

Chapter 29

Agricultural Land Conversion and Food Policy in Indonesia: Historical Linkages, Current Challenges, and Future Directions



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Abstract The problem of agricultural land conversion (ALC) is inseparable to the food security issue in Indonesia. The government has set ALC as the primary threat to the existence of food security. The monoculture food policy in Indonesia has developed an unbalanced food system which relies heavily on rice and shaped the rice-eating habit among Indonesians. The government has formed an act about sustainable agricultural land (LP2B) to protect productive agricultural land and to mitigate the risk of decreasing rice production. The government also encourages the diversification of food to lessen the dependence on rice. However, it is difficult to implement both policies. The formation of LP2B will promote the conflict of interests between stakeholders involved (farmers, real estate developer, and commercial business). On the other hand, food diversification will not be sufficient unless followed by massive effort to stimulate the establishment of supporting institutions (the market for the agricultural product, processing industries, and the market for the consumer). Thus, it is required to limit the rate of ALC with a different and innovative approach. In this chapter, we explain how increasing agricultural land rent encourages farmers to retain farmland. Furthermore, we also identify what significant factors that affect the rent of agricultural land.

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29.1 Introduction: Intersection Between Land and Food Policy in Indonesia

The conversion of agricultural land is a significant threat to the food security of a nation (Agus and Irawan 2006; FAO 2011). Especially in Indonesia, where rice as the the most important staple food crop, is mostly grown in convertible agricultural land (Irawan 2011). Historically, the self-sufficiency of rice has always been the top priority of food policy in each Indonesian government regime (Hafsah and Sudaryanto 2004). It shows that rice has a critical political value.

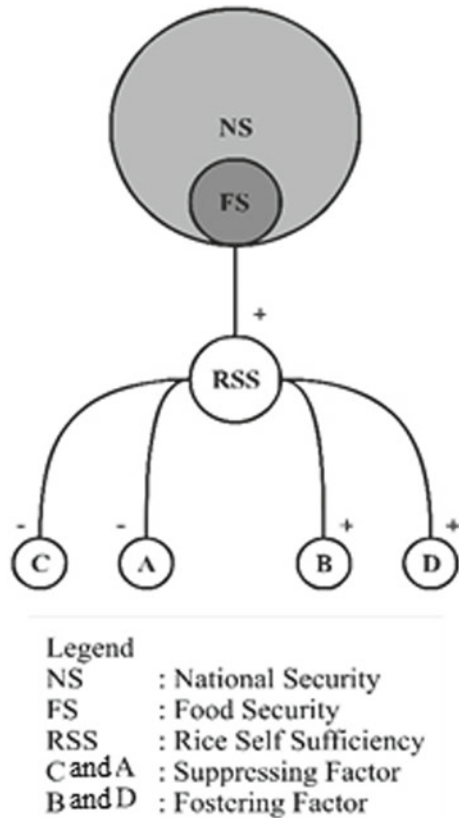
Consequently, it is not only crucial to food security but more importantly also vital to national security. Thus, the logical framework to achieve rice self-sufficiency (RSS) is by fostering the factors which increase rice production and suppressing the factors which decrease it. Diagrammatically, this framework is provided in Fig. 29.1.

One of the significant suppressing factors to achieve RSS is agricultural land conversion (ALC) (Pasandaran et al. 2006). As the Indonesian economy is experiencing rapid industrialization, more land is needed to support this process (Azadi et al. 2011). The conversion of productive farmland mostly supplied this demand since the cost of development in that area is much cheaper than in an established neighborhood (Bhatta 2010; Omrani et al. 2015). Commonly, ALC started to occur in the area near the urban core and formed an area termed as peri-urban (Pribadi and Pauleit 2016). Peri-urban area is the result of quick urbanization and economic development in the urban core which requires more spaces for either housing, commercial, or public uses (Liu et al. 2014; Magsi et al. 2017). Previously, urbanization occurred only in the metropolitan area such as the national and the provincial capital city. Currently, there are many new urban cores in the district and sub-district level which further increase the rate of ALC and the number of peri-urban areas (Hudalah and Firman 2012a).¹ Most of these districts have an agricultural-based economic structure and play a vital role in supplying food for the population. Thus, the ALC in these areas has more crucial implications for food security than those in the metropolitan area.

Moreover, urbanization is the major cause of the loss of valued agricultural landscapes (Schulp et al. 2019). Urbanization is often accompanied by the over-exploitation of natural resources which changes agricultural landscapes completely

¹Indonesia has two levels of the regional administrative government. The first regional administrative government is province (Provinsi) and the second regional administrative government is district (Kabupaten). Each district consists of sub-districts (Kecamatan) which in turn consisted of several villages (Desa).

Fig. 29.1 Framework to achieve rice self-sufficiency



(Plieninger et al. 2016). Also, it makes agricultural landscapes less dominant, aggregated but more unstable, and fragmented but irregular (Su et al. 2014). Furthermore, as cultural landscapes are defined as a result of the interaction between the human affair and the natural aspect of landscapes, the higher economic value of peri-urban land compared to those in the rural area has influenced the shapes and forms of the houses and generally in the form of the landscape in both areas. Thus, understanding how land economic value contributes to the development of landscape in both areas is important for the planning of development policy in the area.

ALC poses a significant threat to food security because of Indonesians' high dependence on rice (Ariani 2004). Indonesia is a mega-biodiversity nation with over 800 varieties of food crops (Fajar 2014). However, the monoculture food policy of the Indonesian government which focuses only on rice has shaped the habit of rice eating among Indonesian people. Also, the monoculture nature of food policy has caused an imbalanced development between supporting institutions for rice and another food commodity (Sumarno 2004). Thus, the food diversification policy is difficult to achieve. Currently, Indonesians are the major rice consumer in

the world with over 100 kg/capita/year of rice consumption (OECD/FAO 2013). The Indonesian government encourages food diversification policy to lessen dependency on rice. However, it is worthy to note that it requires 70 years and many resources to shape this rice-eating habit. It is evident that the same or even more substantial amount of time and resources are required to change this habit. Thus, at least in the next few decades, rice is still the main food in Indonesia.

Consequently, ALC will still be the main threat to food security. Moreover, numerous investigations have expressed the significance of farming in peri-urban zones. Peri-urban farming can enhance the state of nature by alleviating the urban high-temperature impact and decreasing flood hazard (Malaque and Yokohari 2007; Yokohari et al. 2000), making green spaces for the urban populace (Ives and Kendal 2013; Tassinari et al. 2013; Zasada 2011), what's more, a wellspring of pay particularly for poor people (Bryld 2003; Zezza and Tasciotti 2010). Additionally, in the development setting, the indispensable role of peri-urban agriculture has frequently been expressed (McGee 2010). Peri-urban agriculture plays a vital role in supporting food security in the urban region, with its agricultural resource and vicinity to the urban center. Peri-urban area additionally assumed a primary job in the sustainability of urban environment (Allen 2003), providing job opportunities, and alters the course of environmental degradation in the urban region (Douglass 1998). In this manner, it is essential to control the issue of ALC in Indonesia.

The Indonesian government created a regulation to control the rate of ALC which contains two essential systems (Government of Indonesia 2009). The first system focuses on the formation of inconvertible farmland zone under the name of *Lahan Pertanian Pangan Berkelanjutan* (LP2B, in English: sustainable agricultural land). LP2B cannot be converted for non-agricultural use for 20 years. The second system focuses on motivating farmers to retain farmland through various forms of compensation. The type of compensations includes diminishing tax for the land, enhancing farm infrastructure, and compensating the accomplishments of farmers. The former system focuses on limiting ALC by avoiding the conversion of farmland. The latter system focuses on limiting ALC through increasing the motivations of landowners to retain their land in agricultural use.

