

Characteristics and deviation patterns of agricultural land use in tourism area of Canggu, Bali, Indonesia

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ABSTRACT

Canggu Village is primarily a development zone with the potential for rapid growth. Canggu possesses tourism potential as well as ecological conditions conducive to future growth. The rapid growth of the population, followed by development activities, will increase demand for space, particularly in areas with a high strategic value of land, such as tourism areas. Tourism is still regarded as a stimulant to the economy. However, if space development is not adequately managed and controlled, it will affect the conversion of land functions, particularly agricultural land, into built-up areas for commercialization. A study effort is required to map the characteristics and deviation patterns of agricultural land use in Canggu to achieve spatial order. By mapping the characteristics and deviation patterns of agricultural land use in Canggu Village, it is hoped that appropriate actions or solutions to Canggu Village's ecological problems can be compiled and developed.

Keywords: Deviation patters, Agriculture, Land use, Tourism development.

Article type: Research Article.

INTRODUCTION

The five significant development components are capacity, equity, empowerment, sustainability, and interdependence. These components represent an effort to strengthen people's ability to direct their future, and they represent an effort to strengthen a person's ability to direct their future (Bryan & White 1987; Vermeulen *et al.* 2018). Capacity means that development is an activity that results in the optimal development of human abilities. To increase people's capacity, they need equity synonymous with the development that fosters a sense of community, value equality, and prosperity. Empowerment aims to foster community trust through equal opportunity while the objective of sustainability, or development, is to generate the capacity for self-sufficiency. Interdependence implies that by fostering mutually beneficial and respectful relationships, development can help a country reduce its reliance on other countries. These five major development implications must be oriented around people (Suryono 2013). In most developing countries, including Indonesia, agricultural sectors have become essential to contribute to development, particularly in rural areas. However, the development of an area has implications to the deviation of the agricultural area to become other land use such as settlement. Agriculture is a critical component of food production, but agricultural land in short supply. It is critical for human survival because it provides most of the nutrition required by the entire society (Ambros & Granvik 2020). Additionally, it is critical to maintaining ecosystem balance and spatial order. Additionally, it is a valuable possession passed down through generations, determining their social standing in local communities. Food sovereignty advocates view agricultural land as a strategic factor in determining future food production. Nonetheless, its volume continues to decline as it is gradually phased out of production and converted into built-up areas, recreational zones, or ecological compensation areas. Individuals who are not directly involved in agriculture frequently make

