ASSESSMENT OF THE RICE FIELD SUSTAINABILITY IN JAVA ON BASIS OF REGIONAL SPATIAL USE PLANNING (RTRW)

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ABSTRACT

The problems of the rice field sustainability in Java as the national rice producer are induced by the rice field land conversion into settlement and industrial areas due to the increase of population. The rice field conversion causes the decrease of both land quantity and quality. As mentioned in Act Number 26/2007 concerning Spatial Use management, the goal of implementing the spatial use management is to achieve the protection of spatial use function and the prevention of the negative impacts of the environment resulted from the spatial use implementation. The objective of this study is to assess the consistency of the governmental policies in implementing the Act Number 26/2007 to achieve the rice field sustainability on the basis of agro-ecological concept. By using the GIS modelbase, the rice field agro-ecological zones proposed as standard rice field areas for the benchmark of the sustainable rice field agriculture management system were synthesized from the spatial database of land system, land cover, area status, agro-climate, irrigation condition, social and culture integrated in the administration boundary layers. The results show that the governmental policies from non-agricultural sector in allocating the area status of the settlement areas as presented at the provincial regional spatial use planning map (RTRW map) have not fully consistent to the regulations as stated in Act Number 26/2007 for protecting the productive rice field function as the national rice producer. The potential loss of the rice production caused by the implementation of the rice field conversion into settlement areas allocated at the productive rice field agro-ecological zones is predicted 3.5 million tons per year.

Key words: rice field agro-ecological zone, spatial use management, GIS modelbase, land conversion.

ABSTRAK

Masalah keberlanjutan lahan sawah di Jawa sebagai lumbung beras nasional dipicu oleh konversi lahan sawah menjadi daerah permukiman dan industri karena peningkatan jumlah penduduk. Konversi lahan sawah mengakibatkan penyusutan dan degradasi lahan sawah. Sebagaimana yang diamanatkan dalam Undang-Undang No.26/2007 tentang Penataan Ruang, tujuan penataan ruang adalah untuk melindungi fungsi penggunaan ruang dan mencegah dampak lingkungan sebagai akibat dari implementasi penggunaan ruang. Tujuan penelitian ini adalah untuk mengkaji konsistensi kebijakan pemerintah sebagai implementasi Undang-Undang No. 26/2007 dalam menjaga keberlanjutan lahan sawah berdasarkan konsep agrokologi. Dengan menggunakan basismodel SIG, zona agroekologi yang diusulkan sebagai acuan untuk penetapan luasan baku lahan sawah disintesa dari basisdata sistem lahan, penutup lahan, status kawasan, agroklimat, kondisi irigasi, dan sosial-budaya yang diintegrasikan dalam layer batas wilayah administrasi. Hasil penelitian menunjukkan bahwa kebijakan pemerintah di sektor non-pertanian dalam pengalokasian status kawasan permukiman ternyata tidak secara penuh konsisten dengan Undang-Undang No.26/2007 dalam menjaga keberlanjutan lahan sawah produkif sebagai lumbung beras nasional. Potensi kerugian proudksi beras dari akibat implementasi kebijakan tersebut diperkirakan mencapai 3,5 juta ton per tahun.

Kata Kunci: zona agroekologi lahan sawah, penataan ruang, basismodel SIG, konversi lahan.

