

Value Changes of Lebak Swamp Land over Time in Jakabaring South Sumatra

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ABSTRACT

The research aimed to assess value changes of lebak swamp land over time in Jakabaring South Sumatra. This study was conducted in Jakabaring located in the Southern part of Palembang city. The research used mix methods of quantitative and qualitative approaches and describe the research area. The research resulted that Jakabaring area can be divided into three regions, namely North Jakabaring (around 1,544.13 ha or 57.19 %), East Jakabaring (about 809.46 ha or 29.98 %) and South Jakabaring (around 346.41 ha or 12.83 %). Total population was around 232.369 people in 2000, became 262.390 in 2015 and 280.692 people in 2030. The increasing in high population will give pressure to land use changes. Population increases and land use changes cannot be avoided, but they can be only managed properly. The dominant order of land use before landfills namely lebak swamp, settlement/industry, rice fields, swamp bush, agriculture fields, swamp forest, infrastructure, fish ponds, and garden including open spaces. In 2030 it will predictably change, i.e. settlement/industry, garden including open spaces, swamp bush, infrastructure, fish ponds, lebak swamp, rice fields, agriculture fields, and swamp forest. Almost all types of land use changes are driven by the government, meaning that the government is very dominant in determining land use change, whereas the private sector plays only a small role in the land use changes especially for lands with high economic impacts. Land use change initiated by the farmers is very limited and the smallest because farmers are just seek a livelihood at small-scale level.

Key words: Value changes, land, time, Jakabaring South Sumatra

INTRODUCTION

Land resource plays a very important role in all sectors of economic development because the land serves as a place to accommodate all economic development activities. Land resource cannot be renewed and very limited, however land needs increase continually in line with population growth (Eko and Rahayu, 2012, Wildayana, 2003a, 2003b). We need to manage land resources optimally, effectively and efficiently, thus all land resource can be utilized by the whole society (Armanto, 1995, 2002, 2003, 2005).

Lebak swamp in South Sumatra covers an area of 1.1 million ha and has been utilized

approximately 368.690 ha and the rest which is still not utilized around 731.310 ha (Direktorat Rawa dan Pantai, 2009). Jakabaring lebak swamp is located directly adjacent to Palembang city, therefore this region receives direct pressure from the economic development of Palembang. The high development of Palembang causes some issues to public opinion, such as an inefficient use of lebak swamp land, land speculation, complexity of land ownership status, commercialization of uncontrolled land prices and any others (Busri, 2014, Armanto, 2014, Wildayana *et al.*, 2008).

In the lebak swamp utilization, there are many constraints not only in the forms of physical, chemical and biological barriers, but also social and economic aspects (Sjarkowi *et al.*, 2007, Wildayana, 2006a, 2006b, 2014, 2015). In fact all the problems were rooted in balance sensitivity of lebak swamp ecosystem

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or touch on some upstream developments to lebak swamp ecosystem that always brings poorly problem on utilization of lebak swamp (Imanudin *et al.*, 2010a, 2010b, 2011, Imanudin and Armanto, 2012). Thus, it should also be researched not only the potential of lebak swamp, but also some appropriate technologies for lebak swamp ecosystem over time (Armanto *et al.*, 2010, 2013, 2016).

After Jakabaring was mostly landfilled in 1989, then most of agricultural issues especially for agricultural production in the region is marginalized. Before landfills, Jakabaring land was regarded as social community functioning, now Jakabaring land serves as a very important economic function and some people try to gain as much as possible benefits from the Jakabaring lands. Therefore this research aimed to assess value changes of lebak swamp land over time in Jakabaring South Sumatra. The research result is expected to be useful for determination of policy directions and strategies in utilization and development of lebak swamp effectively, efficiently and sustainably and it is able to be used as a reference for lebak swamp elsewhere.

METHODS

This study was conducted in Jakabaring located in the Southern part of Palembang city. The research used mix methods of quantitative and qualitative approaches and describe the research area. Respondents were selected by purposive sampling. The research used descriptive and analytic method which describes condition and problems. These methods are as follows: interview guide, in depth interviews, observations and focus group discussion. The data have been collected, processed to be described quantitatively and qualitatively.

