Utilization of Abandoned Plantation Areas for Crop Livestock Integration: Review

Yuni Prasetyani, Eka Sri Wahyuni, Ratu Putri Ganesa

Postgraduate Student of Animal Science, Magister Program, University of Jambi

*Corresponding author: setyani432@gmail.com

ABSTRACT

An uncultivated plantation is an abandoned land caused by factors limiting the carrying capacity of the land and the completeness or condition of the plantation infrastructure so that the condition is overgrown with weeds and shrubs. The plantation area in question is an area that has not been attached to land rights and already has a permit/concession/business license that is deliberately not cultivated or not utilized. Indonesia has a plantation area of 26.5 thousand hectares, and 4.5% is an abandoned land that is not utilized. Thus, it is necessary to control this plantation land by government regulation. It can be utilized optimally by the community and the state. This land can be utilized by the crop-livestock integration approach.

Keywords: *Abandoned land, cattle development, intercropping, uncultivated plantations*

INTRODUCTION

Abandoned or unutilized land refers to land that is not being used or managed properly, whether for economic or environmental reasons (Keenleyside and Tucker, 2010). Factors that may lead to landscape abandonment include environmental factors such as reduced soil fertility and degradation caused by overgrazing, as well as socio-economic factors and socio-political changes (Szirmai et al., 2022). According to Government Regulation of the Republic of Indonesia Number 20 of 2021, abandoned land includes land rights, management rights, and land obtained based on control over land, which is deliberately not cultivated, utilized, or maintained. This definition encompasses various areas such as mining, plantation, industrial, tourism, large-scale integrated housing/settlement areas, or any other areas whose exploitation, use, and/or utilization are based on the contents/concessions/business licenses related to land and space utilization.

During the financial crisis of 1998, many large plantation companies faced financial difficulties, which led to the emergence of abandoned land, such as uncultivated plantation areas. As a result, the land was left in a neglected state. This, in turn, caused a change in land cover, leading to shrubs or open land, which can become critical and cause land abandonment, leading to increased or decreased erosion. To address this issue, Government Regulation of the Republic of Indonesia Number 11 of 2010 was introduced, requiring the verification and supervision of abandoned land, including land that has been granted rights by the state. The regulation applies to property rights, business use rights, building use rights, use rights and management rights, or the basis of control over land that is not cultivated, not used, or not utilized by its condition or the nature and purpose of granting the right or basis of control.

Abandoned land can be effectively managed through reorganization to optimize its use for the benefit of both the community and the state. This is in line with Article 1, Paragraph (7), the Regulation of the Head of the National Land Agency of the Republic of Indonesia Number 4 of 2010, which outlines the procedures for curbing abandoned land. The utilization of previously abandoned state land for the

betterment of society and the state can be achieved through agrarian reform, state strategic programs, and other state reserves. The mentioned strategic programs are government initiatives (which can be implemented by the central government, regions, and/or business entities) that have a strategic nature aimed at promoting growth, equitable development, and improving people's welfare (Government Regulation 20 of 2021).

Crop Livestock Integration is one effective way to reorganize abandoned land. This method involves managing land by applying intercropping patterns while also maintaining ruminants. When non-legume grains are intercropped with legumes, it helps to overcome the problem of forage production sustainability and optimize the use of uncultivated plantation land (Tsubo et al., 2005). For better results, seasonal non-legume crops should be intercropped with legume crops because legumes can fix nitrogen that can be utilized by surrounding plants (Warman and Kristina, 2018). Intercropping several varieties of soybean with sorghum provides a land equivalence value (LER) greater than one, which means that sorghum-soybean intercropping is more productive than monoculture (Siantar et al., 2019). This study aimed to reveal the possibility of using unused plantation land for livestock development with intercropping systems.

MATERIALS AND METHODS

To collect data, the researchers used the literature review method. This involves gathering information from books and other relevant sources that pertain to the subject matter and research objectives. These books and literature serve as sources of information that the researchers analyze and study to acquire theoretical knowledge.

RESULTS AND DISCUSSIONS

Definition of abandoned/uncultivated plantation

The Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency of the Republic of Indonesia Number 20 of 2021 outlines the procedures for ordering and utilizing abandoned areas and land. According to the regulation, abandoned areas are non-forest areas that do not have land rights, permits, concessions, or business licenses, and are intentionally not cultivated or utilized. The regulation also clarifies that plantation areas are included in the abandoned areas described in Article 4. These plantation areas are used for plantation business activities under the laws, regulations, and RTR, but have not been attached to land rights.

