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THE IMPACT OF SUBAK RICE FIELD CONVERSION ON SOCIO-ECONOMIC WELFARE AND ENVIRONMENTAL SUSTAINABILITY IN NORTH KUTA DISTRICT, BADUNG REGENCY

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Abstract

Badung Regency, as the main tourism center in Bali, has experienced massive agricultural land conversion to meet the needs of tourism facilities. The area of rice fields decreased from 9,072 hectares in 2019 to around 8,024 hectares in 2022, with an average conversion rate of around 95 hectares per year. This phenomenon has had a significant impact on the welfare of local communities who have lost their livelihoods in the agricultural sector, even though they have gained short-term economic benefits from the sale of land. This study aims to analyze land conversion patterns and evaluate their impact on the economic, social, and cultural welfare of local communities. The research method uses a mixed approach, including literature studies, quantitative surveys of affected communities, stakeholder interviews, and satellite image-based spatial analysis. This study is expected to provide a comprehensive understanding so that land management can balance the needs of tourism development and the preservation of community and environmental welfare.

Keywords: Land Use Change, Tourism, Community Welfare, Sustainability

1. INTRODUCTION

Development is often seen as an effort to improve local economic performance. One significant agent of development is the tourism sector, which contributes to employment, increased tax revenue, and infrastructure improvements in tourist destinations. However, this process also has direct and indirect impacts on the character of local communities in facing these changes. When local communities realize that they are part of a tourist destination, their lives will change and be influenced by various tourism activities.

Development often promotes community empowerment as a slogan to justify the achievement of development goals. However, in reality, issues such as poverty remain a persistent problem. This poverty is characterized by unemployment, underdevelopment, and powerlessness. One of the classic problems that has the potential to cause community powerlessness is land conversion. Land conversion, whether forced or voluntary, can cause the loss of local cultural ties, thereby uprooting communities from their cultural

roots. Although land conversion can generate short-term financial gains, it means selling off capital assets. Bali, as a major tourist destination, is no exception to this phenomenon.

The province of Bali has an area of approximately 5,632.86 km², which covers only 0.19 percent of Indonesia's total area. With a relatively small area, high population density, and uneven development between sectors, especially between agriculture and tourism, accelerated land conversion is inevitable. Bali does not have natural resources of high economic value; such as mines or forests. Its resources consist of rice fields, dry land, waterways, and beaches that are developed for the agricultural, fisheries, and tourism sectors. The basic concept of intensive development in Bali, which was discussed in the 1970s, was the development of cultural tourism supported by the agricultural sector, with the hope of achieving balanced economic growth between the two sectors.

Badung Regency is the area with the highest concentration of tourism products in Bali. The number and variety of tourism products make this sector very complex. High demand for tourism products, triggered by an increase in the number of tourists, has led to numerous changes in land use. Kuta, for example, as the most popular destination for both domestic and foreign tourists, has enormous spatial development needs. Land constraints have not stopped development; on the contrary, they have encouraged increased land conversion in the surrounding areas, threatening the existence of green spaces and agricultural land in the region.

Data shows that land conversion in Badung Regency continues. In 2019, the area of rice fields in Badung reached 9,072 hectares, but shrank to 8,024 hectares in 2022. This represents a decline of approximately 1,048 hectares over a period of three years. This land conversion is strongly suspected to be the result of the massive tourism development " ". Additionally, the average land conversion in Badung Regency has reached 95 hectares per year over the past five years. The Badung Regency Government has designated approximately 6,656 hectares as Sustainable Food Agricultural Land (LP2B) out of a total of 8,800 hectares of basic rice fields, in an effort to curb the rate of land conversion. However, the challenges in implementing this policy remain significant.

The above facts indicate that tourism development is more directed at increasing regional income and meeting the needs of tourists as a measure of development success. Previous studies have shown a positive relationship between tourism destination development and the welfare of local communities. However, development success should not only be measured in economic terms, but also in terms of the welfare and sustainability of local communities. Land use change often means a change in land ownership, which results in local communities losing their rights to cultivate the land, replaced by financial compensation. Therefore, it is important to examine the financial management patterns of communities after land conversion and how their livelihoods are sustained after losing their agricultural land.