RESULTS AND DISCUSSION

This research is dealing with value changes of lebak swamp land over time in Jakabaring South Sumatra. Some important components

will be discussed in this paper, namely administrative regional division of Jakabaring, population and livelihoods, distribution of land uses and changing value of lands over time.

Administrative Regional Division of Jakabaring

Based on its administrative regional position, the area can be generally divided into three regions, namely North Jakabaring is located in Palembang city, East Jakabaring belongs to Sub district of Rambutan Banyuasin and South Jakabaring is a part of the Sub district of Pemulutan Ogan Ilir (Table 1).

North Jakabaring is the most dominant part of Jakabaring with an acreage of 1,544.13 ha (57.19 %). It is precisely located in the North West of Palembang city including three Sub districts, i.e. Seberang Ulu I, Seberang Ulu II and Plaju. East Jakabaring is sited in Eastern part of Jakabaring and included to Sub district Rambutan Banyuasin that covers an area of 809.46 ha (29.98 %). South Jakabaring is the narrowest part of Jakabaring and is located in Southern part of Jakabaring and belongs to the administration area of Sub district Pemulutan Ogan Ilir with an acreage of around 346.41 ha (12.83 %). The North Jakabaring is more dominantly developed and its land use is also dominantly converted from agricultural to non-agricultural uses compared with those in East and South Jakabaring.

Because it is located in three administrative regions (namely Palembang city and two Districts of Banyuasin and Ogan Ilir), then not only the physical and socio-economic issues are becoming complicated, but also an institutional issue of its governmental management needs to be studied comprehensively.

Busri (2014) states that the acreage of Jakabaring is around 2,666 ha, while the result of Landsat imagery interpretation shows Jakabaring area is 2,700 ha. Its acreage difference (about 34 ha) is due to different techniques of interpretation and the use of different Landsat images. In addition, this

research calculated all landfills by both government and private sector, while Busri

(2014) emphasized on Jakabaring landfills funded by governmental sectors only.

Table 1. Administrative regional division of Jakabaring area

Nr	Jakabaring Site */	Acreages (ha)	Percentage (%)
1	North Jakabaring	1,544.13	57.19
2	East Jakabaring	809.46	29.98
3	South Jakabaring	346.41	12.83
Total		2,700.00	100.00

Source : */ It was calculated and interpreted on the basis of Palembang land use map (1: 250,000 scale) and Landsat 2014 as well as Google map 2014 as well as field survey (2015)

Population and Livelihoods

According to BPS Kota Palembang (2014), the average population growth rate of Jakabaring was 0.7-1.7 % per year. On the basis of this population rate, it can be projected to the total population in 2015 and in 2030 presented in Table 2.

The highest population is found in North Jakabaring around 173.519 people and predicted becoming 190.898 people in 2030. The lowest population is determined in South Jakabaring approximately 44.234 people and increasing 48.895 people in 2030. Population amount in Jakabaring was around 232.369 people in 2000, increasing people became

262.390 in 2015 and 280.692 people in 2030. Similarly, the population density is also increased by about 75 people/km² in 2000, increased to 90 people/km² in 2015 and 112 people/km² in 2030. This relatively high increase will pressure the total area to change its land uses from agricultural to non-agricultural uses.

The increasing number of people is stimulated not only by the land availability for activities of social and economic life, but also influenced by the region function as an area of international sport centers, trading and commercial services, thus this region looks like a strong magnet for the local people to migrate to Jakabaring.

Table 2. Total population in Jakabaring before and after landfills

Nr	Jakabaring site	Jakabaring population (people) in year of		
		2000	2015 ^{b/}	2030 ^{b/}
1	North Jakabaring	151,756	173,519	190,898
2	East Jakabaring	40,894	44,637	49,899
3	South Jakabaring	39,719	44,234	48,895
Total		232,369	262,390	280,692
Density (people/km ²)		75	90	112

Note : ^{b/} Projected population of Jakabaring
 Source : BPS Sumatera Selatan (2014).

Therefore the increasing in this population cannot be avoided and can only be managed, this increasing population needs automatically land and infrastructure, including facilities and public services. All these phenomena will encourage the development of social and economic activities of the population and the physical region development. Shifting land use changes cannot also be avoided, namely land conversion from agriculture to non-agriculture land. Other impact is related to

environmental threats, such as floods, land and water degradation and pollution and any others.