capital investments in agricultural land. Due to its immobile nature, land supply in the local market increases primarily when current owners decide to sell rather than continue renting their property. Due to a combination of economic, social, and climatic factors, agricultural land resources are scarce and limited (Bański 2017; Dwijendra *et al.* 2021). Individuals who are not involved in agricultural production or environmental protection purchasing agricultural land have ecological and economic consequences, including the impoverishment of indigenous people. Land displacement can occur due to free trade in the land market. Large-scale land acquisitions by significant investors do not always meet an entire population's needs, as the local availability of a critical food production factor may deteriorate due to the land acquisition (Marselis *et al.* 2017). Given the impending depletion of agricultural land resources, the urgency of effective agricultural land management appears even greater today (Vermeulen *et al.* 2018; Brown *et al.* 2019). Agricultural landscapes have been transformed over the last five decades as a result of economic and social development (Lambin & Geist 2003; Walker 2004; Wright 2005; Adhika & Putra 2021). They contribute significantly to land cover disruption and global environmental change, and their numbers are growing at an alarming rate (Foley *et al.* 2005; Rindfuss *et al.*). Forest loss as a result of urbanization, agricultural expansion, logging, and pastoral expansion is one of the most dramatic and rapid environmental changes currently occurring (Lambin & Geist 2003; Foley *et al.* 2005). The tourism industry generates revenue by utilizing natural resources (Mather 1992; Yogantari & Dwijendra 2020; Nurjani & Dwijendra 2020). It explains why resource extraction increases as transportation costs decrease between cities (Chaplin & Brabyn 2013). This evidence is no longer relevant for the developed world, owing to improved infrastructure (Sinclair 1967), including the tourist destination of Canggu in Bali. Canggu is a growing spatial development area from the current environmental and nature conservation standpoint. This development is due to Canggu's abundance of natural resources, including beautiful coastal areas and agricultural land managed through the *subak*, the traditional irrigation system (Putra *et al.* 2021). Natural resources, such as agricultural land with the *subak* system, should be preserved to ensure long-term viability. Canggu, a popular international tourist destination, is not immune to the growing population and the resulting need for more living space, which leads to an increase in agricultural land conversion. In Canggu today, the dominant agrarian lifestyle shift is the phenomenon of land use violations in agricultural areas into an industrialist lifestyle (tourism), which is typically modern, undermining traditional values and local wisdom. On the other hand, tourism growth can wreak havoc on the surrounding ecology while also being viewed as a critical economic driver. The uncontrolled and unregulated growth of the Canggu tourism sector threatens and significantly impacts the village's ecological sustainability. Environmental problems can occur naturally or unnaturally. Natural ecological problems frequently result in land function conversion, including land use inconsistent with the spatial plan. This violation is indicated by strategic land values that align with the land's carrying capacity, uncontrolled investments, and insufficient law enforcement to deter spatial violators. According to field data, the most common land conversion is from agricultural to commercialized built-up land. Factors such as population growth, land requirements for non-agricultural activities, economics, socio-cultural factors, environmental degradation, and regional autonomy contribute to converting agricultural land to non-agricultural land (Andita 2015). In this case, the ecological consequences of the tourism sector's expansion in Canggu include a decline in environmental quality, a reduction in agricultural land, commercial buildings on agricultural land, and a loss of natural vegetation owned. Inextricably linked to the city's spatial development, particularly in the tourism sector, is the issue of land use violations in agricultural areas. Changes in the landscape pattern are associated with biodiversity and other ecological values, so it can be viewed as an integrative tool for assessing ecological sustainability (Renetzeder *et al.* 2010). Landscape fragmentation is the most damaging effect land development can have on ecosystems. This phenomenon, which either natural or anthropogenic factors can cause, has a negative impact on ecological processes as well as a variety of plant and animal species (Farina 1997). As a result, isolated patches become more vulnerable to outside disturbance, putting habitats and biodiversity at risk (Nilsson & Grelsson 1995). Furthermore, the term naturalness refers to the extent to which human activities have deviated from what would be considered natural vegetation (Renetzeder *et al.* 2010). As a result of human intervention, simplified and geometrized landscapes exhibit a decline in biodiversity and ecological sustainability (Zechmeister & Moser 2001; Peterseil *et al.* 2004). Terrestrial and riverine ecosystems share many characteristics (Wiens 2002). He contends that in landscape ecology, the location of changes in landscapes, whether on land or in aquatic systems, is unimportant; what matters are the patterns and processes that occur in space. Regardless of spatial planning directions or policies, massive spatial development in Canggu, which has significant tourism potential, will affect

development in areas with strategic land values. If this downward trend continues, agricultural lands that serve as socio-cultural and ecological spaces, as well as a source of food security, will continue to decline year after year. To accommodate tourism development negatively impacts the emergence of enclave tourism, in which tourist destinations are only considered stopovers. The still-beautiful, comfortable, and well-organized ecological condition is, indeed, what draws tourists. As a result, if tourist saturation occurs due to diminished ecological value as an attraction, it is not unlikely that tourists will abandon Canggu in the future, and the ecological value will be difficult to restore due to the lack of prior prevention efforts. As a result, as a first step toward achieving spatial order and ecological sustainability in the village, a study effort is required to map the characteristics and patterns of deviations in agricultural land use in Canggu. We can use the results of mapping the characteristics and deviation patterns of agricultural land use as a starting point for compiling and formulating appropriate actions or solutions for Canggu's ecological problems. There are some studies about land use change, tourism and GIS-based analyses around the world (Taghvaye Salimi *et al.* 2008; Gholami *et al.* 2016; Dianati Tilaki *et al.* 2020; Vafina *et al.* 2020; Gholizadeh *et al.* 2021; Voronkova *et al.* 2021). Physical, biological, political, economic, and social forces all interact to shape a landscape's structure, and changes in a landscape due to anthropogenic influence (for example, agriculture) are critical indicators of long-term viability. Paddy fields in monsoon Asia have the potential to help ensure long-term sustainability rather than wreaking havoc on ecological systems. From the standpoint of ecological sustainability, it is critical to pay close attention to land-use changes and environmental issues. In this study, we used a landscape ecology approach by conducting a GIS-based analysis of the spatiotemporal transition of land uses following a tourism development period to examine the river basin's overall landscape change and its implications for agricultural land management.