Some researchers have demonstrated that the use of legal power to limit ALC has given rise to illegal farmland conversion (Chen et al. 2015; Wang and Scott 2008; Zhong et al. 2014). Economically, the regulation that limits ALC contradicts with the motive of the sellers (farmers who own farmland) and the buyers (parties who intend to convert farmland for other uses). As rapid economic growth increases the land rent for non-agricultural purposes, the economic benefits accrued to farmers by retaining their farmland are relatively low. Thus, it drives farmers to sell their land (Ettema et al. 2012; van Vliet et al. 2015). On the other hand, the buyers (whether firm willing to expand their business, a real estate developer, or government willing to build physical infrastructure) need more land with low buying and development costs. Thus, because there is an agreement in economic motives between buyers and sellers, the occurrence of ALC is unavoidable.

Conversely, the policy focus on incentivizing farmers to retain their farmland is proven to be effective in limiting ALC. For example in Europe, decoupled

payments and environmental schemes increase land value because those payments are included in land value (Ciaian et al. 2013; Feichtinger and Salhofer 2013; Kilian et al. 2012; Latruffe and Le Mouél 2009). The payment makes farmers reluctant to convert the land for other uses since the payment improves land value. Moreover, conflict among farmers and between farmers and non-farmers has emerged as the result of increasing land value. Increasing land value limits ALC in two ways: first, by decreasing farmer's economic motive to sell the land, since it is more profitable for them to retain their land, and second, increasing the buying costs of agricultural land, in the form of conflict costs. The conflict costs arise because farmers are interested in obtaining the economic incentive of retaining the farmland.

Based on that background, this chapter focuses on measuring the agricultural land rent (as the proxy for land economic value) relative to non-agricultural land and identifying the determinants of rent for each type of land. In explaining those purposes, this chapter summarized the result of our previous study, which is conducted in two different areas, the first one is in peri-urban area where rapid ALC occurred and the second one is in rural area which has never experienced ALC (Rondhi et al. 2018). Besides, before explaining those results, in the next section, we first describe the historical course of food policy in Indonesia. The purpose of this section is to appreciate the impact of continuous rice-based food policy on high Indonesian dependent on rice and indirectly on the existence of agricultural land. The second section is followed by the explanation of the current challenge of agricultural land and food policy in Indonesia. This is the challenge of the establishment of LP2B to limit ALC and food diversification to reduce the dependency of Indonesians to rice. It is in the fourth section that we explained the result of our previous studies regarding agricultural and non-agricultural land rent. In the fifth section, we showed the cultural landscapes in the peri-urban and rural area. In the sixth section, we proposed how to use the finding of this study as a future direction for policy aimed to control ALC in Indonesia. Finally, we conclude this chapter in the last section.

29.2 Historical Course of Food Policy in Indonesia

After gained independence in 1945, Indonesia has been led by seven presidents for 74 years. Consequently, it has experienced numerous political interests and various policy packages. However, in case of food policy, RSS has always been the top priority, whether for shortest-reigned president (B. J. Habibie) or the longest-reigned president (Soeharto). In general, there are four groups of Indonesian presidential. President Soekarno led the first era and was named *Orde Lama* (Old Era), while President Soeharto led the second era and was named *Orde Baru* (New Era). The third was named the transition era which was led by President B. J. Habibie. After the transition, four presidents have led Indonesia, and this era is named *Era Reformasi* (Reform Era). Figure 29.2 shows the overall course of food policy in Indonesia.

Presidential Period	Old Order	Transition	New Order	Transition	Reform Era	1952	1964	1969	1998	2000	2004	2014	2019
Means of Power	1. Yayasan Bahan Makanan 2. Yayasan Urusan Bahan Makanan 3. Yayasan Badan Pembelian Padi	- KOLONGNAS - BULOG	BULOG	BULOG	Perum BULOG	Ministry of Agriculture	Ministry of Agriculture	Ministry of Agriculture	Perum BULOG	Ministry of Agriculture	Ministry of Agriculture	Ministry of Agriculture	Ministry of Agriculture
Program	1. Kasimo Welfare Plan 2. BIMAS 3. Panca Usaha Tani		Repellita 1 and 2 (1969 - 1979) Repellita 3 and 4 (1979 - 1989) Repellita 5, 6, and 7 (1989 - 1998)	Repellita 1 and 2 (1969 - 1979) Repellita 3 and 4 (1979 - 1989) Repellita 5, 6, and 7 (1989 - 1998)	Privatization of BULOG - No Option Strategy - RSS	- Agribusiness Development - High Value Added Agriculture - Food Diversification	- Agribusiness Development - High Value Added Agriculture - Food Diversification	Privatization of BULOG - No Option Strategy - RSS	Privatization of BULOG - Sale of IPTN's assets - Restoring BULOG	Privatization of BULOG - Sale of IPTN's assets - Restoring BULOG	Privatization of BULOG - Sale of IPTN's assets - Restoring BULOG	Privatization of BULOG - Sale of IPTN's assets - Restoring BULOG	Privatization of BULOG - Sale of IPTN's assets - Restoring BULOG
Focus	Rice Self Sufficiency	Stabilizing Rice Supply	Rice Self Sufficiency	Rice Self Sufficiency	Rice Self Sufficiency	Food Self Sufficiency	Food Self Sufficiency	Rice Self Sufficiency	Rice Self Sufficiency	Rice Self Sufficiency	Rice Self Sufficiency	Agricultural Revitalization	Rice Self Sufficiency
POLICY ASPECT PRESIDENT	Ir. Soekarno		Soeharto	Soeharto							Mega-wati S.	Susilo Bambang Yudhoyono	Joko Widodo

Fig. 29.2 Historical course of food policy in Indonesia

B. J. Habibie
H. Abd. Wahid

29.2.1 Food Policy in the Old Order (1952–1964)

Soekarno led the Old Era and lasted for 22 years. The food policy in this regime mainly focused on rice and had strong political interests. The first policy was aimed to achieve RSS through *Program Kesejahteraan Kasimo* (Kasimo Welfare Plan) (Nusantoro and Cramb 1990). *Yayasan Bahan Makanan* (the Foundation for Food) was established to carry this plan and did its job from 1950 to 1952. In 1953, the government changed the foundation's name to *Yayasan Urusan Bahan Makanan* (the Foundation for Food Supply). However, the core function of this body remained the same. The government issued the second policy in 1956 under the name *Swasembada Beras Melalui Program Sentra Padi* (Rice Self-Sufficiency through Rice Center Program). The second policy remained to focus on achieving RSS; however, in the second program the government started to focus on rice production. In 1956, the government established *Yayasan Badan Pembelian Padi* (the Foundation of Rice Purchasing Agency). The main job of this agency is to buy rice from farmers and also act as the price-regulating authority for rice. In 1963, the government introduced maize as the substitution of rice, since typically Indonesian farmers planted maize after rice. In 1964, the government wanted to further support the rice farming by issuing farm intensification program, *BIMAS* (Mass Extension Program) and *Panca Usaha Tani* (Five Farming's Principles) (Soen 1968).

Soekarno's regimes collapsed in 1965 and followed by the formation of a transitional government in 1965–1967. In this transition period, the government formed KOLOGNAS (National Logistic Command). It acted like the YBPP in the Soekarno era. However, in 1967, the KOLOGNAS was halted, and the government formed BULOG (National Logistics Agency), which mainly acted as a sole buyer of rice. This agency was the initial period of the most extended Indonesian government regime led by Soeharto (Nawiyanto 2017).