Indonesia has a total plantation area of 26.5 thousand hectares, of which 4.5% is comprised of abandoned plantation land that remains unutilized. Some of the provinces that have a significant percentage of abandoned plantation land include West Papua (18.1%), East Kalimantan (17.3%), South Sulawesi (11.5%), and West Nusa Tenggara (10.6%) as per the data provided by the Statistic Bureau in 2020.

Criterion and soil quality of abandoned/uncultivated plantation

Supriyanto (2010) stated that a plantation can be considered abandoned or uncultivated if the land is not being used or cultivated in a manner that aligns with its condition, nature, purpose of use, or principles of management. The term "abandoned land" refers to land that meets the following criteria: a) the cultivator has cleared the land; b) the cultivator has cultivated the land for up to one or two harvests; c) the cultivator has left the land unused for a certain period, allowing it to revert to forest; and d) the land has returned to the ownership of the customary law community. Degraded landscapes are expanding in the tropics as forests are converted to unsustainable pastures or cultivation and then abandoned (FAO 1978; Nair 1984; Bussmann 2004).

Table 1 shows the soil quality characteristics of the land that has not been cultivated or utilized, such as uncultivated plantation land (Sarkar et al., 2019), compared with oil palm and rubber plantations, and forests (Okalia, 2022).

Table 1. Soil quality properties of uncultivated/abandoned plantations compared to oil palm and rubber plantations and forest

Criterion	Uncultivated plantation with soil depth (cm)		Oil palm plantation*	Rubber plantation*	Forest
	0-15	15-30			
pH	8	8	5.46[1]	4.35-5.24[2]	-
Soil organic carbon (SOC) (%)	1.69	1.34	1.54	1.61	3.30
N total (%)	0.18	0.15	0.17	0.16	0.39
P availability (ppm)	15	12	14.55	15.35	19.80
K availability (ppm)	6,742.09	5,958.33	0.48**	0.49**	0.65**
C/N ratio	8	8	-	-	-

Note: *) 6 year   **) K-dd
1) Qishty et al., 2023
2) Nurmegawati et al., 2014

The difference in some nutrient content such as pH and soil organic carbon and nitrogen (N) in uncultivated plantations with active plantations (oil palm and rubber plantation) is a result of activity in the active plantation like fertilizing and land clearing. Okalia (2022) found the differences in soil C-organic content on plantation land occur due to the loss of topsoil during land clearing.

Economic and environmental impact of uncultivated plantation

Land that is allocated for specific purposes, such as plantation land, but is not utilized properly will become an inhibiting factor for a development that should be able to improve the welfare of the community because they utilize the land (Ismail, 2013). Proper land use is necessary to improve the economy and the well-being of the people. Improper land use potentially causes vulnerability in food security, the national economy, and socioeconomic access to the community (Mahruf, 2017). Therefore, abandoned or unutilized land could be used by the people for business purposes, for example for gardening (Yuwono, 2009).

From an economic perspective, the impact of land abandonment results in the loss of the land's economic potential (Limbong, 2017). For instance, if 1.2 million hectares Hak Guna Usaha (the Right to Cultivate) plantation is abandoned, there will be an estimated loss of IDR 15.1 trillion and over 400 thousand people will lose their jobs in the plantation sector (Sembiring and Johnes, 2020).

Concerning the environment, uncultivated plantations can have both positive and negative impacts. Negative impacts include the loss of biodiversity, increased risk of land fires, erosion, and reduced water quantity. However, uncultivated plantations also have the advantage of natural reforestation and revegetation, which supports soil nutrient cycling and biodiversity (Benayas et al., 2017)

Vegetation cover in abandoned plantation

After abandonment, light-demanding species initially dominate, but are eventually replaced by shade-tolerant species due to differences in growth rate, longevity, and shade-tolerance among tree species that colonize the site (Mullah et al., 2011). Secondary vegetation has developed in the abandoned areas, providing an excellent basis for various spontaneous secondary succession studies. The succession of abandoned lands was initially greatly influenced by the date of abandonment, the type of last crop before abandonment, its weed vegetation, landscape history, soil water supply, and organic carbon content (Szirmai et al., 2022). If old fields are left undisturbed, they can eventually turn into forests once again through the natural process of succession. Over time, shrubs and trees will gradually take over old fields that were once dominated by grasses and various herbaceous plants (Land Owner Resource Centre, 1999).

