainable food farmland area in District of Aceh Besar

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Abstract. Conversion activity of paddy land to non-agricultural use of the growing opportunity to threaten national food security. One anticipation step is to set the sustainable food farming land (LPPB). This study aims to provide information about the food farming land that should be protected from the threat of conversion in the district of Aceh Besar. The approach taken is through the classification of land based on biophysicalpotency. Data obtained through survey, observation, secondary data collection, and literature studies. The study results indicate that there are four categories of paddy land, namely: the main land I (9 districts), the main land II (7 districts), the secondary land I (5 districts), and secondary land II (2 districts). The main land is the land which is suggested to be an everlasting land (sustainable) for reliable biophysical characteristics, while the secondary land could be converted as long as it is based on the main reason and more urgent.
Keywords: Food security, farmland, sustainable

Introduction

In Indonesia, the converted paddy field to non-agricultural use became a highlight of many parties after Director General of Food Crops Production successfully identified more than 160 million hectare of national paddy field converted during period from 1981 to 1999. Siswadi (2009) stated that this activity will increase and estimate to reach 14-15 % per year. This rate is very fantastic if it is compared to same experience at various countries in the world. Xiangzheng *et al* (2002) indicated that United Stated lost its agricultural land 0.1-0.3 % per year for constructions. Agricultural land in Japan decreased 1 % per year during last three decades for the same interests. The same trend can also be found in South Korea. Most of European countries have experienced the decrease of agricultural land about 1.2-1.5% per year since 1975 to 1995.

This fact seems easy for some of people and assumes that the decrease can be replaced. This such of paradigm of thinking is not wise concerning the limitation of land availability. Even the land used for paddy needs different prerequisite with other land use such as fertility rate, climatic suitability, water availability and topography. Land which is suitable for agriculture is exactly suitable for other uses, but it is not always working in reverge. The effort of substitution through creating of new paddy field is possible to be done, however according to Asyik (1996) it needs a longer time which is about 10 years for ecosystem improvement and its productivity is usually lower caused by biophysical obstacle. Pasandaran (2006) said that the level of new paddy field productivity is only 1.5-3 ton/Ha. This means that it needs 4-5 Ha of new paddy field to replace 1 Ha of the loss productive paddy field. Besides, the effort of creating the new paddy field is also facing the budget constraint. If it is reviewing the current situtation, the government faces difficulties to maintain the existence infrastructure, therefore, to build the new infrastructure mainly the new irrigation is considred difficult. Many irrigated projects are not properly maintained.

Unfortunately, conversion activity of paddy field also leads to overinvestment. It can be imagined that it was a huge investment done by government to provide the agricultural infrastructure since new regime era (masa orde baru). Then it seemed useless as the paddy field converted to non agricultural use. For assuring this conversion, many people give their effort to develop the technological capability in attempt to enhance the paddy field productivity. However, nowadays technological innovation of our agriculturehas stagnated. According to Apriantono (2007), the achievement of our paddy productivity showed saturation point, hinger than America and china, it means the increase of productivity is only possible through land expension.

Certainly, the effort of land expension is possible as long as the conversion activity is still permitted. Based on this consideration, the government through policy of regulatory declares UU No.41 2009 about Protection of Agricultural Paddy field and Food Sustainability or it is called timeless land. The timeless land of agriculture is a policy about land use, where the

government allocates 15 million Ha paddy field and moorland which can only be used for agricultural activity and they are not permitted to convert to other users. This paper aims to provide information about classification of biophysical condition to paddy field zone in Aceh Besar District, Aceh Province-Indonesia that can become as refference for determinating zone of Protection Paddy field and Food Sustainability.