INTRODUCTION

Background

In conjunction with the increase of population, the rice fields in Java as the national rice producer tend to decrease periodically. Due to the increase of population, the rice field agriculture is converted into settlement and industrial area, resulting in the biophysical, social, and economical problems. FAO (1996) stated that the pressure on land due to the increase of population causes the decrease of both the land quantity and quality. As stated by Isa (2006), the agricultural land conversion into non-agriculture is the main factor being faced by the agricultural sector. The assessment conducted by Tambunan (2008) shows that the current rice field conversion in Java has reached 59.7 % for settlements and 21.8% for industrial areas, and central business districts. Ironically, the rice field conversion occurs at the central areas of the rice producer which are commonly close to the main road and high ways. Sumaryanto et al. (2001) reported that the rice field conversion results in the decrease of the national food security and farmer income, the increase of poor people, the degradation of local community of rice farming culture, and the uselessness of investments. The problems of the rice field sustainability in Java induced by the land conversion as the consequences of the increase of population have made policy makers both from executive and from legislative power give serious attention. The serious concern of these policy makers to the sustainable national development has been indicated by the existence of Act Number 5/1960 concerning the Agrarian Basic Regulation which regulates the land ownerships. In 1992, cooperating with the legislative power, the government produced the Act Number 24/1992 which regulated the spatial use management. This Act Number 24/1992 was then revised into the Act Number 26/2007. On October 14, 2009, the government just legalized the act of Protection of Sustainable Agricultural Land for Crops (UU-PLPPB).

The existence of those various regulations, however, has not given the guarantee of protecting the rice field sustainability in Java from the threat of the land conversion. The trend of the rice field conversion into settlements and industrial areas are even to be increase. Currently, the efforts of preventing the rice field sustainability from the threat of the land conversion has not been optimal. It seems that the Department of agriculture is the only one sector who has to be responsible for protecting the rice field sustainability. This assessment is based on the existence of high way construction planning along the northern coastal areas (Kompas November 17, 2008). The development of this high way construction plan will potentially convert the productive rice fields in the districts of of Purwakarta, Subang, Indramayu, Cirebon, Brebes, Tegal, Pemalang, Pekalongan, Batang, Kendal, Semarang, Boyolali, Sragen, Karanganyar, Ngawi, Nganjuk, and Mojokerto. This high way construction planning indicates that the non-agricultural sectors are not serious to maintain the rice field sustainability. Isa (2006) stated that there is a strong indications to convert the rice fields through the mechanism of the provincial or district regional spatial planning.

To support the goal of UU-PLPB in maintaining the national food security, the rice fields in Java should be mapped by considering their potential production and carrying capacity. Nurwadjedi *et al*. (2009) reported that the rice field carrying capacity was spatially measured on basis of the rice field agro-ecological zones. In their study, the rice field

agro-ecological zone is defined as the rice field area which has the similarity of land qualities and potential rice production. According to the experts (Gliesmann, 200; Altieri, 1989, 2002; Dalgaard et al., 2003), the primary aim of the study of agroecology is to achieve the sustainable agriculture. Because of its characteristic in reflecting the rice field carrying capacity and potential production, the rice field agro-ecological zone mapped is useful for a benchmark in establishing the standard rice field areas and a tool for coordinating among sectors as well as for monitoring the implementation of the provincial regional spatial use planning which supports the achievement of the national food security.

Objective

The objective of this study is to assess the consistency of the governmental policies in implementing the Act Number 26/2007 to achieve the rice field sustainability on the basis of the agroe-ecological concept. The results are expected as inputs for spatial land use planning in establishing the sustainable rice fields in Java island.

METHODOLOGY

This study used the Geographic Information System (GIS) modelbase for zoning the rice field agroecology as conducted by Nurwadjedi et al. (2009). In this model, the rice field agro-ecological zone is defined as an available land which has the similarity of land qualities and potential rice production. The rice field agro-ecological zones (RFAEZs) were synthesized from the spatial database of land system and land cover, agro-climate, irrigation condition, area status, and social and culture data from the administration boundary layers. The land system and land cover database were developed based on remote sensing interpretation and field observation. The agro-climate database was analyzed from the mothly rainfall of 1998-2007. The area status database was compiled from the forest status (Department of Forestry, 2004), The irrigartion condition database was compiled from the irrigation map (Department of Public Work, 2003), while the social and culture information were collected from the interview of selected farmers. while theThe spatial thematic database was developed by the GIS software of ArcGIS version 9.2.