Numerous plant species are found in uncultivated rubber plantations, including *Merremia vitifolia* and rubber trees (*Hevea brasiliensis*), which are typically found at an average of 12.8 stems per plot. Rubber trees are the most frequent plant variety in uncultivated plantations, although these plantations have been abandoned for approximately 40 years. Additionally, various plant species are used as food and may have been cultivated in the past, such as star fruit, durian, rambutan, and others (Neo et al., 2013). In Eucalyptus (*Eucalyptus globulus*) plantations that have been abandoned for almost 40 years and left to regenerate, only a few plant species are growing. These plantations are dominated by small tree species that are dispersed by birds, such as *Clerodendrum infortunatum* and *Litsea wightiana* (Nerlekar et al., 2019).

Potential uses of the uncultivated plantation through crop-livestock integration
The potential of vegetation cover
During one year, seven different types of vegetation appeared on the abandoned agricultural land. These included *Brachiaria, Hyparrhenia*, weeds, bushes, and planted tree types such as Cecropia, ishipingo, tabebuya, and tahuari. The presence of *Pueraria phaseoloides* and other climbers, along with the soil conditions, further influenced the secondary succession process in the area (Kobayashi et al., 2014).

Certain plants, such as *Eupatorium odoratum, Melastoma malabathricum*, and *Imperata cilindrica*, which are unappetizing, and toxic species like *Lantana camara* and *Asclepias curassavica*, will remain as weeds. However, the majority of the remaining vegetation will be used as forage when the animals are introduced to the system. The spontaneously growing plant species found in a particular location may include a mix of grasses, legumes, and broad-leaved plants. Animal species may consume some of these plants more than others, depending on their preferences. Legumes are generally more nutritious and are preferred over grasses in integrated systems with small ruminants, as they can contribute to higher levels of animal production. Some tropical legumes, such as *Calopogonium caerulium*, are not palatable to animals. The standard mixture of legumes that is currently used as cover crops for rubber and oil palm plantations in Southeast Asia includes *Centrosema pubescens, Pueraria phaseoloides, Calopogonium muconoides* and *Calopogonium caerulium*. Out of these, only *C. pubescens* is palatable, while *P. phaseoloides* is only partially consumed and the *Calopogonium* species is almost not consumed at all (Sanchez, 1995).

Intercropping pattern approach
It is important to make use of abandoned or uncultivated plantation land while also developing crop varieties that can thrive in suboptimal conditions. Additionally, Law No. 41/2009 on the Protection of Sustainable Food Agriculture Land can help optimize the use of uncultivated plantation land (Mulyani et al., 2011).

Uncultivated plantation lands, such as coconut, oil palm, rubber, or cocoa, and even land that hasn't been planted with food crops and annual crops, can be put to good use by applying an ecosystem approach. One way to do this is by using intercropping patterns with crops such as cassava, peanuts, sweet potatoes, rice, and sweet potatoes (Rusdiana and Adawiyah, 2013). This approach has many benefits, including efficient use of land, reduced pests, improved soil fertility (especially in terms of nitrogen), diverse crop yields, reduced weed growth, and less need for production facilities (Aisyah and Herlina, 2018; Lingga et al., 2015).

Several factors to successfully cultivate plants in abandoned plantation areas with intercropping patterns should be addressed including adding appropriate nutrients, considering the time between planting each plant, the width of each plant's crown, the distribution area of each plant's roots, and the physiological properties of each plant. These properties relate to the compounds released by each plant that can either inhibit or support the growth of surrounding plants (Warman and Riajeng, 2018). The types of crops that will be intercropped are taken into account, as certain crops cannot be intercropped, such as peanuts, kidney beans, and beans intercropped with sweet corn (Saragih et al., 2019). This is because these crops cannot compete with weeds, which can reduce their ability to produce well due to the absorption of nutrients and water from the soil, as well as take up space to

grow. As a result, weed presence in intercropping crop cultivation can cause losses in production both in quality and quantity (Dinarto and Astriani, 2012).