2. LITERATURE REVIEW

Much research has been conducted on land use change from various perspectives and approaches. Mamarodia emphasizes that land as a resource for development has limited availability, so that the conversion of agricultural land to non-agricultural use can have an impact on food security and community welfare. This is reinforced by Wahyunto, who states that modernization and urbanization have shifted the agrarian culture to an industrial and service-based development orientation, including tourism. However, this research does not sufficiently consider the social and economic factors in the land

conversion process, particularly its impact on farmers' livelihoods after land conversion occurs.

Research conducted by Lestari and Irawan highlights the negative impacts of land conversion, including the loss of environmental carrying capacity and local economic potential. However, these two studies are still general in nature and lack specific analysis of the factors driving land conversion in the context of tourism. Irawan also highlights that land conversion occurs due to increased demand for non-agricultural commodities as a result of economic growth. This perspective is in line with Law No. 41 of 2009, which emphasizes the importance of sustainable food land protection. However, this research has not considered the socio-cultural impacts arising from land conversion, especially in the context of tourism destinations such as Badung Regency.

Sudaratmaja more specifically describes the impact of tourism development on land conversion and the weakening of the subak system in Bali. In his research, he highlights how the demand for non-agricultural land has caused socio-economic changes, including increased land prices, loss of farmers' livelihoods, and shifts in the economic structure of local communities. However, this study does not explicitly discuss community adaptation strategies after land conversion, which is an important aspect in the formulation of sustainable land management policies.

Based on a review of previous studies, there is a gap in understanding how communities adapt after land conversion, especially in the context of tourism in Bali. Therefore, this study will focus on analyzing land conversion patterns, their impact on the economic and social welfare of communities, and the adaptation strategies implemented by communities after land conversion. Thus, the results of this study are expected to contribute to the design of land management policies that are oriented towards environmental sustainability and the welfare of local communities.

3. RESEARCH METHODS

In this study, a mixed-method approach (combining qualitative and quantitative methods) was used, which enabled researchers to comprehensively understand the phenomenon of land use change, both in terms of spatial data and the perceptions of the affected communities. Data was collected through satellite image analysis and Geographic Information Systems (GIS) to map land use changes in Badung Regency over the past 10 years. This technique enabled the identification of areas with high rates of land conversion and their spatial relationship with tourism development. In addition, field observations were conducted in locations with significant rates of land conversion to document physical changes and community economic activities before and after land use change.

To gain a deeper understanding, interviews were conducted with stakeholders, such as landowners, farmers, tourism managers, and local governments, to identify the factors driving land use change and its impact on the welfare of local communities. In addition, a quantitative survey was conducted by distributing questionnaires to affected communities to measure socio-economic changes, including income, employment, and access to natural resources. Documentary studies were also used to examine official documents, regulations related to agricultural land protection, previous research reports, and relevant news about land conversion in Badung Regency.

Data analysis was conducted using various approaches. Spatial analysis was used to identify trends in land use change based on satellite imagery and GIS data, while descriptive-qualitative analysis was used to organize and interpret the results of

interviews and documentation studies. Survey data was processed using statistical analysis to measure the economic, social, and environmental impacts of land conversion. In addition, SWOT analysis was applied to evaluate the challenges and opportunities in land management and sustainable tourism development.

To increase the validity of the research results, data triangulation was applied by comparing the results of satellite image analysis, field observations, interviews, and documentation studies. From a research ethics perspective, informed consent was obtained from respondents prior to conducting interviews, and the confidentiality of their identities and personal data was maintained in accordance with research ethics principles. With this systematic methodological approach, the study is expected to provide a comprehensive picture of the impact of land use change on the welfare of local communities and to develop data-driven policy strategies for sustainable tourism development.

4. FINDINGS AND DISCUSSION

Badung Regency is geographically located between coordinates 8°14' to 8°50' South Latitude and 115°5' to 115°14' East Longitude with an area of 418.52 km² or about 7.43% of the land area of Bali Island. This region is divided into 6 subdistricts, namely South Kuta, Kuta, North Kuta, Mengwi, Abiansemal, and Petang. Petang Subdistrict has the largest area of 115 km², while Kuta Subdistrict is the smallest with an area of 17.52 km². The capital of the regency is Mangupura. This regency is bordered by Buleleng Regency to the north, Denpasar City, Bangli Regency, and Gianyar Regency to the east, the Indonesian Ocean to the south, and Tabanan Regency to the west.