Table 1: The Criteria of Rice Field Agro-ecological Zoning

No.	Agro-ecological Zone	Land Suitability	Irrigation Condition	Area Status	Cropping Intensity (Per Year)
1.	A (S_1/ IP 300)	S_1	Good	Cultivated Land	3xPS
2.	B (S_1/IP 200)	S_1	Moderate	Cultivated Land	2xPS, 1xPL
3.	C (S_1/IP 100)	S_1	Scarce/Bad	Cultivated Land	1xPS, 2xPL
4.	D (S_2 /IP 300)	S_2	Good	Cultivated Land	3xPS
5.	E (S_2 /IP200)	S_2	Moderate	Cultivated Land	2xPS, 1xPL
6.	F (S_2 /IP 100)	S_2	Scarce/Bad	Cultivated Land	1xPS, 2xPL
7.	G (S_3/IP 300)	S_3	Good	Cultivated Land	3xPS,
8.	H (S_3/IP200)	S_3	Moderate	Cultivated Land	2xPS, 1xPL
9.	I (S_3/IP100)	S_3	Scarce/Bad	Cultivated Land	1xPS, 2xPL
10.	J (N/IP100)	N	Rainfed	Non Cultivated Land	Not used

Notes*:* Cultivated land: an established area which has a primary function for cultivation by regarding potential natural resource, human resource, and anthropogenic resource (Act No 26/2007), PS=wetland rice, PL=arable crops, Good irrigation: water debit > 10 l/sec/km^2,, Moderate irrigation: water debit 2.5-10 l/sec/km^2, Bad irrigation: water debit < 2.5 l/sec/km^2, The cropping intensity is aasigned to the paddy variety of Ciherang or IR64 which has the growing period of 100-125 days.

In this GIS modelbase, the analysis of the land suitability for wetland rice (Oriza Sativa,L) used the method developed by FAO (1976) and CSR/FAO Staff (1983). The land suitability is clasiified into 4 classes, namely S_1 (highly suitable), S_2 (moderately suitable), S_3 (marginally suitable), and N (not suitable). Each class land suitability was then classified on the basis of water availability shown by the Oldeman agroclimate and irrigation conditions. The results of the land suitability classification were then overlaid with the area status compiled from RTRW and forest status. The criteria for delineating the rice field agro-ecological zones is presented in Table 1.

RESULTS AND DISCUSSION

Rice Field Agro-ecological Zone Distribution

Based on the GIS modelbase developed by Nurwadjedi et al.(2009), the rice field area of 3,569,828 ha in Java interpreted from the Landsat ETM imageries of May 2005 can be grouped into 8 RFAEZs . Except zone J (N/IP100), the areas of 7 RFAEZs are 3,147,393 ha (88%), which are mostly distributed at the fluvial and volcanic landform origin having the fertile soils formed from the volcanic parent materials. Zone J (N/IP100) with the area of 422,436 (12%) distributes at the unsuitable lands for wetland rice due to the topographic, agroclimatic, and/or soil nutrient availability factors.

Figure 1: Rice field agro-ecological zone map in Java (Nurwadjedi et al., 2009).

Based on BPS data (2003-2008) at the selected samples in sub-district areas, the total rice production per year at the 7 RFAEZs areas of 3,147,393 ha with the productivity range of 5.20 – 6.20 tons/ha is 24,068,821 tons/year. By considering their distribution at the suitable land and cultivated areas, the productive land of these 7 RFAEZs is useful for the benchmark in establishing the standard rice field areas. In addition, the establishment of the 7 RFAEZs for the standard rice field areas concerned also meets with the Governmental Regulation Number 26/2008 concerning the National Spatial Planning (RTRWN) of chapter 66, point a which regulates the criteria of allocating the cultivated areas for agriculture should consider the land suitability.