Intercropping is a farming method that involves planting two or more crops together in the same field. This method can significantly improve forage production as ruminant feed. Koten et al. (2013) reported that one effective intercropping pattern involves planting Arbila and sorghum with an arbila planting distance of 120 cm and two to three rows of sorghum. This technique results in high yields of BK (4.53-5.33 tonnes/ha), BO (4.57-5.33 tonnes/ha), and PK (0.55-0.77 tonnes/ha).

CONCLUSION

There are large areas of plantations in several provinces of Indonesia that are currently abandoned and uncultivated. The vegetation in these areas is diverse, including various tree and shrub species. However, the land is not being utilized effectively, and it is crucial to implement the right utilization strategy under applicable policy provisions. When utilizing this land, it is essential to consider several factors due to the nature of this land. One effective approach to utilizing this land is through a crops-livestock integration method. This method involves optimizing vegetation cover and intercropping patterns to make the most of the abandoned plantation's potential.

REFERENCES

Aisyah, Y., and Herlina, N. (2018). Pengaruh jarak tanam tanaman jagung manis (*Zea mays* L. var. saccharata) pada tumpangsari dengan tiga varietas tanaman kedelai (*Glycine max* (L.) Merrill). *Produksi Tanaman*. 6(1): 66-75.

Badan Pusat Statistik. (2020). Provinsi Dalam Angka/Region in Figures 2020. Jakarta: Badan Pusat Statistik.

Benayas, J. M. R., Ana, M., Jose, M. N., and Jennifer, J. S. (2007). Abandonment of agricultural land: an overview of drivers and consequences. CAB Reviews: *Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*. 2(57): 1-14

Dinarto, W., and Astriani, D. (2012). Produktivitas kacang tanah di lahan kering pada berbagai intensitas penyiangan. *Agri Sains*, 3(4): 33-43.

Ismail, K. I. (2013). Pendayagunaan tanah negara bekas tanah terlantar melalui program reformasi agraria. *Lex Jurnalica*, 10(2): 121-134

Keenleyside, C., and Tucker, G. M. (2010). *Farmland Abandonment in the EU: an Assessment of Trends and Prospects*. Report prepared for WWF. Institute for European Environmental Policy, London.

Kobayashi, S., Soudre, M., and Ricse, A. (2014). Secondary succession of mixed plantations established to rehabilitate abandoned pasture in the Peruvian Amazon. *Tropics*, 23(2): 83-90

Koten, B. B., Soetrisno, R. D., Ngadiyono, N. and Soewignyo, A. (2013). Penampilan produksi hijauan hasil tumpangsari arbila (*Phaseolus lunatus*) berinokulum rhizobium dan sorgum (*Sorghum bicolor*) pada jarak tanam Arbila dan jumlah baris sorgum. *Sains Peternakan*, 11(1): 26-33.

Land Owner Resource Centre. (1999). Management Options for Abandoned Farm Fields. Queen's Printer for Ontario. http://www.lrconline.com/Extension_Notes_English/pdf/ab_flds.pdf. ISSN 1198-3744. Accessed 1 February 2024

Limbong, D. (2017). Tanah negara, tanah terlantar dan penertibannya. *Mercatoria*. 10(1): 1-9.

Lingga, G. K., Purwanti, S., and Toekidjo. (2015). Hasil dan kualitas benihP a g e | **31** kacang hijau (*Vigna radiata*(L.) Wilczek) tumpang sari barisan dengan jagung manis (*Zea mays saccharata*). *Vegetalika*. 4(2): 39-47

Mahruf. (2017). Analisis hapusnya HGU berdasarkan Surat Keputusan Penetapan Tanah Terlantar dari BPN: Studi kasus atas PutusanNomor : 25/G/2013/PTUN.JKT. *Ilmu dan Budaya*, 40(55): 6329-6348.

Mullah, C. J. A., Totland, Ø., Klanderud, K. (2011). Recovery of Plant Species Richness and Composition in an Abandoned Forest Settlement Area in Kenya. Restoration Ecology, 20(4): 462-474. https://doi.org/10.1111/j.1526-100X.2011.00810.x

Mulyani, A., Ritung, S., and Irsal, L. (2011). Potensi dan ketersediaan sumber dayalahan untuk mendukung ketahananpangan. *Litbang Pertanian*. 30(2): 73-80.