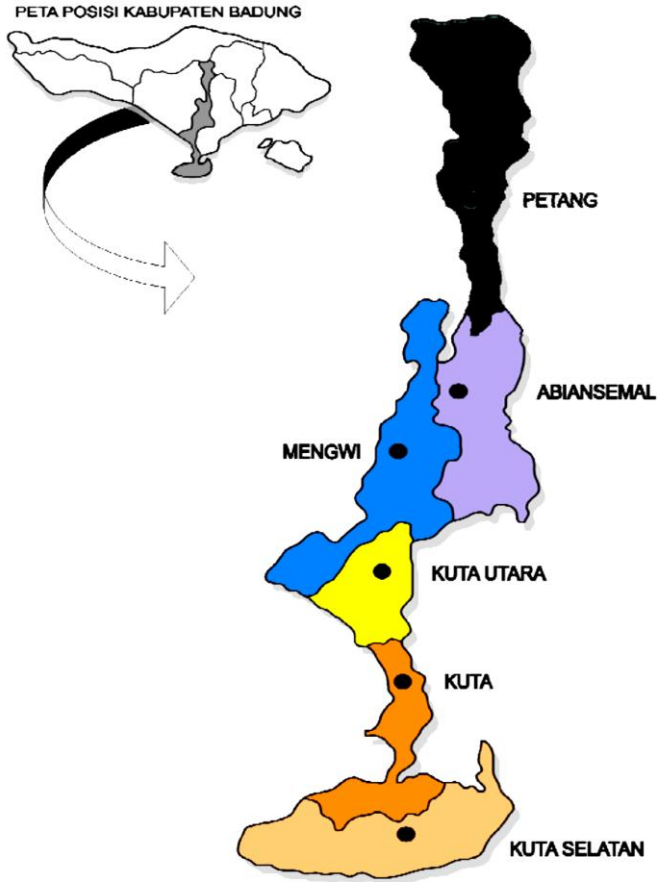

Figure 1. Map of Badung Regency
Source: Researchers (2025)

North Kuta District is located at coordinates approximately 8°38'44.2" S and 115°09'42.3" E, covering an area of 33.86 km² with an average elevation of 65 meters above sea level. This subdistrict consists of six villages: Kerobokan Kelod, Kerobokan, Kerobokan Kaja, Tibubeneng, Canggu, and Dalung. North Kuta is known as one of the coastal areas that has experienced rapid tourism development, resulting in many agricultural lands being converted into villas, resorts, and restaurants.

The North Kuta area consists of rice fields (approximately 1,515 hectares), gardens/farms (approximately 390 hectares), and approximately 1,144 hectares of land for houses or buildings. The conversion of agricultural land has occurred significantly, for example: in 2003 (42 ha), 2004 (29 ha), 2005 (73 ha), and 2006 (4 ha), and has continued in the last decade. According to the latest data, the current area of rice fields is only about 44 hectares in several subak due to the rapid conversion of land.

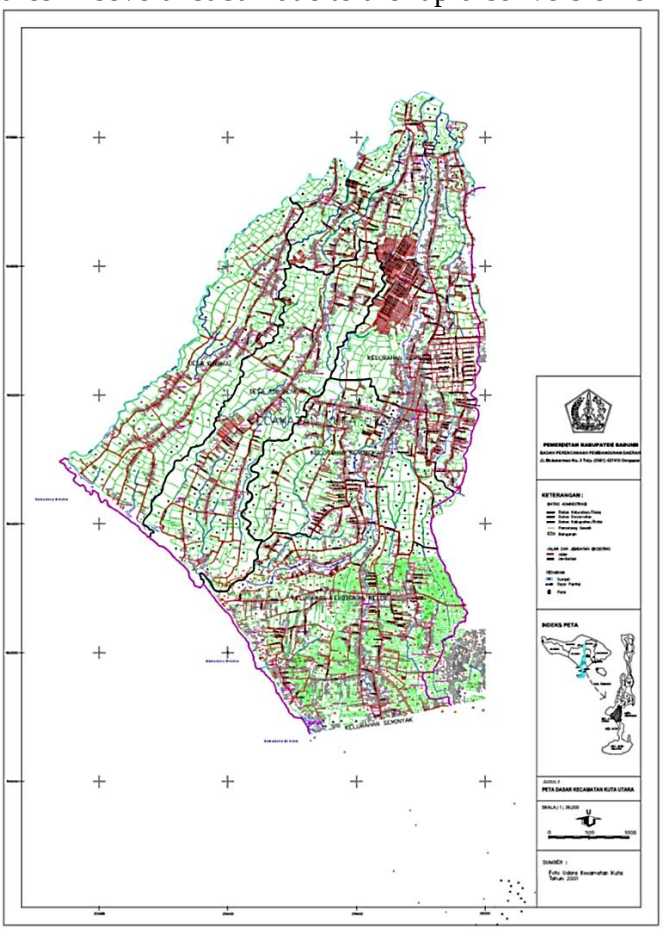

Figure 2. Map of North Kuta District
Source: Researchers (2025)

North Kuta still has 19 subaks with a total area of 1,539.9 hectares, according to 2010 data. The names of the subaks and the area of each subak have been compiled in the previous table. However, the number of active rice fields has likely decreased dramatically due to ongoing conversion.