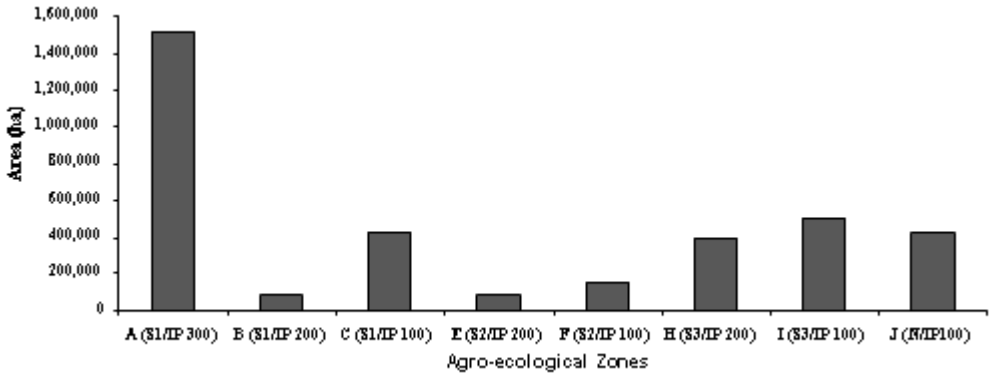

Figure 2: Rice field agro-ecological zone distribution (Nurwadjedi, et al., 2009)

Spatial Use Patterns of RTRW

Implementation of spatial use management, according to Rustiadi *et al.* (2008), is conducted through 3 steps, namely 1) spatial use planning, 2) implementation of spatial use, ad 3) monitoring of spatial use. The regional spatial use planning (RTRW) is the production of general spatial use planning in a region (national, province, and district/city). Based on the provincial RTRW mapped by Department of Public Works (2003), the spatial use patterns at the provinces as the rice producers in Java (Banten, West Java, Central Java, D.I Yogyakarta, and East Java), as illustrated in Figure 3a, consist of the cultivated areas (11,019,142 ha, 83 %), protected areas (1,089,978 ha, 8 %), and settlement areas (1,098,841 ha, 9 %). The spatial use patterns of RTRW in each province as shown in Fugure 3b are similar with that in Java island. According to the Governmental Regulation Number 26/2008 concerning the National Regional Spatial Use Planning (RTRWN) Chapter 64, cultivated areas are allocated for production forest (chapter 64), agriculture (chapter 66), fishery (chapter 67), mining (chapter 68), industry (chapter 69), tourism (chapter 70), and settlement (chapter 71). This study shows that the spatial use patterns are dominated by the cultivated areas (83 %), while the protected and settlement areas are almost equal. Both of them is less than 10 %. Asssuming that the areas of DKI. Jakarta are allocated for cultivated and settlement areas, the allocation of the protected areas in Java (1,089,978 ha) only accomplish the minimum standard as stated in RTRWN Chapter 54.

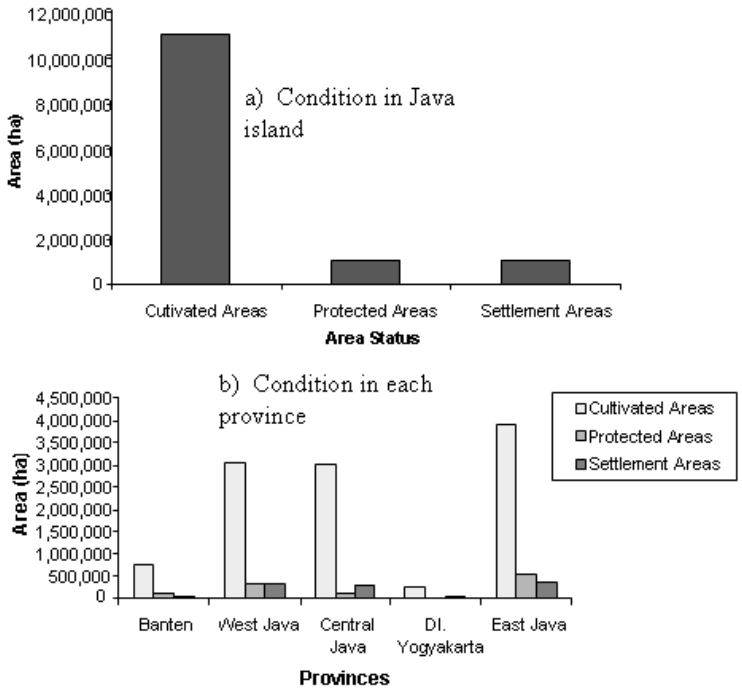

Figure 3: The condition of the spatial use pattern in Java island and each province (a, b)