Livelihoods are mainly self-employed, trade and day labors, where most people have the economic life in the form of labors. Most people work as daily paid workers both in the market and in the industry and doing petty trade, and traditional agricultural products. Some economic activities that can form a social structure, among others:

Farmers. Approximately 23-25 % of people work as farmers, they cultivate mixed farms around their residences and mostly located in remote area. Most farmers live in the East and South Jakabaring. Most of the population is a community of farmers who rely on rice fields, especially in river levee and farmers cultivate food crops such as corn, peanuts and vegetables. In general, farmers using the means of production are very low, especially in the lebak swamp, thus its agricultural production is also low (around only 2.0 tons Milled Dry Grain/ha/year). In order to fulfill their living cost, some farmers seek employment outside farming, namely as day labors, construction workers, becak drivers, small traders, barbers, occupiers and other services.

Based on the assessment of site characteristics and accessibility, Jakabaring can be developed as downstream for any food crop products. This is supported by the infrastructure availability such as markets, farmer groups and agricultural extension services, post-harvest tools and most of the people are farmers. Common constrains are faced by farmers in carrying out downstream farming are limitation of farm capital, and not the optimal role of financial services institutions such as cooperatives.

Fishermen and Breeders. These professions are 13-15 % and the fisheries concentrate on fishery ponds and breeder focus on animal husbandry especially poultry, cows fattening, goats and swamp buffaloes. Their farms are mostly scattered and distributed especially in the area with adequate infrastructure. The fishermen and breeders look like conditions of farmers. They have to work in farming in order to fulfill their living cost, they also seek employment outside farming, namely as day labors, construction workers, becak drivers, small traders, barbers, occupiers and other services.

Employees. Activities of employees (public servants and private sectors) cover approximately 17-20 % and are generally located in North Jakabaring which is directly

adjacent to Palembang city. Most employees are spontaneous migration from Palembang and its surrounding and they live concentrated in housing and settlement complex. This profession is relatively stable, most of them are able to fulfill their living cost, and thus they are able to concentrate on their works.

Merchants and Services. They belong to 34-38 % and trading activities and services tend to evolve along arterial roads and main roads, regional centers, settlements and industry. This profession also belong to spontaneous migrants because they come to this area which is already moderately populated. Most of them are living near to crowded markets and highly populated places, especially in North. These professions are very dynamic conditions depending on situations in this area, if there are a lot of events either nationally, locally or internationally, these conditions will give good chances for them to make a lot of money.

Sports and others. These professions are about 2-13 % and sporting activities centered in the region and developing international sports centers and the main stadium of Jakabaring and its supporting facilities. Actually this profession belongs to everyone involved with sports activities, so the profession is very broad ranging from athletes to cleaning services or people involved in hospitality of athletes and sport activities.

Distribution of Land Uses

Order of dominance-The dominant order of land use before landfills were as follows lebak swamp, settlement/industry, rice fields, swamp bush, agriculture fields, swamp forest, infrastructure, fish ponds, and garden including open spaces. In 2030 it will be predictably changed, i.e. settlement/industry, garden including open spaces, swamp bush, infrastructure, fish ponds, lebak swamp, rice fields, agriculture fields, and swamp forest (Table 3).

Table 3. Land uses changes in Jakabaring before and after landfills and in 2030

Nr	Land uses	1988 ^{a/}		2015 ^{b/}		2030 ^{c/}	
		ha	%	ha	%	Ha	%
1	Lebak swamp	2,362.03	87.48	416.98	15.44	90.23	3.34
2	Swamp forest	8.85	0.32	47.34	1.75	35.19	1.31
3	Swamp bush	40.34	1.49	405.23	15.01	164.51	6.09
4	Agriculture fields	12,25	0.45	89.12	3.31	56.76	2.09
5	Rice fields	50.56	1.87	494.07	18.29	72.71	2.69
6	Fish ponds	7.09	0.26	80.23	2.97	81.52	3.02
7	Infrastructure	8.49	0.31	85.41	3.16	90.45	3.35
8	Settlement/Industry	216.43	8.02	929.91	34.44	1,836.23	68.01
9	Garden/open space	6.21	0.23	151.71	5.62	272.40	10.09
Total		2,700	100	2,700	100	2,700	100

Note : ^{a/} before landfills, ^{b/} existing condition, ^{c/} predicted data

Source : */ It was calculated and interpreted on the basis of Palembang land use map (1: 250,000 scale) and Landsat 2014 as well as Google map 2014 as well as field survey (2015)

If there is no regulation and supervision of the government, then all lands use are predicted would become a reality and this can cause serious threats to the environment, such as flooding, slum formation, and other socio-economic problems.