Kerobokan Kelod consists of 266 hectares of rice fields (with semi-technical irrigation), 180 hectares of dry land, 148 hectares of yards, 91 hectares of gardens, and 21 hectares of fields. In the Batu Belig area, part of the Petitenget subak, the rice fields have now shrunk to 10 hectares from 34 hectares, reflecting the high rate of conversion in coastal tourist areas.

The conversion of agricultural land to the tourism sector provides new income for the community, but it has an impact on changes in the local economic structure, labor migration, and the erosion of traditional farming jobs. This has led to welfare challenges, including the loss of local food security, lifestyle changes, and spatial conflicts between agricultural functions and tourism business interests. The Badung regional government has responded with a subak protection program and seed/fertilizer subsidies, but the challenges of preserving the agrarian landscape remain significant.

Table 1. Number and Area of Rice Field Subaks in North Kuta District

No	Nama Subak	Luas Subak (Hektar) Tahun 2010	Luas Subak (Hektar) Tahun 2025
1	Canggu	125	80
2	Liplip	51	30
3	Umealas	36	19
4	Umedesa	83	53
5	Bernasi	117	60
6	Banjasari	64	40
7	Semat	75	41
8	Perancak	65	42
9	Bantan	64	35
10	Daksina	64	44
11	Saih	144	80
12	Gaji	79	45
13	Sebuah	129	55
14	Tegal	71	30
15	Dawas	33	15
16	Basangkasa	94	45
17	Petitenget	71	38
18	Kedampang	101	66
19	Muding	73.9	20

Source: Researchers (2025)

4.1 Social Impact

Banjar Batu Belig still offers a beautiful rural atmosphere with vast rice fields and easy access to popular tourist areas such as Kuta and Seminyak. This makes it an area of choice for tourists and expatriates who make Kerobokan Kelod, especially Umalas and Batu Belig, their temporary or second residence while in Bali, whether for a short or long stay. This trend opens up great opportunities for investors to build various tourism facilities, such as restaurants, hotels, and luxury amenities targeted at the high-end market. Examples include the establishment of Hotel W, Metis Restaurant, and RobPeetoom Salon, which focus on providing premium services for high-end tourists.

This development brings complex social dynamics. The local community has experienced changes in their way of life. Previously not very busy with tourism activities, many are now directly involved in this sector to meet the needs of tourists. The community's English skills have improved, and there have been cultural changes in terms of more modern clothing and lifestyles. However, these changes also have negative impacts, such as a reduction in time for social interaction and mutual cooperation among residents, which was originally a strength of the village community. This phenomenon is reflected in the obligation to pay fines for families who cannot participate in mutual cooperation programs.

On the other hand, the appeal of the Batu Belig and Umalas areas as rural areas that still have rice fields has become a magnet for investment. Investors are interested in

investing here because this area still retains a calm and beautiful environment, which is an added value compared to mass tourist areas such as Kuta and Seminyak. However, increased development for tourism has led to the conversion of rice fields into buildings that support tourism. This process threatens to erode the distinctive characteristics of the area, which are one of its main attractions. To support sustainable tourism, the Badung Regency Government has launched the Batu Belig Beach Development Project in 2024 with a budget of Rp 48 billion, covering the construction of public facilities and the expansion of the beachfront, aimed at enhancing tourist comfort and safety while providing economic benefits to the local community. This project is also part of efforts to preserve Balinese traditions and customs in balance with modern tourism development. From a regulatory perspective, protecting sustainable agricultural land such as rice fields in this area is crucial to prevent land conversion that damages environmental and cultural sustainability. In accordance with Government Regulation No. 1 of 2011 and Law No. 41 of 2009, the conversion of agricultural land is only permitted under strict conditions, such as for public interest with a feasibility study and the availability of replacement land, which to date remains a challenge for implementation in areas experiencing high tourism pressure.