Threat of RTRW to the Sustainability of Rice Fields

The rice field agro-ecological zones presented in this stud y is the physical aspect of spatial use management. According to Rustiadi *et al*. (2008), the physical aspect of the spatial use management has important functions in relation with the 3 things, namely 1) the efficiency and productivity, 2) the goal of the proportional and balance distribution of resource, and 3) the prevention of sustainability. Therefore, the results of the rice field agro-ecological zones in this study are useful for the benchmark of the sustainable agricultural management system. The important role of the rice field agro-ecological zones, however, is facing the threat of the land conversion into settlement areas as indicated in provincial RTRW map.

The study also shows that at the provincial RTRW map, the 398,349 ha (12,7 %) of the 7 RFAEZs which distribute at the productive lands are allocated at the settlement areas. This finding strengthens the statement of Isa (2006), stating that there is an indication of a systematic way to convert irrigated rice fields into settlement areas through the mechanism of RTRW. As shown in Table 2, the potential rice production of the 7 RFAEZs allocated as the settlement areas is about 3,479,675 tons per year. This rice production is equal to the potential loss of the rice production per year that will be induced by the land conversion. The potential loss due to the land conversion will be higher than that predicted because the rice fields have the multi-functions of soil resource conservation, social, economy, and culture.

Table 2: Prediction of rice production at the productive rice fields allocated as the settlement areas.

No.	Agro-ecological Zones	Area (ha)	Productivity* (ton/ha)	Cropping Intensity	Rice Production** (ton/year)
1.	A (S1/IP 300)	250,041	6.2	3	2,790,454
2.	B (S1/IP 200)	2,322	6.12	2	17,054
3.	C (S1/IP 100)	50,680	5.75	1	174,844
4.	E (S2/IP 200)	13,295	5.58	2	89,026
5.	F (S2/IP 100)	11,085	5.7	1	37,910
6.	H (S3/IP 200)	47,472	5.2	2	296,224
7.	I (S3/IP 100)	23,454	5.27	1	74,162
	Total	398,349	-	-	3,479,675

Notes: * Based on BPS data of 2003-2008 at selected samples of the sub-district areas and field surveys Calculation using the coeficient factor of 0.6, IP = cropping intensity (x harvesting/ year)