29.2.2 Food Policy in the New Order 1969–1998

It was in the New Order where agriculture received considerable attention from the government, especially rice-based agriculture. The policy was started with a ten-year development program under *Repelita 1 and 2* (*Rencana Pembangunan Lima Tahun*/five-year development plan) in the period of 1969–1979. The main aim of the policy remained the same, achieving self-sufficiency in rice production. The policy started with the addition of BULOG task as National Food Buffer Stock, alongside this policy, is the use of National Food Balance (*Neraca Pangan Nasional*) as the standard for food security. However, the BULOG in this era did not focus only on rice but also on sugar, and wheat import (1971), meat procurement for the capital city (Jakarta) started in 1974, and soybean import control (1977). The first ten years of the New Order also marked with the rise of Indonesian Farmers Union (*Serikat Petani Indonesia*) in 1973 and the introduction of the Green

Revolution to achieve RSS in 1974. The end of this period showed the introduction of the floor price for maize, soybean, green bean, and peanuts (Soen 1968).

The second ten-year period of the New Order showed remarkable growth for rice production. Although the national focus changed to food self-sufficiency, which was marked by the expanding tasks of BULOG as a price control authority for rice, wheat flour, sugar, meat, and other food commodities, Indonesia achieved its first and only rice self-sufficiency in this period. It was in 1984 where Indonesian rice production exceeds its consumption. The RSS achieved in 1984 affected the direction of food policy in the third development period. The national focus changed back to rice self-sufficiency. In 1995, the entire BULOG personnel were officially appointed as government officials (PNS, *Pegawai Negeri Sipil*) along with its privileges and incentives. The subsequent major policy showed the narrowing tasks of BULOG. In 1997, BULOG was appointed to control only the price for rice and sugar. In 1998, the narrowing of BULOG tasks continued by controlling only the price for rice. The third period was planned for Repelita 5, 6, and 7 and started in 1989. However, the New Order regime cannot retain its power, collapsed in 1998, and marked the beginning of the Reform Era.

29.2.3 Food Policy in the Transition Period 1998–2000

This period was the age of turmoil in the history of Indonesian politics. The economy was collapsed, coupled with unstable national security. It was more challenging to sustain food production in this period. However, rice was still the primary focus of the government. The first president in this period (B. J. Habibie) tried to stabilize national food supply (rice). Habibie sold the IPTN's aircraft for Thai's rice in 1998/1999. As the national stability increased, the shift in focus of national policy occurred during the second president (Abdurrahman Wahid). In 2000, the government reaffirmed the task of BULOG as the rice logistic management authority which focused on stabilizing supply, distribution, and the price of rice. Abdurrahman Wahid was projected to be in the office from 1999 to 2004; however, due to political circumstances, the office was assumed by Megawati in 2000.

29.2.4 Food Policy in the Reform Era 2000–Now

The course of Indonesian politics has shown the significant role of BULOG in food policy. Back then, BULOG was a not-for-profit government agency and acted mostly to stabilize the national rice logistics. The previous government, either in Old Order, New Order, or in the transition period was only modifying the role of BULOG by expanding or narrowing its tasks, it was only in the era of Megawati that BULOG experienced significant changes. In 2003, the government privatized

BULOG into a general corporation form. By the privatization of BULOG, it focused more on business activity rather than public services. However, although the government reduced its role in national rice logistics (through reducing the role of BULOG), in 2004 the government declared RSS as the sole priority for national food security. It was more challenging to achieve RSS than ever before, given the reduced priority of government in rice policy.

The era of Susilo Bambang Yudhoyono (SBY) realized the difficulty of achieving RSS. Consequently, he focused on agricultural revitalization rather than on individual rice policy. In the ten years of SBY, the food policy not only focused on rice but also on food diversification and strengthening the agribusiness sector that adds value to agricultural products. However, with only ten years, the dependence of Indonesians on rice does not significantly decrease. It was exacerbated by the current Indonesian government (Joko Widodo) which focuses on food policy on achieving the self-sufficiency in rice, maize, and soybean by increasing the investment in agricultural irrigation infrastructure.

The previously described course of Indonesian politics showed that rice was essential to Indonesians, and politically, it is more critical for the government. With this condition, it is difficult or even impossible to completely change the rice-eating habit of Indonesians in the next few years. Thus, the government focuses on minimizing the suppressing factors which limit rice production, such as the conversion of fertile farmland by forming LP2B as the sustainable agricultural land which is inconvertible for other uses. Also, the promotion of “eat local food” is also encouraged today. However, both of these policies have critical challenges. The next section will discuss the challenges of these policies.

29.3 Current Challenges of Food Policy in Indonesia

The importance of preserving rice-based policy in general and protecting farmland from conversion and diversifying food sources, in particular, has been discussed in the previous sections. In this section, we will focus on describing why these policies are relevant to Indonesian conditions and the challenges that arise in the implementation stages. The protection of farmland has been regulated under *UU NO. 41 Tahun 2009*. There are two significant policies contained in this regulation, the formation of legally protected farmland (LP2B) and the effort to improve the economic value of agricultural activities to incentive farmers to retain their land. Meanwhile, food diversification has been regulated under *Perpres No. 22 Tahun 2009* and its main aim was to foster the consumption of locally produced food.

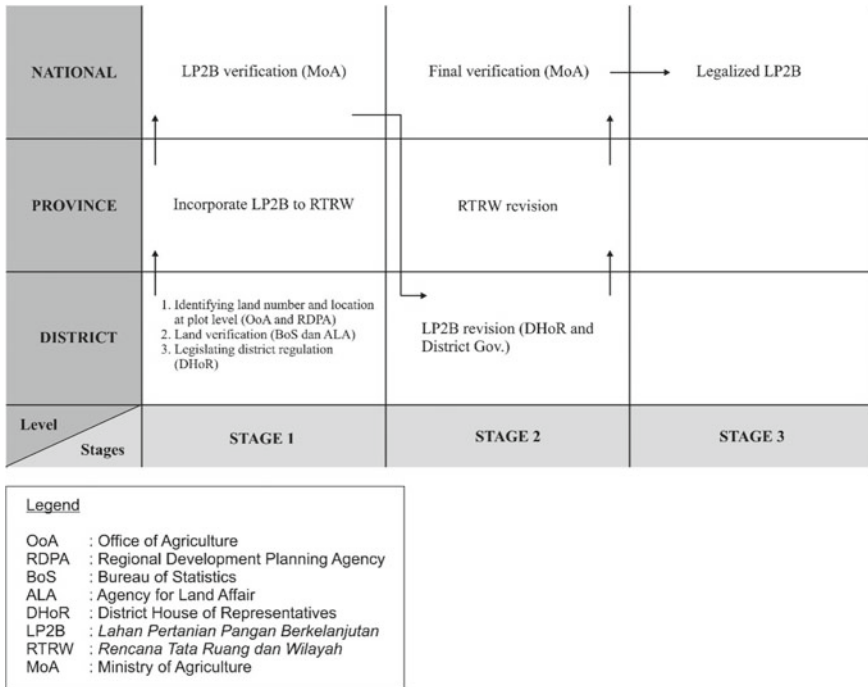


Fig. 29.3 Mechanism of LP2B formation

29.3.1 Farmland Protection Under UU No. 41 Tahun 2009

Forming legally protected farmland is conceptually sound in restricting its conversion to other uses. However, instinctively, it contradicts with the economic motives of the related stakeholders as has been found that there were many problems arisen in the formation of LP2B, whether in the district, provincial, or national level. There are three stages consisting of three administrative levels involved in the formation of LP2B. The three stages are submission, verification, and implementation stages. Diagrammatically, Fig. 29.3 represents the process.