Materials and Methods

This research focus on center zone of paddy production in Aceh Besar District that covers on 23 Subdistricts. Geographycally, research zone is located between 5.2 ^{0} – 5.8 ^{0}U dan 95 ^{0} – 95.48 ^{0}E. The research was conducted with using various of related information which obtained through survey, observasion, collecting of secondary data and literature study. Appraisal of paddy field quality for interesting of classification is done based on three parameters of biophysics. They are irrigation status, cropping index and productivity level. Variation of this three parameters forms four grades of paddy field which are called as the 1st main paddy field, 2nd main paddy field, 1st secondary paddy field and 2nd secondary paddy field. The zone of main paddy field is the protected zone, whereas the zone of secondary paddy field can limitly be converted that accorded to main reasoning and urgency (Table 1).

Table 1. Criteria of paddy field quality

No	Status of Irrigation	Cropping Index (CI)	Productivity (ton/Ha)	Grade Land	Zone
1	Technical/Semi-technical	≥2 times planted	≥4,50	1st Main paddy field	Protected
2	Technical/Semi-technical	≥2 times planted	≤4,50	2nd Main paddy field	Protected
3	Technical/Semi-technical	≥2 times planted	≥4,50	2nd Main paddy field	Protected
4	Technical/Semi-technical	≥2 times planted	≤4,50	2nd Main paddy field	Protected
5	Simple/rainfed	≥2 times planted	≥4,50	2nd Main paddy field	Protected
6	Simple/rainfed	≥2 times planted	≤4,50	1st Secondary paddy field	Limited Conversion
7	Simple/rainfed	≥2 times planted	≥4,50	1st Secondary paddy field	Limited Conversion
8	Simple/rainfed	≥2 times planted	≤4,50	2nd Secondary paddy field	Limited Conversion

Source: Modified from Abdurrahman *et al* (2005) and BPN (2004)

Results and Discussion

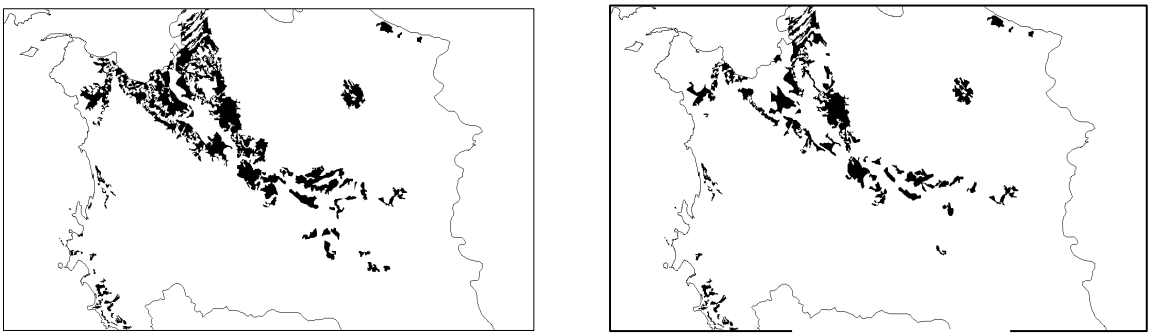
Aceh Besar District considered as one of zone of paddy production center in Aceh Province-Indonesia. It has area of paddy field 30.421 Ha. This district is capable of giving contribution around 10.31 % of total paddy production in Aceh. Its location which border directly with Banda Aceh city, the capital city of Aceh province, has led Aceh Besar to become a district which is very vulnerable to conversion activity of paddy field. According to statistical data, potential of villages in Nanggroe Aceh Darussalam (BPS NAD 2008), comparing to other 23 districts/cities in Aceh, Aceh Besar has highest potential to conversion activity of paddy field for needing of settlement, industry, stores as well as for other needs.