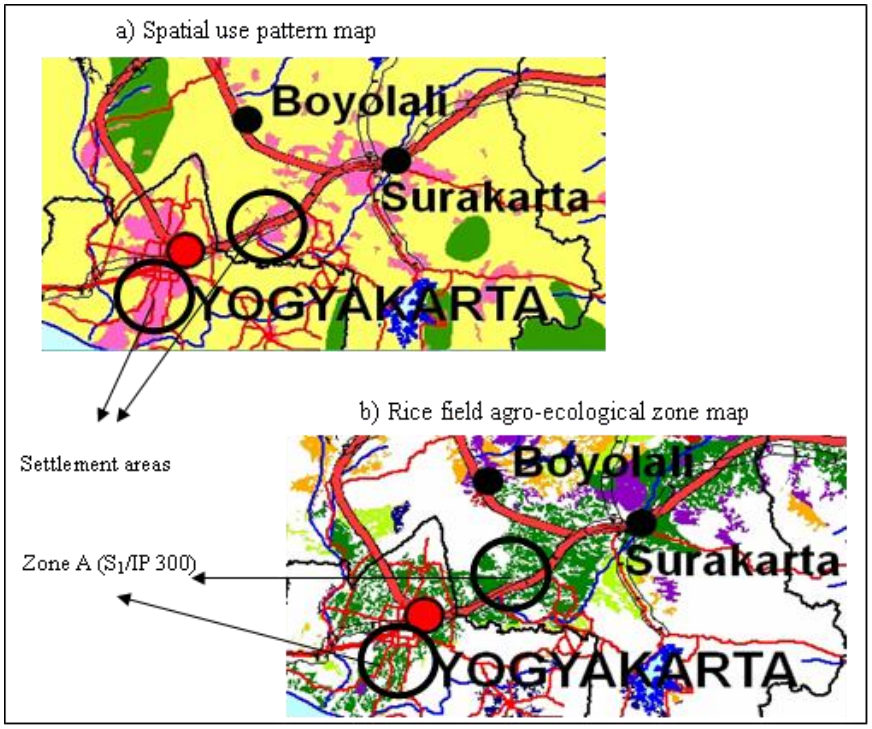

Figure 4: An example of the rice field agro-ecological zones allocated as the settlement areas

The Challenges of The Rice Field Sustainability in The Future

Basically, the spatial use management includes two elements, namely physical arrangement and institutional arrangement (Rustiadi et al., 2008). The rice field agro-ecological zoning used in this study is an example of the physical arrangement of the

spatial use management. Technically, there are no significant obstacles in the physical arrangement, unlike in the institutional arrangement. Based on the results of this study, the allocation of the settlement areas at the productive rice field agro-ecological zones as already mentioned are the institutional arrangement problem. This phenomena implies that there is no coordination among the sectors or the related agencies in the spatial use management.

The problem of the spatial use management of the rice fields due to the coordination among sectors is caused by the failure of managing the relations among stakeholders and the allocation of the land resource. In this case, the government is fail to arrange the value system how the stakeholders allocate the land resource as stated in RTRWN. This institutional arrangement problem is a main challenge of the rice field sustainability in Java in the future. It is predicted that the failure of managing this challenge will cause the degradation of the land resource and environment. Torras and Boyce (1998) and Katharine (2007) *in* Rustiadi et al. (2008) stated that the degradation of land resource and environment is the institutional arrangement problem, rather than the physical and economic problems. The impacts of the environment and land degradation on land resources are mainly caused by their characteristics as common- pool resources (CPRs). Because of having multi-functions which include soil resource conservation, social, economy, and culture, the rice field resource has the characteristics of common property as shown in CPRs. According to Hess and Ostrom (2001), CPRs are subject to problem of congestion, overuse, pollution, and potential destruction unless harvesting or use limits are devised and enforced. These environmental problems are the phenomena of the tragedy of the commons as explained by Hardin (1968), which trigger the degradation of the land resource and environment.

To overcome this CPRs management problems, Adams et al. (2002) explain that it is required dialogue between stakeholders that make differences clear in the planning processes of allocating resources. Gerber et al. (2008) state that the management of CPRs needs integrated policies which accommodate nationwide planning, better coordination between local governments, and the better syncronization of the different CPRs institutions with each other and with other institutions. These CPR management concepts would be applicable for handling the institutional arrangement problem as happened in this study.

CONCLUSIONS AND SUGGESTIONS

The rice field agro-ecological zone defined as the rice field area which has the similarity of land qualities and potential rice production has an important role in preventing the rice field sustainability in Java. Because of its characteristics which are able to reflect the potential rice production and carrying capacity, the rice field agro-ecological zones mapped in this study are useful as the inputs in establishing the standard rice field areas and a tool for coordinating among sectors as well as for monitoring the implementation of the provincial RTRW.

In Java, the sustainability of the rice field resource as a CPR still faces the problem of the institutional arrangement. The government policies in preventing the rice field sustainability is not yet consistent to the regulations as stated in RTRWN. In establishing the settlement areas of the spatial use management, the related agencies from non-

agricultural sectors have not considered the strategic values of the productive rice fields as presented the rice field agro-ecological zones in this study. To protect the productive rice fields allocated as the settlement areas, the existing provincial RTRW should be revised.

The institutional arrangement problem indicated by the lack of coordination among the sectors as found in this study would be solved by promoting dialogue between the stakeholders and implementing the integrated approach policies which accommodate the interest of each stakeholder involved in spatial land use planning, particularly for protecting the sustainability of the productive rice fields in Java. It is predicted that the failure of solving the institutional arrangement concerned could result in the negative multidimensional impacts triggered by the phenomena of the tragedy of the commons.