Lebak swamp is dominated Jakabaring area before landfills which covers an area of around 2,362.03 ha (87.48 %) and declined in existing condition about 416.98 ha (15.44 %). The lebak swamp is predicted to be under pressure due to high population pressure and economic development. This land is estimated to be remaining 90.23 ha (3.34 %) only in 2030. The sharp decline of the lebak swamp will impact seriously on the flood potency and soil subsidence.

Swamp forest before landfills was relatively minimal only about 8.85 ha (0.32 %) and an increase six times becoming 47.34 ha (1.75 %) and this area will be maintained until the future. The increase is due to the intensive city greening with swamp trees along protocol roads and residential areas, regional sports center and recreation area. This action is very important that environmental impacts can be minimized. But when compared to extensive loss of lebak swamp, the greening is still not comparable and need to be reproduced again in the form of city forests.

Swamp bush has an area of around 40.34 ha (1.49 %) before landfills and the existing condition is around 405.23 ha (3.01 %). It

figures that there are a lot of abandoned lands becoming swamp bush. Land abandonment is due to many land speculators who abandon their lands until the land prices increase very high. The land speculators will continue until 2030 which are still found swamp bush around 164.51 ha (6.09 %).

Agriculture fields before landfills were relatively minimal namely 12.25 ha (0.45 %), but in existing condition it would be increased to 89.12 ha (3.31 %). Increased agriculture fields are also a sign of the land speculators because they planted their lands with annual crops as the sign only that they cultivate their lands. Actually they wait until the land prices increase so high due to the high land need for economic development. By 2030 their purposes are to control the land prices in Jakabaring.

Rice fields shows the pattern of similarities with agriculture fields. Even though an increase of rice fields was around 50.56 ha (1.87 %) before landfills and increased nearly ten-times to 494.07 ha (18.29 %) in 2015. It is all just camouflage for dominating and marking their lands by cultivating rice fields. It will be expected in 2030, the rice fields will be dropped sharply to 72.71 ha (2.69 %).

Fish ponds cover an area before landfills of around 7.09 ha (0.26 %) and improve about ten-times to 80.23 ha (2.97 %) and is predicted to persist until 2030. The increasing of fish ponds was because the government

built water retention (ponds and man-made lakes) in order to anticipate flooding, such as OPI lake and others. Government should create retention ponds and man-made lakes such an area at least 810 ha (30 %) for the entire Jakabaring.

Infrastructures include roads, bridges and other public facilities. Before landfills, highly available infrastructure cover only an area of at least 8.49 ha (0.31 %) and in the existing condition infrastructure area has reached 85.41 ha (3.16 %) and a slight increase in infrastructure until 2030.

Settlement/industry increased very fantastic where only 216.43 ha (8.02 %) before landfills and becoming 929.91 ha (34.44 %) in 2015 and continue to increase sharply until 2030 covering an area of 1,836.23 ha (68.01 %). So the increase in settlement/industrial is maximum, unfortunately this increase is not followed by increasing in infrastructure. If this condition continues to run, it is possible that Jakabaring area will face some environmental problems, namely sanitation, water shortage, less infrastructure, particularly roads, bridges and other public facilities.

Garden/open space largely covers the area of government development areas, such as areas of international sport centers and recreation area. Before landfills garden/open space covers an area of only 6.21 ha (0.23 %) and continued to increase to 151.71 ha (5.625 %) in 2015 and continue to expand until 2030 around 272.40 ha (10.09 %).

Changing Values of Lebak Swamp Lands over Time

Value changes of land happened over time dominantly in 27 years (1988-2015). As we know that land values are not only determined by their characters or physical and chemical characteristics, but also by existence of accessibility and infrastructure, especially roads. The more specific lands are fully accessible and infrastructured, the higher

values of lands will be. It is clear that one hectare of land located in hinterland of Palembang city is higher agricultural values than one hectare land of very highly fertile lands in a remote area. It means that values of lands may also change over time relatively.