The formation of LP2B initiated at the district level. The district government, through its executive body, identifies the number (area) and location of farmland in the district. The executive body involved is the Office of Agriculture (OoA) and Regional Development Planning Agency (RDPA).² Technically, the field extension

²Officially, OoA is *Dinas Pertanian Kabupaten* while RDPA is *Badan Perencanaan Pembangunan Daerah (BAPPEDA)*.

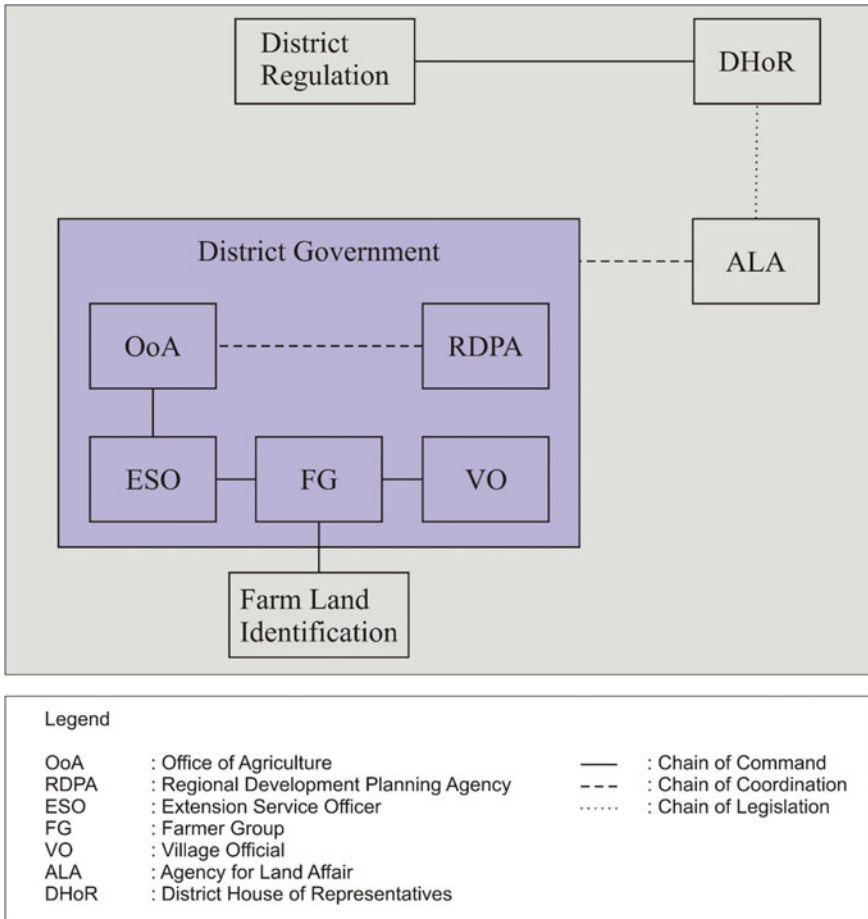


Fig. 29.4 Mechanism of LP2B formation at the district level

officials of OoA cooperate with farmer group and village officials to enumerate the field at the plot level. The obtained data is used as the basis to plan District Regulation which is legalized by the District House of Representatives (DHoR).³ The data obtained is also confirmed with the data gathered by the Bureau of Statistics (BoS) and the Agency for Land Affair (ALA).⁴ Diagrammatically, Fig. 29.4 shows the mechanism in the district level.

³DHoR is Dewan Perwakilan Rakyat Daerah (DPRD) in the official term.

⁴BoS: *Badan Pusat Statistik*; ALA: *Badan Pertanahan Nasional* (BPN).

The submission stage continued to the provincial level by incorporating the LP2B at the district level to provincial spatial and regional system plan.⁵ Then, the provincial government submits the plan to the Ministry of Agriculture (MoA) which then verifies the farmland at the district level. The verification results are then used to re-plan the LP2B in the second stage. The procedures are the same as the submission stage. The difference lies only in the data used. In the second stage, the data used to design District Regulation is that coming from MoA. The second stage is the revision of the first. After the regulation legalized in the district level, the district government then submitted the final LP2B to the province, which then submitted back to MoA. In the final stages, the MoA will coordinate with other agency to determine the final figure of LP2B in each district.

Here is the example of LP2B formation in the Province of Yogyakarta. In the first stage, the proposed LP2B amounted to 51,770 ha. The verification of MoA obtained a result of 71,868 ha of farmland in Yogyakarta. Also, the MoA recommends that LP2B should include both the existing and the newly developed farmlands. The initial plan was then revisioned, after conducting spatial analysis of farmland potential, the province government (Office of Agriculture) proposed 128,381 ha of farmland for the revisioned LP2B. Finally, after coordinating with the Office of Land Affair and Spatial System, the final proposed LP2B is 104.905 ha, which was then legalized by the MoA.

Conceptually, LP2B land is inconvertible for 20 years. However, the legalized LP2B is always lower than the actual farmland. It means that there is farmland which is intended for conversion. Most of these lands are located near the urban core and play a vital role in the urban environment. In East Java, for example, the total farmland in 2017 is 1.086.486 ha, and the LP2B is 952.285 ha. It means that there are 134.201 ha of convertible farmland. Figure 29.5 shows the distribution of farmland in the heavily urbanized and less urbanized region in East Java. Based on the level of urbanization, the Province of East Java is categorized into four groups in the order from the highest to the lowest level of urbanization, megapolitan, metropolitan, intermediate city, and small city.

In the megapolitan region, LP2B comprises 49% of productive farmland. In the metropolitan region, LP2B comprises 94% of productive farmland. However, it is only 4% of the total farmland in the province. In the intermediate city, the LP2B is 51 percent of the total land. However, the rate of ALC in the period of 2012–2017 is 39% which is the highest compared to another region.

Furthermore, the intermediate region has 59% of the total farmland in the province. Thus, the high rate of ALC in the intermediate region causes a significant loss of farmland. In the small city where the urbanization level is low, the LP2B land comprises 94% of the total land and also the rate of ALC is the lowest compared to the other region. This figure shows that the ALC will continue to occur and with the highest rate will be likely to occur in the intermediate city which currently experiences rapid

⁵The provincial government has a spatial system which contained in *Rencana Tata Ruang dan Wilayah* (RTRW).

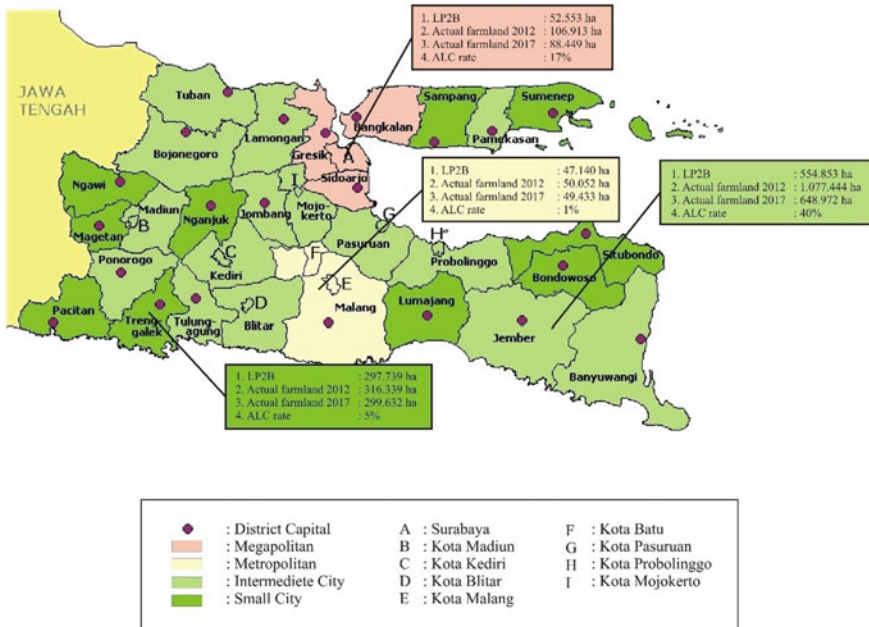


Fig. 29.5 LP2B and actual farmland (2012 and 2017) in East Java

growth of urbanization. The agricultural land conversion poses a severe risk, given the importance of farmland to the urban environment.