MATERIALS AND METHOD

The data in this study were analyzed using qualitative data analysis techniques. The data collection process will be processed and examined to ensure that all data requirements are met. The data analysis flow in this study is as follows: conduct library research to identify relevant literature for problem-solving, then conduct observations and interviews to identify issues that arise in Canggu Village, and finally, examine the phenomenon using the GIS overlay technique.

RESULTS AND DISCUSSION

Canggu Area overview

Canggu is a popular tourist destination in Badung Regency's North Kuta District. The area has been included in the Canggu Regional Tourism Strategic Area delineation due to Bali Provincial Regulation No. 3 of 2020 amending Regional Regulation No. 16 of 2009 concerning spatial planning Bali Province 2009-2029 (Peraturan Daerah Provinsi Bali No 16 Tahun 2009 Tentang RTRW Provinsi Bali Tahun 2009-2029). It indicates that the area has a high potential for land development. Between 2016 and 2020, Canggu's total population is expected to reach 7,035 residents, 2.1 percent increase over the previous years (BPS 2022) (see Table 1). Due to its high population density and rapid population growth, Canggu appears to have significant potential for habitation and urban development.

Table 1. Population growth rate in Canggu.

No	Population					Growth Rate
	2016	2017	2018	2019	2020	
1	5.375	5.873	6.229	6.615	7.035	2.1

Source: BPS, 2022.

Table 2. Spatial patterns of regional spatial planning in Canggu.

No	Space Designation	Area (Ha)
1	Green Area Along the River and Beach	0.14
2	Tourism	44.31
3	Trade and Services	27.01
4	Settlement	300.17
5	Wetland Food Farming	200.43
6	Marine Nature Park	2.38
7	others	2.83
	Total	577.26

Source: Spatial Planning of Badung (2013).

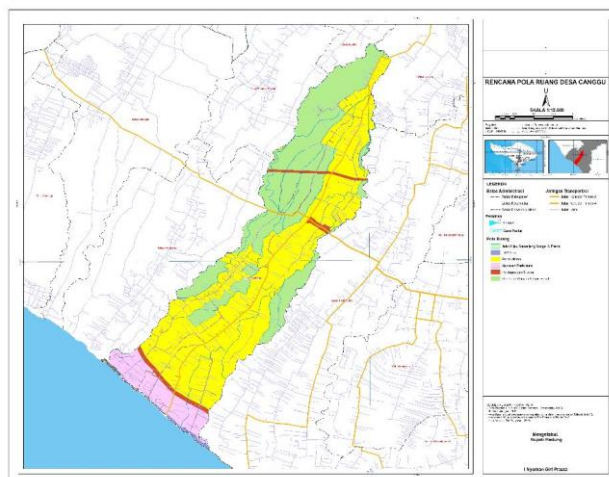


Fig. 1. Spatial plan of Canggu village.

Source: Master Plan (RTRW) Badung Regency 2013-2033.

Canggu will always require additional space due to its large population and rapid population growth. As a result, the money pattern plan will be oriented around preserving the current composition of the space. The spatial plan for the Canggu Village is dominated by settlement designations totaling 300.17 ha, followed by wetland and food agricultural designations totaling 200.43 ha.