Thus, Batu Belig and Umalas are at a crossroads between economic opportunities through luxury tourism investment and the need to preserve the environment and the socio-cultural life of the local community. This balance must be the focus of area management so that tourism development brings benefits without sacrificing the identity and livelihood of local communities.

4.2 Economic Impact

The development of the tourism sector in Petitenget and its surrounding areas, including Umalas, has brought about major changes in the social and economic structure of the local community. Previously, the majority of residents depended on the agricultural sector, particularly rice farming and other agricultural land, with nearly 90% of their livelihoods coming from farming. However, there has now been a significant shift where people have begun to abandon farming and switch to the tourism sector, either as direct workers or through other supporting sectors.

Interviews and observations show that most of the current population of Umalas works in the tourism industry, mainly in hotels, villas, and restaurants managed by large investors. They generally occupy staff positions, such as gardeners, security guards, and waiters, but none have reached managerial positions. This phenomenon indicates that the labor market in the tourism sector demands more experienced and educated workers, who are often filled by workers from outside the region. Farmers aged 50 and above dominate, while the younger generation tends to be uninterested in agricultural professions because they are considered low-profit and physically and mentally uncomfortable. The negative perception of the farming profession is further reinforced by the assumption that this work is unpromising and outdated. As a result, the younger generation's declining interest in agriculture has led to a reduction in productive labor in this sector, which in turn threatens the sustainability of the agricultural ecosystem and local food security. Land prices in Umalas currently reach Rp. 700 million to Rp. 1 billion per are (100 m2). This situation affects farmers' mindset and land management patterns, with many reluctant to sell their land and choosing to rent it out instead because the rental income is much higher than the harvest yield. Rental income ranges from IDR 10 million to IDR 15 million per year, while harvest income is only around IDR 180,000 per are for three harvests per year. The

lack of active involvement from the Agriculture Office and extension programs has caused farmer groups in the Petitenget area to become less active and transition from a productive community to one that depends on income from land rental. This has increased pressure on agricultural land and accelerated the conversion of land into commercial and modern residential areas in line with the development of tourism investment.

As a result of economic and social pressures, many agricultural lands have been converted without following strict regulations. However, based on Government Regulation No. 1 of 2011 and Law No. 41 of 2009, the conversion of agricultural land must undergo a feasibility study and there must be replacement land so as not to threaten the sustainability of food security and the regional ecosystem. Ignoring these regulations has the potential to cause environmental damage, a decline in the availability of local food, and the loss of traditional agricultural culture.

4.3 Environmental Impact

Batu Belig is one of the banjars included in the Petitenget farming system. Until 2025, this area still maintains an active rice field area of around 10 hectares, a significant decrease from the previous 34 hectares, or a decline of more than 70% in recent decades. Overall, the Petitenget persubakan had approximately 71 hectares of rice fields in 2025, down from approximately 121 hectares in 1988, or a decline of about 41% over the past ±37 years.

The impact of land conversion was evident between 2002 and 2009, when rice fields, which still dominated at 78% in 2002, shrank to 57% in 2009, while land used for residential and tourism industries increased to 43%. This trend continued into 2025, with the rapid development of hotels, villas, restaurants, and other tourism facilities taking over the function of traditional rice fields. The agricultural productivity of the remaining rice fields recorded a yield of around 82 tons of rice every three months with a selling price of around Rp 240 per kilogram or equivalent to Rp 180,000 per are. However, the declining quality of irrigation water due to land conversion and waste from tourism activities, such as used restaurant oil and plastic waste, has begun to negatively impact the balance of the agricultural ecosystem and the sustainability of the subak system in the region.

The Badung Regency Government has provided Special Financial Assistance (BKK) of around Rp 15 million per year for each subak, which is allocated to support subak maintenance, including the construction of temples and supporting facilities proposed by the local community. However, complaints from farmers about developments carried out by developers who do not comply with regulations, such as the closure of irrigation channels and ditches, remain an unresolved issue. As an effort to preserve the environment and improve community welfare, the development of Batu Belig Beach, which began in 2024 with a budget of around Rp 48 billion, includes the development of public facilities and the widening of the beach border, which is expected to maintain the balance of the ecosystem and cultural values of the area. Facing the challenge of land conversion, Government Regulation No. 1 of 2011 and Law No. 41 of 2009 require the protection of sustainable agricultural land with very strict conversion provisions and the obligation to provide replacement land to maintain food security and the preservation of the subak system. The Special Financial Assistance (BKK) program for subak and subak abian in Badung Regency in 2025 is a concrete step towards preserving the subak system as part of local wisdom that must be preserved. To further illustrate the situation in the study area, please refer to the following visualization:

Figure 3. Visualization Map of North Kuta District 2010-2025
Source: Researchers (2025)

In the 2010 satellite image, North Kuta District shows a land use pattern that is still dominated by undeveloped areas. The following are the detailed characteristics: (1) Dominance of Agricultural Land and Vegetation, the bright green areas spread across the map indicate the high prevalence of agricultural land, especially irrigated rice fields (subak) and dry land that is planted. In 2010, undeveloped land in the Sarbagita area (including North Kuta) was still dominated by dry fields covering an area of 61,506.78 hectares and rice fields/wetlands covering an area of 54,658.35 hectares. This pattern reflects the traditional function of North Kuta as a strong agricultural area. (2) Scattered Settlement Pattern: Settlements in 2010 appear to be more separated and less dense, as indicated by the gray color scattered with considerable distance between clusters. This pattern indicates that housing development is still limited in scale and follows the traditional Balinese village pattern. (3) Connectivity with the Coast, although blue (sea) dominates the western part, the road infrastructure connecting residential areas with the coastline is still relatively simple. The coastal area shows several separate tourism accommodation facilities, which have not yet formed a dense cluster. (4) Natural Vegetation and Open Spaces, many areas with light green colors and irregular patterns indicate the presence of natural vegetation, rice fields with traditional irrigation systems, and vast open spaces. This shows that in 2010, North Kuta still maintained its semi-rural characteristics with a balance between agriculture and residential areas.

After that, when compared with the satellite image visualization of North Kuta District in 2025, the changes seen in the 2025 image show a fundamental transformation in land use in North Kuta District: (1) Massive Settlement Expansion, with gray and brown-pink colors dominating most of the area, indicating an extraordinary expansion of built-up land. Previously scattered settlements now form dense blocks with a structured grid pattern of roads. Changes in land use from 2010 to 2020 show a 17% increase in settlement area, and this trend continues until 2025. (2) Loss of Green Areas and Agricultural Land: A significant decline in green areas is evident. Previously extensive agricultural land now only remains in a few remote locations, particularly in the east and south. In the 2010-2020 period, rice fields/wetlands decreased by 9%, and dry fields/drylands decreased by 8%. This pattern reflects the conversion of agricultural land to residential and commercial infrastructure. (3) Intensification of Coastal and Commercial Development, Coastal areas show very dense development with centralized accommodation facilities, restaurants, and entertainment centers. Land use for tourism accommodation increased by 223.66 hectares between 2010 and 2020, and this acceleration in development is expected to continue until 2025. This pattern reflects intensive tourism development in the coastal area. (4) Complex Infrastructure Pattern. By 2025, a more organized road network with a clear grid pattern will be visible, indicating more structured development planning. This reflects the government's efforts to accelerate road infrastructure in North Kuta as part of tourism development. (5) Drastically Increased Building Density: The visual texture in 2025 shows a much denser and more closed building pattern compared to 2010. Buildings are no longer separated by large open spaces but are close to each other, indicating a significant increase in development density. (6) Limited Vegetation Areas, only a few areas in the east and south still retain their green color, indicating that open green spaces and agricultural areas have been minimized. The loss of vegetation coverage impacts changes in land surface temperature and indicates increasing environmental pressure.

5. CONCLUSION

The rapid conversion of agricultural land in Badung Regency, mainly due to the development of the tourism sector, has caused a significant decline in rice field area in recent years. This phenomenon has impacted the livelihoods of local communities, who face social and economic challenges in maintaining their welfare, despite the short-term benefits of land sales. Land conversion also has social and cultural implications that need to be considered in sustainable development management. This study shows the need for a balance between the growth of the tourism industry and efforts to preserve agricultural land and the subak system as cultural heritage and a source of local food security. Agricultural land protection policies and active community participation are crucial to controlling the rate of land conversion and maintaining the socio-economic and environmental sustainability of the region. In addition, based on the mapping visualization, this transformation reflects the impact of the designation of North Kuta District as a Sarbagita urban area since 2011 and the acceleration of uncontrolled tourism development, in line with your research focus on overtourism and sustainable tourism development in Bali.

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