In general, LP2B attempts to reduce the rate of conversion through state power by prohibiting the conversion of particular farmland. However, if we look at the root causes of ALC, farmers (the seller) decide not to retain their land because the economic incentive they receive is high. On the other hand, the buyer receives higher economic incentive by transforming agricultural land for other uses, such as real estate, commercial site, and industrial plant. Consequently, the government faces parties with conflicting interests, and this will reduce the effectiveness of LP2B policy. The government task would be easier by aligning their interest with the farmers to retain the farmland. One way to motivate farmer to retain their land is by increasing the economic incentive of agricultural activity.

29.3.2 Food Diversification and Its Challenges

Indonesia has a rich variety of food crops. It is not less than 800 food crops grown in Indonesia. Currently, there are four crops available as a substitute for rice as the source of carbohydrate, e.g., cassava, maize, sweet potato, and sago. These food crops grow in the majority of the Indonesian region. Table 29.1 shows the distribution of the growing region of these crops.

Table 29.1 Growing region (a) for cassava, (b) for maize (c) for sweet potato (d) for sago in Indonesia

Food crop	Growing region	
	Province	District
Cassava	North Sumatera	Serdang Bedagai
	Bangka Belitung	Bangka Barat; Bangka; Belitung; Belitung Timur
	Lampung	Lampung Timur; Lampung Utara; Lampung Tengah; Tulang Bawang
	West Java	Cimahi; Bandung; Ciamis
	Central Java	Banjarnegara; Boyolali; Kebumen; Wonogiri
	Yogyakarta	Bantul; Kulon Progo; Gunung Kidul
	East Java	Trenggalek; Malang; Pacitan
	West Nusa Tenggara	Lombok Barat; Lombok Tengah; Lombok Timur; Dompu; Lombok Utara; West Sumbawa
	Southeast Sulawesi	Muna
	Maluku	Maluku Tenggara Barat; Maluku
	East Kalimantan	Nunukan
	Southeast Kalimantan	Sukamara
Maize	Central Java	Magelang; Temanggung; Boyolali; Semarang; Batang
	East Java	Kediri; Bangkalan; Tulungagung; Lumajang; Ponorogo
	East Nusa Tenggara	Lembata; Flores Timur; TTS; TTU; Alor; Ende
	North Sulawesi	Minahasa Utara
	Gorontalo	
Sweet potato	Aceh	
	North Sumatera	Medan
	Bengkulu	Bengkulu Utara
	Riau Islands	
	Banten	Serang
	West Java	Kuningan
	West Papua	Manokwari; Sorong Selatan
Papua	Wamena	

(continued)

Table 29.1 (continued)

Food crop	Growing region	
	Province	District
Sago	Riau	Pekanbaru
	Riau Islands	Karimun; Natuna
	Central Kalimantan	Sampit
	West Kalimantan	Pontianak
	Central Sulawesi	Parigi Moutong; Poso
	Southeast Sulawesi	Kendari
	North Sulawesi	Sangihe
	Maluku	Ambon; Seram; Maluku Tengah
	Papua	Keerom; Jayapura
	West Papua	Sorong Selatan

Source Hariyanto (2017)

The lack of supporting infrastructure and policy to encourage the consumption of this food is the main reason behind the low acceptability of this food to Indonesian. Although the government issued a regulation to encourage food diversification, it was not followed by the establishment of a market for these crops, the processing plant, and the mass commercialization of the food made with these crops. Consequently, few Indonesian know this food and still fewer are willing to consume it.

There must be a considerable effort from the government if food diversification is to be achieved. However, the government should focus on strengthening their role as the stimulator in the on and off the farm. In the on-farm, the government should stimulate farmer to grow these alternative food crops by stimulating the establishment of a market for these crops. In the off-farm, the government should stimulate the private sectors to develop new food product using these alternative crops as the raw materials. The involvement of private sectors will foster the development and innovation of food product based on this alternative food crops, but more importantly, commercialization and heavy promotion of this food will follow.

29.4 Land Economic Value as the Tool to Control Agricultural Land Conversion

Both of the challenges previously described show that rice is still the primary food in Indonesia. Consequently, the preservation of farmland is crucial to food security. To preserve farmland, it is crucial to control ALC. In this section, we present the result of our study which shows that the main driving factors of ALC are the relative land value between agricultural and non-agricultural uses.⁶

29.4.1 Study Background

According to traditional location theory, urban land creates higher rent compared to agricultural land and causes the occurrence of ALC (Irwin and Bockstael 2002, 2007; North 1955). The characteristics of ALC in developing countries such as Indonesia are rapid and unplanned. Rapid urbanization causes a growing number of urban areas in Indonesia. Unfortunately, this area is surrounded by productive agricultural land (Imhoff et al. 1997). Consequently, as the urban core grows, the subsequent agricultural land was converted to support this growth. The rate of ALC grows faster since both the seller (farmer) and the buyer (real estate developer, a firm, or government) will receive higher rent by converting those lands. It means that there is a significantly higher rent for urban land compared to agricultural land.

Conversely, zero ALC occurred in an area with higher rent for agricultural land. Many factors affect the rent for agricultural land, and identifying these factors can help in controlling ALC since the leading causes of ALC are the lower rent created from agricultural land related to urban land. Increasing rent for agricultural land will slow down the rate of ALC. The rent for agricultural land can be increased by manipulating factors which significantly increase it.

The general purpose of this study is to examine the rent for agricultural and urban land. The study was conducted in the peri-urban area with high rate of ALC and in a rural area where the ALC has not yet been recorded. The point of conducting this study in these areas was to compare the role of land rent in slowing or accelerating the rate of ALC. Also, this study also identifies factors that affect the rent for agricultural and urban land in both areas.

The primary purpose of this investigation is that it exhibits that land rent is the primary driver of ALC as has been previously mentioned in several empirical studies. However, few policy implications to control ALC are based on these findings. In the case of Indonesia, the study of urbanization has primarily focused on big megapolitan cities (Firman 1999, 2000; Firman and Dharmapatni 1994; Hudalah and Firman 2012b). Few studies are conducted in the smaller region which

⁶The full paper can be found in Rondhi et al. (2018).

experience the initial phase of urbanization. Studying these cities is essential. Furthermore, controlling ALC in the early urbanization process will be less costly than in the advanced urban area.

29.4.2 Methods for Measuring Land Rent

Two villages in Jember district in the Province of East Java Indonesia were selected for this study. The first village (Kepanjen) represents the rural area which has never experienced ALC during 2009–2016. The second village (Antirogo) represents the peri-urban area with 8.6% ALC rate during 2009–2016 (BPS-Statistics of Jember Regency 2017). The selection of these locations was to compare the rent for agricultural and non-agricultural land in the area with a rapid ALC and in the area with no ALC. Figure 29.6 shows the relative location of the studied area to Indonesia.