Characteristics and Patterns of Land Use Deviations in Canggu

Canggu has been designated as a Regional Tourism Strategic Area (KSPD), which strongly emphasizes tourism-based economic development. Canggu is one of the Regional Tourism Strategic Areas (KSPD) and National Activity Center (PKN) in the Sarbagita urban area. At the same time, district regulations are based on the Badung Regency Regional Regulation Number 2 of 2013 concerning the 2013-2023 Badung Regency Spatial Plan (Peraturan Daerah Kabupaten Badung Nomor 26 Tahun 2013 Tentang Rencana Tata Ruang Wilayah Kabupaten Badung Tahun 2013-2033. 2013). The National Activity Center is located in Badung Regency, within the Sarbagita Area (Denpasar, Badung, Gianyar, and Tabanan), with one location in the Kuta Urban Area. The North Kuta District Area is best known as Canggu, which serves as a hub for international tourism activities, as well as a hub for national and regional trade and services, as well as a hub for international and domestic air transportation, with the Jimbaran and Mangupura urban areas providing supporting infrastructure. Thus, based on the above description, Canggu undoubtedly continues to develop spatially because it serves a strategic purpose: economic and urban development centered on tourism. On the other hand, the accuracy of the final results in any assessment depends on the accuracy of the data layers used in the initial assessment. Certain variables had well-defined boundaries, such as land cover, whereas others, such as climate and socio-economic conditions, had more ambiguous boundaries. As a result, the final results are uncertain and should be interpreted with caution (Singh Boori & Amaro 2010; Start 2010). Canggu Village is geographically divided into coastal and land space (agriculture, plantations, and settlements), which means that tourism growth in Canggu Village is closely related to available space. If this is not addressed, it has an impact on land conversion, especially in agricultural areas. Irrational land-use practices, such as converting forest to farmland, have exacerbated land degradation. Finally, this problem could be solved by repurposing overgrown land to more productive use (Rindfuss *et al.* 2004). The optimal allocation recommended put a premium on ecological suitability for resource extraction, favoring mixed farming with forestry, pasture, and livestock grazing (Boori *et al.* 2015). As a tourism destination, Canggu has a significant impact on tourism development, with direct implications for increased demand for settlement space and tourism-supporting facilities, increased conversion of agricultural land, which results in decreased regional vegetation cover, centralized traffic, which causes congestion, the emergence of population social problems, and the waning of cultural values that are markers of tourism. In Canggu and throughout Bali, agriculture and culture are inextricably linked (Putra *et al.* 2019). Rice paddy fields are a unique ecosystem due to their high biodiversity and ability to support a diverse assemblage of plants and animals, making them an essential component of the food web (Edirisinghe & Bambaradeniya 2006). The environmental and ecological multifunctionality of paddy fields has received much attention in recent years. Landscape and temporal variation are two of the most

distinguishing features of the paddy field ecosystem, and the relationship between paddy fields and their immediate surroundings is critical for biodiversity conservation (Natuhara 2013). Paddy fields, including irrigation ponds and canal networks, have served as a substitute habitat for a diverse range of wetland species following the loss of natural floodplain habitat for a diverse range of wetland species due to development (Washitani 2007) Because of the rapid growth of rural tourism, the number and dispersion of farmhouses (primarily homestay facilities) within paddy fields have increased, posing a potential environmental hazard. Paddy fields are necessary for flood control efforts because they can slow flood movement and act as a flood detention area (Washitani 2007). Therefore, based on the overlay of the Badung Regency RTRW land designation in 2013-2033 with land built in 2021, the land use deviation in Canggu Village that is 16.12 Ha, will affect the sustainability of the ecological landscape. The land deviation is dominated by trade and services, which cover 15.10 Ha, and villas, lodging, and the like, which cover 0.87 Ha (see Table 3 and Fig. 2). Previous research on changes in agricultural land use has concentrated on spatial differences in landscape pattern changes across different areas and patterns of change caused by urban influences such as perforation, cutting and fragmentation, reduction and loss of agricultural land (Wu 2001). A comprehensive investigation and analysis of the ecological effects of various landscape-pattern changes on paddy field flora and fauna has not been completed. It is recommended that a long-term investigation be conducted to determine the impact of built-up patches on bird species and biodiversity in Canggu's paddy fields and that future local land-use policies take the ecological impact of these changes into account.