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REFERENCES

Adams, B., D. Brockington, J. Dison, and B. Vira. 2002. Analytical Framework for Dialogue on Common Pool Resource Management. Department of Geography, University of Cambridge, England.

Altieri, M. A., 1989. Agroecology: a new research and development paradigm for world agriculture. Agriculture, Ecosystems and Environment, 25 (1989): 37-46. Elsevier Science Publisher B. V. , Amsterdam.

Altieri. M. A. 2002. Agroecology: principles and strategies for designing sustainable farming system. The News Letter of CCOF (California Certified Organic Farmers), Vol 19 (3): 2-5.

Anonim. 1960. Undang-Undang Nomor 5 Tahun 1960 Tentang Peraturan Dasar Pokok-Pokok Agraria, Sekretaris Negara RI, Jakarta.

_____. 1992. Undang-Undang Nomor 24 Tahun 1992 tentang Penataan Ruang. Sekretariat Negara RI, Jakarta

_____. 2007. Undang-Undang Republik Indonesia Nomor 26 Tahun 2007 Tentang Penataan Ruang. Lembaran Negara Republik Indonesia Tahun 2007 Nomor 68, Sekretariat Negara RI, Jakarta.

BAKOSURTANAL. 2005. Land cover maps in Java scale 1: 250.000. National Agency fo Surveys and Mapping. Cibinong, Indonesia.

BAKOSURTANAL. 2006. Land system maps in Java scale 1: 250.000. National Agency fo Surveys and Mapping. Cibinong, Indonesia.

BMG. 2008. Peta Agroklimat di Jawa skala 1: 250.00. Badan Meteorologi dan Geofisika, Jakarta.

BPS. 2003. Kabupaten Majalengka Dalam Angka 2003. Kabupaten Banyumas Dalam Angka 2003, dan Kabupaten Pemalang Dalam Angka 2003.

BPS. 2004a. Statistik Indonesia. Badan Pusat Statistik, Jakarta.

BPS. 2004b. Kabupaten Mojokerto Dalam Angka 2004. Kabupaten Cianjur Dalam Angka 2004, Kabupaten Cilacap Dalam Angka 2004. Kabupaten Cianjur Dalam Angka 2004.

BPS. 2005. Kabupaten Klaten Dalam Angka 2005, Kabupaten Pekalongan Dalam Angka 2005, Kabupaten Sleman Dalam Angka 2005, Kabupaten Kulon Progo Dalam Angka 2005, Kabupaten Gunung Kidul Dalam Angka 2005, Kabupaten Bantul Dalam Angka 2005.

BPS. 2006b. Kabupaten Tangerang Dalam Angka 2006, Kabupaten Lebak Dalam Angka 2006, Kabupaten Serang Dalam Angka 2006, Kabupaten Pandegelang Dalam Angka 2006, Kabupaten Bandung Dalam Angka 2006, Kabupaten Jember Dalam Angka 2006, Kabupaten Tegal Dalam Angka 2006, Kabupaten Pati Dalam Angka 2006, Kabupaten Rembang Dalam Angka 2006, Kabupaten Kendal Dalam Angka 2006.

BPS. 2007. Kabupaten Tasikmalaya Dalam Angka 2007, Kabupaten Garut Dalam Angka 2007, Kabupaten Garut Dalam Angka 2007, Kabupaten Ciamis Dalam Angka 2007, Kabupaten Banjarnegara Dalam Angka 2007, Kabupaten Sukoharjo Dalam Angka 2007, Kabupaten Tulungagung Dalam Angka 2007, Kabupaten Kediri Dalam Angka 2007, dan Kabupaten Malang Dalam Angka 2007.

BPS. 2008a. Kabupaten Magetan Dalam Angka 2008, dan Kabupaten Jombang Dalam Angka 2008.