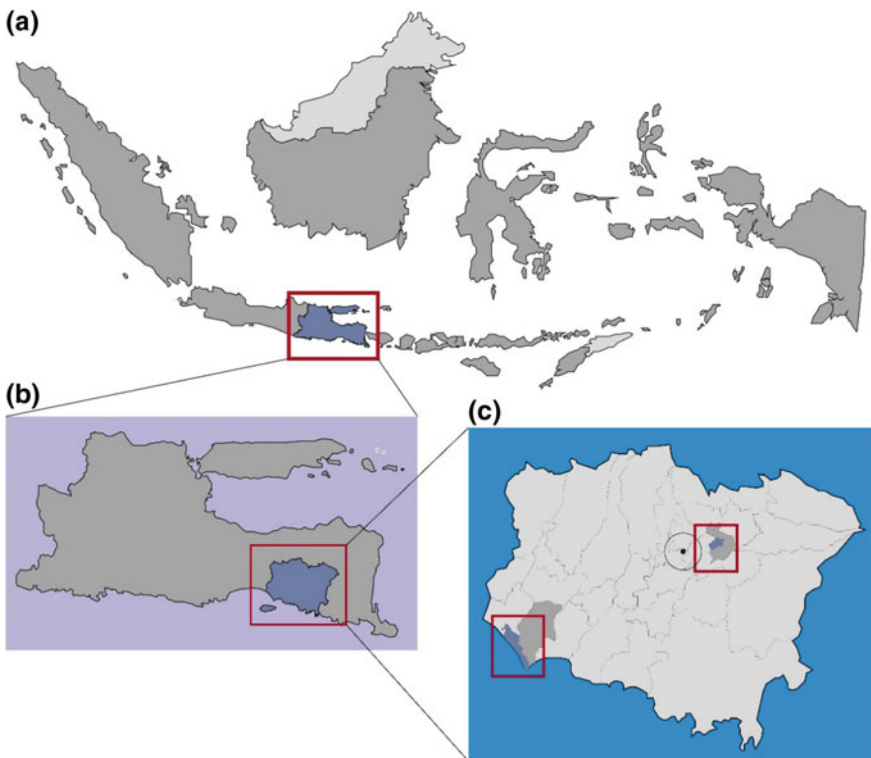


Fig. 29.6 Research site, **a** East Java, **b** Jember, and **c** Jember district map; the upper box shows the peri-urban area (Antirogo); the lower box shows the rural area (Kepanjen); the circle indicates the urban core

Agricultural land in both villages consisted of land planted with a variety of crops. However, the rural area has more various crops with 11 distinct cropping patterns. Meanwhile, the peri-urban area has fewer crops' variety with only two cropping patterns. The non-agricultural land identified in this study was land for housing. The development of housing is the primary purpose of converting farmland in the peri-urban area in Jember district. The new housing in Antirogo was developed in the formerly converted farmland. However, there is an interesting pattern in the farmland conversion. The productive rice field is changed first to moorland before housing construction begins. Moorland is a rice field which is abandoned and left uncultivated for a few years. Rice field abandonment is the pattern in which the housing developer converts agricultural land since they cannot directly convert productive rice field.

The primary data was collected from 200 respondents consisted of 100 farmers and 100 homeowners, the data collected through a survey questionnaire. The questionnaire consisted of two sections. The first section focuses on calculating the rent of farmland and housing, while the second section focuses on exploring the socioeconomic characteristics of landowners. We measure land rent as the annual profit obtained from each type of land. The agricultural land rent was calculated by deducting the total farming cost from the total revenue. The total cost consisted of both the implicit and the explicit costs. The implicit cost is accrued from unpurchased farm input such as seed from the previous harvest, organic fertilizer from livestock manure, and family labor. The housing rent is calculated as the annual net rental fee obtained by the homeowners. The rental fee was estimated as the imputed rental fee.⁷

Meanwhile, we identified seven characteristics of farmer and six characteristics of homeowners. The characteristics cover both physical and socioeconomic aspects of farmers and homeowners. The rural farmers have more land than the peri-urban farmers do. In case of irrigation access, the rural farmers have closer access to the irrigation canal than the peri-urban farmers. The average distance of rural farmer's land to irrigation is only 42 m, while the peri-urban farmers have land which is located 2053 m away on average from an irrigation canal. The sale of farm produce is mostly conducted on the plot. Thus, the average distance of farmland to the market and the road in both areas are similar. Most farmers own the land and perceive their land as fertile land. The majority of farmers in peri-urban and rural areas cultivate food crops, and only a small portion of farmers (33%) cultivate non-food crops (seasonal plantation and horticultural crops).

On the other hand, there are six variables identified for homeowners. The average number of room for peri-urban and rural houses is three, which is the typical Indonesian house. The rural resident has easier access to water than the peri-urban do. There is four percent of the peri-urban resident sampled in this study reported that they do not have access to sufficient water. It shows that there is a degradation in the quality and quantity of water resources in the peri-urban area.

⁷Imputed rental fee is the rental fee obtained by the homeowners had the house been rented.

Peri-urban area has easier access to road and downtown area. The downtown is the sub-district center (kecamatan) of each village which is vital to village life since the significant purchase of the villagers occurred in this area. Thus, it plays an important economic role.

29.4.3 Results and Discussion

29.4.3.1 The Dynamic of Land Rent in the Peri-urban and Rural Area

The result demonstrates that peri-urban area has a higher value of housing land rent compared to agricultural land. Conversely, in the rural area, the agricultural land has higher rent compared to housing. The critical distinguishing characteristic between the two is that the agricultural-housing rent gap in the peri-urban area is significantly higher compared to those in the rural area. In average, the agricultural land rent in peri-urban has a value of Rp 4447/m²/year, and the average land rent for housing is Rp 39,904/m²/year. Meanwhile, in the rural area, the average agricultural land rent is Rp 6047/m²/year, and the rent for housing is Rp 5059/m²/year on average.

Housing creates 700% higher value compared to agricultural land in the peri-urban area. The wide agricultural-housing land rent gap is the main reason for the rapid conversion of farmland in this area. Moreover, the converted agricultural land creates higher rent when used for housing. The converted farmland creates a rent of Rp 7917/m²/year which is two times higher than when it used for agricultural purposes. In the rural area, although agricultural land has a higher land rent, it was only 19% higher compared to housing rent. It shows that currently, agriculture is still the main economic activity in the rural area. However, the narrow gap between agricultural and housing land rents indicates that the land can be converted easily to non-agricultural use.

Many studies demonstrated that urbanization and economic growth in the urban region cause the conversion of farmland (Wasilewski and Krukowski 2004; Kontgis et al. 2014; Phuc et al. 2014; Peerzado et al. 2018). Urbanization causes people to live in the urban area and increases the demand for housing. The development of new housing is often conducted in flat agricultural land. Similar conditions occurred in the peri-urban area of our study. The economy that overgrows and is moving away from agriculture causes rapid urbanization. The urbanization started to impact the nearby agricultural region which followed by the conversion of productive farmland and the degradation of environmental quality. The farmers choose to sell their land to capitalize on the rising land price. Also, they regard that works in agriculture are much less enticing than in the other sectors. Meanwhile, although currently there is no ALC in the rural area, the narrow gap in land rent indicates that ALC can happen any time in the future since farmers tend to sell their land when there is a rising price for the land.

The systematic effort is required to control the rate of ALC in the peri-urban area and to mitigate the risk of ALC in the rural area. The effort should focus on increasing the rent for agricultural land both in the peri-urban and in the rural areas. Thus, it is crucial to identify the factors that affect rent. The next results of our study found that land area, accessibility (to irrigation, market, and road), and cropping pattern significantly affect agricultural land rent. Land area has a negative impact on land rent since the cost of farming in larger land requires more input than in smaller land. The farm yield potential is not maximized since the farmer tends to use constrained family labor.