Table 3. Land use deviations in Canggu Village.

No	Land use	Area (Ha)
1	Trade and service	15.10
2	Villa	0.87
3	Temple	0.14
	Total	16.12

Source: Author Analysis (2022).

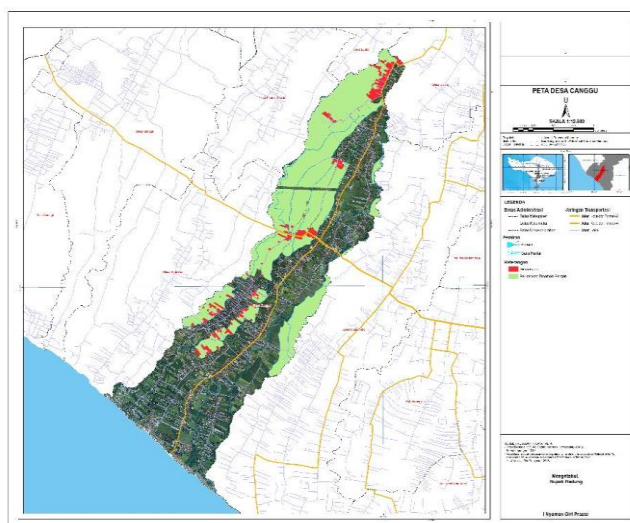



Fig. 2. Land use deviations in Canggu Village.

Source: RTRW Badung Regency 2013-2033.

According to Fig. 2, green denotes areas designated for food crop agriculture, while red denotes deviations (buildings that are incompatible with the land use) within the agricultural area. According to the land use built on agricultural land, it is dominated by commercial and service activities (restaurants, cafes, and minimarkets) along Jalan Raya Canggu. Meanwhile, villas, inns, and similar structures are typically built near coastal areas or rice fields. The characteristics of Canggu Village's intersections for trade and service activities are most prevalent along the Canggu highway corridor and other secondary road corridors. Meanwhile, the pattern of agricultural land use deviations in Canggu resembles a road network ribbon. This is consistent with the criteria for the ribbon's/spread. The development of morphology in the form of ribbons will in a concentration of dense residential areas behind the main road corridor, which is incompatible with road capacity (see Table 4).

Table 4. Characteristics and Deviation Patterns of Agricultural Land Use in Canggu Village.

Deviation map of agricultural land use in Canggu Village	Deviation characteristic	Deviation Spatial pattern		
		C	R	LP
	The development of trade and services is along the primary and secondary road corridors.	-	✓	-
	The acceleration of deviation growth occurs due to the role of road access and the strategic value of land.	-	✓	-
	The development of deviations in the form of villas, inns and/or the like tends to the south because at the border it has an ecological view of rice fields that is calm and comfortable and close to the object. Beach tourism	-	✓	-

Remarks:

C = Concentric

R = Ribbon

LP = Leap Frogging

Source: Author analysis (2022).

CONCLUSION

Canggu Village is viewed as a place experiencing continued spatial development growth as a result of the development of the trade and service sectors, as well as the development of the tourism sector, from a current environmental and nature conservation perspective. In Canggu Village, land grabbing occurred due to the expansion of the trade and service sectors, as well as the tourism industry, resulting in the unauthorized use of agricultural land. Ecological problems can occur inadvertently or deliberately. Natural ecological problems frequently result in the conversion of land functions, including land use contrary to the spatial plan. This violation is manifested by strategic land values that are out of line with the land's carrying capacity, unregulated investments, and a dearth of effective law enforcement to deter those who violate the spatial development law. Trade and service activities, characteristic of Canggu deviations, are more likely to develop along the Canggu highway corridor and other secondary road corridors. Meanwhile, in Canggu, the pattern of agricultural land use deviations resembles a ribbon that runs parallel to the road network and is visible from a distance.

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