The department of Food Crops and Horticulture of Aceh Besar District (2009) identified that loss of paddy field which caused by conversion of 673 Ha area or equal to 2.27 % of the total paddy field. Even The result of GIS analysis showed that since 1978-2009, the paddy field in this district decreased as many as 39.89 % and if it is averaged equal to 1.28 % per year. The cause factor and outcome effected from conversion of this paddy field are not explained in this paper, however it needs to be given stressing that if this activity is not controlled, so it have very potential as threat for prospect of food security in province level as well as national level. The effort of controlling that is very effective is to slow down or to stop the rate of conversion through determination of agricultural land for food sustainability. The

research result indicated that there are four categories of paddy field in Aceh Besar district, namely:

1. The main Paddy field I

The main paddy field is paddy field which has reliable biophysical criterion. It has enough water resource and equipped by technical irrigation system/semi-technical, so that it can be planted paddy more than or equal to twice in 1 year, therefore it can reach level of productivity over or equal to 4.5 ton/Ha. This land is the zone that must be protected, kept and maintained its conservation from conversion. The zone which is classified in this category consists of 9 districts, they are: Blang Bintang, Darussalam, Indrapuri, Ingin Jaya, Kuta Baro, Kuta Malaka, Montasik, Simpang Tiga, and Suka Makmur. Seven of them were irrigated by technical irrigation, whereas 2 of the rest (Kuta Baro and Kuta Malaka) are still irrigated by semi-technical irrigation. All of them in these districts were planted paddy a number of 2 times in a year. The level of productivity which reached at this zone is around 4.9 ton/Ha-5.2 ton/ha. The zones that have level of productivity 5.2 ton/Ha consist of seven subdistricts, they are : Blang Bintang, Darussalam, Indrapuri, Ingin Jaya, KutaBaro, Montasik, and Suka Makmur, whereas 2 of the rest are Kuta Malakaand Simpang Tiga have level of productivity 5.1 ton/Ha dan 4.9 ton/Ha.



Year 1978 Year 2009

Figure 1. Decreasing of paddy field in Aceh Besar district base on result of GIS analysis (Yasar *et al.,* 2010)

Table 2. Zone of the main paddy field I

No	Name of District	Irrigation Status	CI	Productivity
1	Blang Bintang	Technical	2	5.2
2	Darussalam	Technical	2	5.2
3	Indrapuri	Technical	2	5.2
4	Ingin Jaya	Technical	2	5.2
5	KutaBaro	Semi-Technical	2	5.2
6	KutaMalaka	Semi-Technical	2	5.1
7	Montasik	Technical	2	5.2
8	Simpang Tiga	Technical	2	4.9
9	Suka Makmur	Technical	2	5.2

2. The main paddy field II

The 2nd Main paddy field is considered as potential paddy field, but it is only from behaving the three of biophysical criteria, there is one shortage compared to the 1stmain paddy field. The shortage is possible to reach two with requirement, like irrigation status as technical or semi-technical. This is caused by cropping index and the productivity is an outcome factor from irrigation function. In general, if irrigation system was enough,cropping index and productivity will easier enhanced. There are four possibilities of paddy field which includes in category to the 2nd main paddy field. They are:

a. Land which its irrigation status is technical or semi-technical and planted the paddy more than or equal to 2 times per year, but result of its production is less or equal to 4.5 ton/Ha.

b. Land which its irrigation status is technical/semi-technical and result of its production more than or equal to 4.5ton/Ha, but it is only planted less than or equal to 2 times per year
c. Land which its irrigation status is technical/semi-technical, but it is planted less than or equal to 2 times per year and its production is also less than or equal to 4.5 ton/Ha.
d. Land which its irrigation status is simple/rainfed, but it can be planted more than or equal to 2 times per year and its production is more than or equal to 4.5 ton/Ha

This land category must also be protected, kept and maintained its conservation from threat of conversion. The zone that includes 7 subdistricts Darul Imarah, Darul Kamal, Krueng Barona Jaya, Kuta Cot Glie, Lembah Seulawah, Lhoong, and Seulimum. Amongs 7 sub districts which classified into the 2nd main paddy field are 6 sub districts which its irrigation status is simple/rainfed, butthey can be planted 2 times per year and result of its production is from 4.9 ton/Ha to 5.2 ton/Ha. Whereas Krueng Barona Jaya sub district had its irrigation status semi-technical with level of reaching production 4.9 ton/Ha, but it can only be planted 1 time per year. The phenomenon above shows that the zone of paddy field at 6 sub districts is basically land with level of an adequate rainfall and water resource. It is only caused by them, so the zone has not yet a facility of adequate irrigation.