Increasing commercialization of agricultural products created new possibilities of using less productive lands by planting cash crops, coconuts and any other crops. Around the beginning of last century, spontaneous migration (Buginese from South Sulawesi, Banjarnese from Kalimantan) introduced appropriate technology of land and water management in Eastern part of Sumatra including Jakabaring and thus able to turn large area of swamp areas into productive rice fields and coconut estate. Meanwhile government and large private companies had opened great part of Jakabaring by using landfills with help of capital-intensive modern technology.

After landfills almost agricultural areas were minimized and become unnecessary for whole society in South Sumatra. These example give us some lessons learned that land values are relative term and subject to change over time. The government showed that how a single innovation can turn an area with formerly almost abandon or useless lands into productive landscapes.

From the viewpoint of indigenous people in Jakabaring normally as subsistence farmers, a piece of land is mentioned as "fertile land" if they can cultivate them continually with their agricultural crops without help of drainage system and agricultural inputs, only with family labors. Such favorable conditions were found in levee of the Musi River and the Ogan River, not in densely population concentration area. Unfortunately such fertile lands are believed that it is not more 15 % of total area of Jakabaring. The rest lands (85 %) are classified as not fertile lands, but their values are extremely high because the lands are located in fully accessible and infrastructure locations (Table 4).

Table 4. Initiation of changes in land use after landfills

Nr	Land uses	Initiator of land uses		
		Government	Speculators	Farmers
1	Lebak swamp	√√√√	√√	√
2	Swamp forest	√√√	√√√	√
3	Swamp bush	√√√	√√√	√√
4	Agriculture fields	√√√	√√√	√√√
5	Rice fields	√√	√√√	√√√
6	Fish ponds	√√√√	√	√
7	Infrastructure	√√√√	√	√
8	Settlement/Industry	√√√√	√√√√	√√
9	Garden/open space	√√√√	√√	√

Note: √√√√ (very dominant), √√√ (dominant), √√ (relatively dominant), √ (less dominant)

Source : */ It was calculated and interpreted on the basis of Palembang land use map (1: 250,000 scale) and Landsat 2014 as well as Google map 2014 as well as field survey (2015)

Land use changes are commonly initiated by the government, private sector and farmers. Almost all types of lands use changes are driven in Jakabaring by the government and directly related to macroeconomic development. It means that the government is very dominant in determining the overall land use change. This is because landfills requires a lot of funding and enormous power, while the private sector only plays a relatively small role in the land use change, especially in area which has high economic impact. The role of the private sector is not dominant compared with government. Land use change initiated by the farmers is very limited and the smallest because farmers is just seek a livelihood at small-scale level (subsistence) and resettlement farmers themselves, not directly related to macroeconomic development.

If the land use change is not taken seriously and wisely from government, private and public, then it is possible that all parameters of the land use and management which have been predicted to be spatially by 2030 will actually become in reality. If this happens and it will result in the threat of sustainable development and environment as a whole, such as the flood threat, land and water degradation, pollutions, and any other environmental problems.

CONCLUSIONS

From the results of research and discussion of research, it can be summarized some conclusions as follows:

- 1) Jakabaring area can be divided into three regions, namely North Jakabaring (around 1,544.13 ha or 57.19 %), East Jakabaring (about 809.46 ha or 29.98 %) and South Jakabaring (around 346.41 ha or 12.83 %).
- 2) Total population was around 232.369 people in 2000, became 262.390 in 2015 and 280.692 people in 2030. High population increase will pressure to land use changes. Population increase and land use changes cannot be avoided, but they can be only managed properly.
- 3) The dominant order of land use before landfills namely lebak swamp, settlement/industry, rice fields, swamp bush, agriculture fields, swamp forest, infrastructure, fish ponds, and garden including open spaces. In 2030 it will predictably change, i.e. settlement/industry, garden including open spaces, swamp bush, infrastructure, fish ponds, lebak swamp, rice fields, agriculture fields, and swamp forest.
- 4) Almost all types of land use changes are driven by the government, meaning that the government is very dominant in determining land use change, whereas the private sector plays only a small role in the

land use changes especially for lands with high economic impacts. Land use change initiated by the farmers is very limited and the smallest because farmers are just seek a livelihood at small-scale level.