Neo, L., Alex T. K. Y., Chong, K. Y., Zeng, T. C., and Hugh T. W. T. (2013). The vascular plant flora of abandoned plantations in Singapore III: Lentor Forest. Nature In Singapore. 6: 113–124.

Nerlekar, A. N., Vignesh, K., Saravanan, A., and Ganesan, R. (2019). Successional dynamics of a regenerated forest in a plantation landscape in Southern India. *Journal of Tropical Ecology*. 35: 57–67.

Nurmegawati, Afrizon, Sugandi, D. (2014). Study of soil fertility on a small rubber plantation in Bengkulu province. *Jurnal Litri* 20(1): 17-26

Okalia, D. (2022). Kajian Kandungan Hara Pada Beberapa Penggunaan Lahan Perkebunan Di Kabupaten Kuantan Singingi. *Jurnal Agro Indragiri* 10(2): 1-8 Doi: Https://Doi.Org/10.32520/Jai.V4i1

Peraturan Kepala Badan Pertanahan Nasional Republik Indonesia Nomor 4 Tahun 2010 Tentang Tata Cara Penertiban Tanah terlantar.

Peraturan Menteri Agraria Dan Tata Ruang/ Kepala Badan Pertanahan Nasional Republik Indonesia Nomor 20 Tahun 2021 Tentang Tata Cara Penertiban Dan Pendayagunaan Kawasan Dan Tanah Telantar.

Peraturan Pemerintah Republik Indonesia Nomor 11 Tahun 2010 Tentang Penertiban Dan Pendayagunaan Tanah Terlantar.

Qishty, M. Y., Harahap, F. S., Sepriani, & Adam, D. H. (2023). Study of some nutritional elements in the replanting land of oil palm (*Elaeis guineensis* jacq.) in Bakaran Batu Village, Rantau Selatan District. *Agro Estate*, 7 (1): 54-60 https://www.ejurnal.itsi.ac.id/index.php/JAE

Rusdiana, S., and Adawiyah, C. R. (2013). Analisis ekonomi dan prospek usaha tanaman dan ternak sapi di lahan perkebunan kelapa. *SEPA,* 10(1): 118 –131.

Sanchez, M. (1995). Integration of livestock with perennial crops. In: D. Chupin. *World animal review*. FAO.

Saragih, B. W. M., Nanik, S., Prasetyo, and Uswatun, N. (2019). Optimasi lahan pada sistem tumpang sari jagung manis dengan kacang tanah, kacang merah, dan buncis pada sistem pertanian organik. *Agroqua*, 17(2): 115-125.

Sarkar, I., Zulfikar, K. Md., and Hanif, Md. (2019). Soil organic fractions in cultivated and uncultivated soils of coastal area in Bangladesh. *Journal of Agricultural Chemistry and Environment*, 8: 129-144.

Sembiring, B. L., and Yohanes, N. A. W. (2020). Menghitung dampak tanah terlantar terhadap potensi kerugian ekonomi di Indonesia. Pertanahan. 10(1): 109-120.

Siantar, P. L., Pramono, E.,Hadi, M. S., Agustiansyah. (2019). Pengaruh kombinasi varietas dalam tumpangsari sorgum-kedelai pada pertumbuhan dan produktivitas benih sorgum dan kedelai, dan vigor daya simpan benih sorgum. *Seri Sains dan Teknologi, Jurnal Siliwangi* 5(1): 32-39.

Supriyanto, 2010. Kriteria tanah terlantar dalam peraturan perundangan Indonesia. *Dinamika Hukum*, 10(1): 51-59.

Szirmai, O., Saláta, D., Benedek, L.K., Czóbel, S. (2022). Investigation of the Secondary Succession of Abandoned Areas from Different Cultivation in the Pannonian Biogeographic Region. *Agronomy,* 12, 773. https:// doi.org/10.3390/agronomy12040773

Tsubo, M., Walker, S., and Ogindo, H. O. (2005). A simulation model of cereal-legume intercropping systems for semi-arid regions. *Field Crops Research,* 93: 10- 22.

Warman, G. R., and Kristiana, R. (2018). *Mengkaji Sistem Tanam Tumpangsari Tanaman Semusim.* Proceeding Biology Education Conference. 15(1): 791-794.

Yuwono. (2009). Tanah terlantar, menyalahi fungsi sosial tanah. *Sosial Humaniora*, 2(1): 29-39.