CSR/FAO Staff. 1983. Reconnaissance Land Resource Surveys 1: 250.000 scale. Atlas Format Procedures. Center For Soil Research. Bogor, Indonesia.

Dalgaard, T., N. J. Hutchings, and J. R. Porter. 2003. Review: Agroecology, scaling and interdisciplinarity. Agricultural, Ecosystems and Environment, 100 (2003): 39-51. Elsevier Science Publisher B. V. , Amsterdam.

Departemen Pekerjaan Umum. 2003a. Peta Pola Pemanfaatan Ruang skala 1: 250.000. Departemen Pekerjaan Umum, Jakarta, Indonesia.

Departemen Pekerjaan Umum. 2003b. skala 1: 250.000, Departemen Pekerjaan Umum. Jakarta, Indonesia.

FAO. 1976. A Framework for Land Evaluation. FAO Soils Bulletin 32. Soil Resource Development and Conservation Service land and water Development Division. Food and Agriculture Organization of the United Nations, Rome.

FAO. 1996. Agro-ecological Zoning. Guidelines. FAO Soils Bulletin 73. Food Agriculture Organization of United Nations, Rome.

Gerber, J. D., S. Nahrath, E. Reynard, and L. Thomi. 2008. The role of common pool resource institutions in the implementation of Swiss natural resource management policy. International Journal of the Commons. Vol. 2 (2): 222-247.

Gliessman, S. R. 2000. Making the conversion to sustainable agroecosystems. Getting from here to there with agroecology. The News Letter of CCOF (California Certified Organic Farmers), Vol 19 (3): 6-8.

Hardin, G. 1968. Tragedy of the commons. Science, 162: 1243-1248.

Hess, C. and E. Ostrom. 2001. Artifacts, facilities, and contents: information as a common-pool resource. Conference on the Public Domain, "Duke Lawa School, Durham, North Carolina, November 9-11, 2001.

Isa, I. 2006. Strategi pengendalian alih fungsi lahan pertanian. Prosiding Seminar Multifungsi dan Revitalisasi Pertanian. A. Dariah, N. L. Nurida, E. Husen. F. Agus (editor), Bogor, 27-28 Juni 2006. Badan Penelitian dan Pengembangan Pertanian, Departemen Pertanian bekerjasama dengan MAFF (Ministry of Agriculture, Forestry and Fisheries, Japan), dan ASEAN Secretarian, Jakarta.

Litbang Kompas. 2008. Tol Picu Konversi Lahan Sawah. Harian Kompas, 17 November

2008.
Matindas, R. W., C. Subarya dan R. Natprawira. 1997. Sistem Penomeran untuk Penunjukan Peta Rupabumi dalam Proyeksi UTM Datum Geodesi Nasional (DGN95) Indonesia skala 1: 250.000. Pusat Pemetaan, BAKOSURTANAL, Cibinong.
Nurwadjedi, S. Sabiham, K. Yasuyuki, and E. Nawata. 2009. Sustaining rice fields based on agro-ecological zones in Java, Indonesia. In Press.
Oldeman, L. R. 1975. An Agroclimate map of Java. CRI (LP3), Bogor.
Rustiadi, E., A. Saefulhakim, dan D. R. Panuju. 2008. Perencanaan dan Pengembangan Wilayah. Institut Pertanian Bogor, Bogor.
Soemaryanto, S. Friyanto, dan B. Irawan. 2001. Konversi lahan sawah ke penggunaan non-pertanian dan dampak negatifnya. Prosiding Seminar Nasional Multifungsi Lahan Sawah, Bogor, 1 Mei 2001. F. Agus, U. Kurnia, dan A. R. Nurmanaf (Penyunting). Pusat Penelitian dan Pengembangan Tanah dan Agroklimat, Badan Penelitian dan Pengembangan Pertanian, Departemen Pertanian Bekerja Sama dengan MAFF Jepang dan Sekretaris Asean.
Tambunan, T. 2008. Ketahanan pangan di Indonesia: inti permasalahan dan alternatif solusinya. Makalah disampaikan dalam Kongres ISEI, Mataram, 2008.