Table 3. Zone of the 2nd main paddy field

No	Name of Sub district	Irrigation Status	CI	Productivity
1	Darul Imarah	Rainfed	2	4.9
2	Darul Kamal	Rainfed	2	4.9
3	Krueng Barona Jaya	Semi-technical	1	4.9
4	Kuta Cot Glie	Rainfed	2	5.1
5	Lembah Seulawah	Simple	2	5.1
6	Lhoong	Simple	2	5.1
7	Seulimum	Simple	2	5.1

3. The 1st secondary paddy field

The 1st secondary paddy field is the paddy field which has simple/rainfed irrigation and has cropping index (CI) more than or equal to 2 time per year or level of productivity more than or equal to 4.5 ton/Ha. This type ofpaddy field has only one obstacle. Nevertheless, it does not mean that the paddy field which includes in this category can be converted. Similar to the 2nd main paddy field , the 1st secondary paddy fieldis also type of paddy field which has potential for paddy planting development, but it is still needed an greater effort for biophysical condition improvement. This type of paddy field is estimated that the paddy field is arable with availability of an adequate water resource, but it is only not yet of optimum using and development. The zone which classified in the 1st secondary paddy field is 5 sub-districts. They are Baitussalam, KotaJantho, Lhoknga, Mesjid Raya andPeukan Bada. All of them are arable paddy field with cropping index 1 time per year, but level of its productivity is highly classified. That is from 4.5 ton/Ha to 4.9 ton/Ha.

Table 4. Zone of the 1st secondary paddy field

No	Name of sub district	Irrigation Status	CI	Produtivity
1	Kota Jantho	Rainfed	1	4.5
2	Lhoknga	Rainfed	1	4.9
3	Peukan Bada	Rainfed	1	4.8
4	Baitussalam	Rainfed	1	4.6
5	Mesjid Raya	Rainfed	1	4.5

4. The 2nd secondary paddy field

The 2nd secondary paddy field can also be called as land which has low biophysical criterion. This land only has not irrigation system, so that process of paddy production depends on rainy season as resource of water availability, because of that capability of plant and production are also low. The zone which includes in this category is Leupung and Pulo Aceh sub-districts. Geographically, both of them are located at coastal area. Even Pulo

Aceh sub-district is island sub-district which separated by sea. Both Leupung and Pulo Aceh, They are not included in produced zone of mainstay paddy in Aceh Besar district. Many zones of paddy field which is damaged by tsunami disaster, because its potential is less well, so that this zone is less become as main priority in order to recover the paddy field. The land which is called as marginal land is not prohibited if it is converted to non-agricultural use, but this land does not become become as converted activity target. Because of that construction in non-agricultural sector can be directed to this zone.

Table 5. Zone of the 2nd secondary paddy field

No	Name of sub-district	Irrigation Status	CI	Productivity
1	Leupung	Rainfed	1	0
2	Pulo Aceh	Rainfed	1	0

Conclusions

Food problem can be caused by various factor, for example natural disaster (flooding and dry season), attacking of pests and diseases, damaging of agricultural infrastructure (irrigation), unstable of market condition and conversion of paddy field. Agronomical analysis, all of factors have property and mechanism that are different in behalf of food security. However, comparing to other factors, generally propertyand mechanism of converted land are looser. This is caused by outcome which effected permanently, whereas another factor is incidental. It means that the problem which effected is only appearing if the case was happening. But the case of converted land, the problem which effected will impact for long time even the case is over. The decline of rice production that is caused by land converted is not recovered as soon as possible in natural condition. The effort for slowing down or stopping the rate of this land converted is a wise way for limited availability of land in day by day, whereas the need of food will continuously increase. Land which has good biophysical characteristic must be obtained awareness from threating of conversion.

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