The accessibility of farmland to irrigation, market, and road increases the land rent (Brown and Barrows 1985; Joshi et al. 2017; Maddison 2009). It is following the compensation scheme of *UU 41 Tahun 2009*. The incentive set in the regulation is in the form of establishment of agricultural infrastructures such as irrigation canal and road. The accessibility of farmland to the road enhances accessibility to the market. However, this kind of incentive is useful only in the rural area where no ALC occurred. The irrigation canal and road are built as a network, and the network will cease to function when some part of it was damaged. In the peri-urban area, the ALC occurred partially and damaged some part of irrigation and road network. The partly damaged irrigation and road network will impact the overall network. Thus, it is essential to identify the kind of incentive should be given to a farmer in the peri-urban area.

29.4.3.2 Urban Farmer and the New Era of Peri-urban Agriculture

The agricultural land rent in the peri-urban area shows an exceptional value. The range value of the rent is between Rp $-416/m^2/year$ and Rp $10,975/m^2/year$. It means there are farmers in the peri-urban area who choose to remain in farming even with the expense of profit. Yagi and Garrod (2018) identify the growing number of the farmers in the peri-urban area who choose not to participate in land speculation and motivated to remain in farming as a hobby or to retain family tradition, and they termed this type of farmer as an urban farmer. The critical point of the urban farmer is that they do not want to sell their land even if it costs them the farm profit.

The existence of an urban farmer will limit the rate of ALC in the peri-urban area. Systematic identification of the urban farmer will help to target the incentive contained in *UU NO. 41 Tahun 2009*. Decreasing land tax, supporting research into high yield variety, and reward for farm achievement will likely be adequate for urban farmer since it will improve their motivation to remain in farming. In our data, the farmer who has negative rent is relatively younger compared to other farmers. However, our data consists only one farmer of this type. Further research is required to identify the characters of the urban farmer.

A carefully planned incentive mechanism accurately targeted to the urban farmer is the most promising policy to reduce the rate of ALC in the peri-urban area. Since agricultural land is privately owned, the sale of farmland is at the control of farmer,

and if the monetary incentive they receive by retaining the farmland is high, it is likely that they will retain the farmland. The form of incentive should be based on the incentive contained in the *UU No. 41 Tahun 2009*. The compensation scheme in the *UU No.41 Tahun 2009* is adequate to motivate urban farmer. Furthermore, promoting the implementation of this regulation would have another advantage in the form of government support and resources.

29.4.3.3 Commercial Farming in the Rural Area and the Degradation of Land Quality

One of the consequences of economic development in the agricultural sector is the shift of subsistence farming toward commercial farming (Nafziger 2012). One of the variables that significantly affect agricultural land rent is the cropping pattern. Non-food cropping pattern is becoming more popular in the rural area. Farmer started to plant non-food crops, especially horticulture because they produce higher rent than the food crops.

Most farmers still cultivate food crops, especially rice and maize. However, the number of farmers who cultivated horticultural crops is growing. The majority of farmers cultivated food crops. Also, some farmers cultivated non-food crops. The rural farmers mix food and horticultural crops, while farmers in the peri-urban area mix food crops with seasonal plantation crops. The result of this study reveals that the non-food crop pattern yielded higher rent compared to food crop pattern. There are 26% of rural farmers and 40% of peri-urban farmers who cultivated non-food crops. Horticulture and seasonal plantation crops need high farming cost and impose a high risk; thus, only a small number of farmers are able to provide the cost and bear the risk.

There is a serious problem caused by the increasing number of farmers in the rural area who planted horticultural crops. The application of pesticides in horticulture farming in the rural area is high, especially in the form of fungicides and herbicides. The average pesticide application frequency is three times a week. It is significantly higher than food crops which require only one to two times application every two weeks. As a consequence, the farmland in the rural area is being polluted by pesticide residue.

Also, the absorption of pesticide residue by the soil in Kepanjen is accelerated with its sandy structure. The water consumed by the rural resident will also be polluted by the residues since the farmland is close to the residential area. Watermelon, one of the leading horticultural crops, is cultivated three to four times annually. The high planting frequency increases the amount of pesticide residue in the soil. Also, the crop residue is left on the field. Consequently, since the pesticide residue also contained in the crop remnants, the amount of residue in the soil increases accordingly. Horticulture generates high rent, but it should be appropriately managed to limit the risk of soil and water quality degradation.

29.5 The Cultural Landscapes in the Peri-urban and Rural Area

29.5.1 *The Landscapes in the Urban Core*

Cultural landscapes are defined as a result of the interaction between human and landscapes which is evolving. One of the major causes of the changes in landscapes is urbanization and rapid economic growth. Urbanization started with high intensity of economic activity in the urban core, and then the following area near the urban is affected accordingly. The urban core is the center of economic, government, and cultural activities. The activity in the urban core can be represented by the existence of the building in which these activities take place.

There are two facilities in the urban core which represent the economic, governmental, and religious activities. First, the economic activity is represented by the largest traditional market in Jember (Fig. 29.7). In Indonesia, most of the retail transaction is conducted in the traditional market. The retail purchase in the traditional market accounts for 80% of the total retail sale. Thus, it plays a central role in the Indonesian economy. The largest traditional market in Jember is called Pasar Tanjung, in which Pasar means market. Second, the town square represents the city center and consisted of city park (Fig. 29.8), government office (Fig. 29.9), and religious building (Fig. 29.10). All of these buildings are surrounding the central plaza.



Fig. 29.7 Front side of the market *Pasar Tanjung*



Fig. 29.8 Central park of Jember



Fig. 29.9 Office of Jember district government



Fig. 29.10 Great Mosque of Jember

29.5.2 The Landscapes in the Peri-urban Area

The existence of these facilities influences the nearby area. The formerly rural area near the urban core is affected by the increasing rate of population growth. As the urban core grows, the housing area for the urban population will be pushed away from the urban core. Consequently, the rural area near the urban core will be transformed into a peri-urban area where the characteristics of rural life are being pushed away by the urban population. It is evident in the shapes of landscapes both in agricultural and in housing landscapes.

The expanding housing area threatens agricultural land in the peri-urban area. In the peri-urban area, the agricultural land was very close to housing. Consequently, the expansion of housing will consume the following farmland. As shown in Fig. 29.11, although there is still vast farmland, the housing was located at the edge of the farmland. As the population growth in this area, the conversion of the farmland is inevitable. Coupled with the existence of the permanent road, the development of housing is certain in the future.

In the case of housing, the peri-urban area consists of two types of neighborhood. The first is the housing of the native resident. The first group was characterized by pertinent rural characteristics, both in the physical aspects and in the social aspects. Physically, the first neighborhood is relatively poor, and most of the economic activity is still in agriculture. The physical form of the house is quite large with a wide yard around the house (Fig. 29.12) since the price of land when the house was built was low. In terms of style, the house is a traditional house.



Fig. 29.11 Farmland in the peri-urban area and the housing in the edge of the farmland area and concrete road to access the housing



Fig. 29.12 Traditional peri-urban house which possessed by the native peri-urban resident



Fig. 29.13 Contemporary peri-urban house which is quite small relative to the traditional peri-urban house

On the other hand, the second neighborhood occupies the newly developed housing which was the result of the growing urban population and has different characteristics. The house was built in the formerly farmland. Hence, it was the result of farmland conversion. Most of these lands are high priced, and it affects the type and size of the house. In terms of size, the house is quite small; typically, it was built on land, not more than 100 m². Consequently, it does not have an extensive yard like those in the traditional peri-urban house. Furthermore, each home is attached to the other house (Fig. 29.13). However, the house building is contemporary in style.