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REFERENCES

- Armanto M.E., Syahrial, R.H. Susanto and D. Probowati S. 2010. Spatial Analyses of Landuse Changing in Tidal Lowland Areas (A Case Study of Saleh Delta Areas in Banyuasin District, South Sumatra). Proceedings of the International Seminar-Workshop on Integrated Lowland Development and Management, 18th – 20th March 2010, Palembang, Indonesia. p. A6-1 – A6-10.
- Armanto, M.E. 1995. Farming Efforts and the Management of Natural Resources in South Sumatra. Indonesia Journal of Development Studies. Vol. 1(1): 61-71. ISSN. 0854-7270.
- Armanto, M.E. 2002. Relationship between Soil Taxonomy and Swampy Land Typology in South Sumatra. Dinamika Pertanian Vol. XVII (2): 24-33, August 2002. ISSN 0215-2525.
- Armanto, M.E. 2003. Existing Impacts of Reclamation Channels on Morphology and Classification Characters as well as Soil Productivity. Journal of Environment Management & Natural Resources 1(2): 105-116, June 2003. ISSN 1693-0391.
- Armanto, M.E. 2005. Kompetisi, Konflik, Strategi, dan Paket Perencanaan Penggunaan Sumberdaya Lahan. Pidato Pengukuhan sebagai Guru Besar Tetap dalam Bidang Ilmu Tanah pada Fakultas Pertanian Universitas Sriwijaya. Inderalaya. 3 Maret 2005.
- Armanto, M.E. 2014. Spatial Mapping for Managing Oxidized Pyrite (FeS₂) in South Sumatra Wetlands, Indonesia. Journal of Wetlands Environmental Managements. Vol 2(2); 6-12, October 2014. ISSN: 2354-5844. Indexed in DOAJ. Web-link: <http://ijwem.unlam.ac.id/index.php/ijwem>
- Armanto, M.E., M.A. Adzemi and Elisa Wildayana. 2016. BRIS Soils Improvement for Sustainable Crop Production from Perspectives of Soil Science. Keynote Speaker paper on Soil Science Conference of Malaysia 2016, 5-7 April 2016, UMT Malaysia
- Armanto, M.E., M.A. Adzemi, E. Wildayana and M.S. Imanudin. 2013. Land Evaluation for Paddy Cultivation in the Reclaimed Tidal Lowland in Delta Saleh, South Sumatra, Indonesia. Journal of Sustainability Science and Management. Vol 8(1): 32-42. June 2013. ISSN 1823-8556. (SCOPUS, Google Scholar and DOAJ indexes). Web-link: <http://jssm.umt.edu.my/files/2013/07/4w.pdf>
- BPS Sumatera Selatan. 2014. Sumatera Selatan dalam Angka. Kerjasama Bappeda Sumatera Selatan dengan BPS Provinsi Sumatera Selatan, Palembang.
- Busri, A.S. 2014. Pemanfaatan dan Penataan Lahan Basah sebagai Upaya Pembangunan Berwawasan Lingkungan di Jakabaring Sumatera Selatan. Disertasi. Program Pascasarjana, Universitas Sriwijaya, Palembang.
- Direktorat Rawa dan Pantai. 2009. Potensi dan Tantangan Pengembangan Rawa Indonesia. Makalah pada Seminar Lokakarya Pengelolaan Rawa dalam Mendukung Ketahanan Pangan Nasional. Departemen Pekerjaan Umum. Hotel Nikko Jakarta.
- Eko, T. dan S. Rahayu. 2012. Perubahan Penggunaan Lahan dan Kesesuaiannya terhadap RDTR di Wilayah Peri-Urban (Studi Kasus: Kecamatan Mlati). Jurnal Pembangunan Wilayah & Kota. Vol 8(4): 330-340, Desember 2012. Biro Penerbit Planologi Undip, Semarang.