The building of the new housing requires a lot of building material, such as sand and rock. Most of this material was obtained from the extraction of the hill in the peri-urban farmland (Label D). The mining of these materials harms the ecosystem in the peri-urban area since the hill plays a role in preserving water resources. Figure 29.14 shows the overexploited hill for the extraction of sand and rock for building material. The mining activity changes the agricultural landscape entirely in the peri-urban area since the exploited hill is mined until it has the same level as the farmland.



Fig. 29.14 Sand and rock mining in the peri-urban area

29.5.3 *The Landscapes in the Rural Area*

The different conditions occurred in the rural area, where the landscape is dominated by farmland. Agriculture is a significant economic activity in the rural area. It is shown in the extensive farmland and various crops planted in the rural area. There can be more than one crop planted in a farmland area (Fig. 29.15), while the housing in a rural area is relatively small than the agricultural area. The house in the rural area has similar characteristics as the traditional house in the peri-urban area. However, the rural house is relatively better than the traditional peri-urban house in terms of quality of the building (Fig. 29.16). Generally, the house is the proxy for wealth in the farmer community; the better the house, the wealthier is the farmer. Based on this measure, the farmer in the rural area is better off than peri-urban farmer. It is also shown in the land rent measurement of farmland in both areas.

29.6 Policy Implications

Indonesia is a big nation, with over 250 million population, and the Indonesian food system receives a massive burden. The monoculture food policy in Indonesia has developed supporting institutions only for rice and shaped rice-eating habit among Indonesian people. Currently, the primary threat to food security in



Fig. 29.15 Farmland in a rural area with three crops planted in the area (peanut, rice, and watermelon)



Fig. 29.16 Rural house which has a wide yard and contemporary style

Indonesia is the loss of productive farmland due to ALC since it reduces rice production. Also, the difficulty of implementing food diversification policy exacerbated the problem. Thus, it is crucial to limit ALC and to strengthen the food diversification policy. Based on the discussion in the previous sections, we propose two policy implications for food security in Indonesia.

First, we propose the limiting of ALC as a short-term strategy to maintain food security in Indonesia. The result of our previous study presented in Sect. 4 demonstrates that significant difference between agricultural and non-agricultural land rents is the primary driver of ALC. The increasing housing demand from the urban resident will increase the rate of ALC in the peri-urban area. Also, the narrow gap between agricultural and non-agricultural land rents in the rural area imposes a possibility of ALC in this area. The narrow gap of land rent indicates that the resistance of farmers to sell the farmland is not quite strong. The increasing land price will be likely to move farmers to sell the land.

It is vital to identify the peri-urban farmer to limit the rate of ALC in the peri-urban area. A peri-urban farmer tends to retain their farmland. The farming motivation of peri-urban farmer is entirely different from the typical farmer. The farming motivation of peri-urban farmer is to satisfy their hobby or to preserve the family farming tradition. Since they tend to retain the farmland, systematic identification of peri-urban farmer and a targeted farming compensation to them will strengthen their motivation in farming and increase the possibility of them retaining the farmland. Also, in rural areas, the identification of commercial farmers and the way they behave are vital to mitigate the risk of ALC in the rural area and the risk of environmental degradation due to the overuse of pesticides.

There are three options to limit the rate of ALC in the peri-urban area and to mitigate the risk of ALC and environmental degradation in the rural area. First, the current compensation scheme in UU No. 41 Tahun 2009 should be focused on the peri-urban farmer. Since peri-urban farmer has a stronger non-economic motive than the typical farmer, this compensation will strengthen their motivation in farming. Second, there should be an effort to mitigate the risk of pesticide residue from commercial farming in the rural area. The cultivation of non-food crops increases the rent of agricultural land. However, pesticide residue causes environmental degradation. Leaving the problem of commercial farming unsolved will sacrifice the sustainability of agriculture itself. Third, commercial farming should be granted access to timely information regarding market and farm innovation. Commercial farmer is responsive to new information, and the improved channel of information to this farmer will improve their productivity and farming practice.

Second, we encourage strengthening food diversification policy as a long-term strategy to improve food security in Indonesia. There should be a keen national interest to make food diversification effort effective. Specifically, the government should focus on stimulating the development of supporting institutions for alternative foods. The kind of institutions that must be stimulated is the market for the primary product of alternative food crops, the processing industry of the food made

from these crops, and the consumer market for food products made from these crops. In stimulating the second and the third institutions, the government should put the focus on stimulating the private sectors.

Currently, the effort to induce food innovation to alternative food crops is aimed at academic and research institutions primarily. Consequently, the products cannot pass the commercialization stages since both of these institutions are focused on research and development alone. There should be a collaboration between academic and research institutions with the private sectors. However, the implementation of this collaboration is difficult. It will be more beneficial if the private sectors are included from the beginning. The inclusion of private sectors will improve the chance of alternative food products to be commercially distributed. Furthermore, the food policy in Indonesia mainly focused on food production. In the longer term, the food policy should also focus on mainstreaming the balance consumption of healthy food and improve the affordability and stability of this food.

29.7 Conclusions and Future Research Directions

This chapter describes the dynamic of agricultural land conversion in the rural and peri-urban area in East Java, Indonesia. It explains the critical position played by ALC in the effort to achieve food security in Indonesia. The monoculture nature of food policy in Indonesia which focused on rice has developed a food system which relies heavily on rice and shaped the rice-eating habit among Indonesians. ALC becomes a primary threat to food security in Indonesia since most of the converted land is located in the agricultural region. Figure 29.5 shows that the LP2B which is the primary tool to limit ALC only protects half of the productive farmland. The remaining farmland was converted at a rapid rate with the highest occurred in the intermediate city where the urbanization has only just begun. Thus, it is vital to protect the non-protected farmland in this region. One of the feasible solutions to limit the rate of ALC is by increasing the rent of agricultural land in this area.

The analysis of land rent for agricultural and non-agricultural land demonstrated that it is highly correlated with the rate of ALC. In the peri-urban area where rapid ALC takes place, non-agricultural land rent is 700% higher than agricultural land. Conversely, the rent for agricultural land in the rural area where no ALC occurred is higher compared to non-agricultural land. Thus, increasing agricultural land rent will be likely to limit the rate of ALC. Consequently, it is logical that the effort to reduce the rate of ALC must focus on the effort to increase the rent for agricultural land. Below, we pointed out the direction for future research in the effort to reduce ALC:

1. The study of ALC should be focused on the intermediate city as shown in Fig. 29.5. Currently, the majority of farmland are located in this region. Moreover, also, this region is experiencing the initial stage of urbanization. Thus, it is better to mitigate the negative impact of urbanization earlier in this

region. The focused study location should be in the peri-urban area and the area where new urban core has emerged. This location experienced the highest rate of ALC.

2. It is vital to identify the characteristics of peri-urban farmer systematically. Peri-urban farmer potentially has the vital role in limiting the ALC in the peri-urban area since their motive of farming is entirely different from the typical farmer in which they tend to retain their farming even at the expense of profit. Targeting the compensation scheme contained in UU NO. 41 Tahun 2009 to these farmers will improve their motivation in farming and will encourage them to retain the land.
3. It is also essential to mitigate the risk of pesticide overuse by a commercial farmer in rural areas. The high level of pesticide is applied to horticulture farming in the rural area. Although horticulture farming increases agricultural land rent and limits the ALC, the pesticide overuse will degrade environmental quality in the long term.
4. Research into the development and evolution of cultural landscapes in a peri-urban and rural area will provide extensive insight into how the landscapes evolved as the consequence of urbanization.

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