- Imanudin, M.S. and M.E. Armanto. 2012. Effect of Water Management Improvement on Soil Nutrient Content, Iron and Aluminum Solubility at Tidal Lowland Area. *APCBEE Procedia* 4 (2012): 253-258. (SCOPUS, Google Scholar and DOAJ indexes). Web-link: www.sciencedirect.com/science/.../S2212670812002138
- Imanudin, M.S., M.E. Armanto and R.H. Susanto. 2011. Developing Seasonal Operation for Water Table Management in Tidal Lowland Reclamations Areas at South Sumatra Indonesia. *Journal of Tropical Soils*, Unila Vol. 16(3): 233-244. ISSN 0852-257X. Open access. Web-link: <http://journal.unila.ac.id/index.php/tropicalsoil> DOI: 10.5400/jts.2011.16.3.233
- Imanudin, M.S., M.E. Armanto, R.H. Susanto and S.M. Bernas. 2010a. Water Table Fluctuation in Tidal Lowland for Developing Agricultural Water Management Strategies. *Journal of Tropical Soils* Vol. 15(3): 277-282. ISSN 0852-257X. Open access. Web-link: <http://journal.unila.ac.id/index.php/tropicalsoil> DOI: 10.5400/jts.2010.15.3.277
- Imanudin, M.S., M.E. Armanto, R.H. Susanto and S.M. Bernas. 2010b. Water Status Evaluation on Tertiary Block for Developing Land Use Pattern and Water Management Strategies in Acid Sulfat Soil of Saleh Tidal Lowland Reclamation Areas of South Sumatera. *Journal of Agriculturas Science – AGRIVITA* Vol 32(3): 241-253. ISSN 0126-0537. Web-link: <http://www.agrivita.ub.ac.id/index.php/agrivita/article/view/16>
- Sjarkowi, F., A. Arbain, M.E. Armanto, U. Santoso, J. Arjuna, Rifardi, A. Setiawan, J. Syahrul, Khairijon and Azizah. 2007. Environmental Quality of Sumatra Island 2007. Center for Regional Environmental Management, Sumatra, State Ministry for Environment, Republic of Indonesia, Pekanbaru, Riau, ISBN. 978-602-8107-00-6. p. 393.
- Wildayana, Elisa, M.E. Armanto dan N. Rahmawati. 2008. Pengembangan Program Pola Usahatani Agribisnis Spesifik Lokasi di Lahan Pasang Surut. *Journal of HABITAT* Vol. XIX (3): 223-236, December 2008. ISSN 0853-5167.
- Wildayana, Elisa. 2003a. Karakter dan Valuasi Ekonomi Konversi Lahan Alang-alang menjadi Lahan Pertanian. *Jurnal Pengelolaan Lingkungan & SDA* Vol 1(2): 73-79, September 2003. ISSN. 1693-0391.
- Wildayana, Elisa. 2003b. Valuasi Ekonomi Konversi Hutan untuk Usahatani Lahan Kering. *Jurnal Pengelolaan Lingkungan & SDA* Vol 1(1): 49-58, Maret 2003. ISSN. 1693-0391.
- Wildayana, Elisa. 2006a. Peluang Bekerja Wanita Tani sebagai Sumber Nafkah Melalui Sistem Usahatani Terpadu. *Jurnal Pengelolaan Lingkungan & SDA* 4 (1): 46-57, Maret 2006. ISSN. 1693-0391.
- Wildayana, Elisa. 2006b. Rancang Bangun Program Kerja Wanita Tani sebagai Sumber Nafkah pada Sistem Usahatani Terpadu. *Jurnal Ilmiah Habitat*, XVII (4): 279-292, Desember 2006, ISSN. 0853-5167.
- Wildayana, Elisa. 2014. Formulating Oil Palm Investment Decision in Tidal Wetlands of South Sumatra, Indonesia. *Journal of Wetlands Environmental Managements (JWEM)*. Vol 2(2); 30-36, October 2014, ISSN: 2354-5844 (indexed in DOAJ). Web-link: <http://ijwem.unlam.ac.id/index.php/ijwem>
- Wildayana, Elisa. 2015. Formulating Rice Fields Conversion Control to Oil Palm Plantations in Tidal Wetlands of South Sumatra, Indonesia. *Journal of Wetlands Environmental Managements (JWEM)*. Vol 3(2); 72-78, October 2015, ISSN: 2354-5844 (indexed in DOAJ). Web-link: ijwem.unlam.ac.id/index.php/ijwem/article/.../11.