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Affecting the Existence of Subak and Farmers' Welfare in North Kuta District, Badung Regency

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ABSTRACT: This study aims to analyze the factors that influence the existence of Subak and the welfare of farmers in North Kuta District, Badung Regency. Specifically, this study examines: (1) the influence of the water availability crisis, Subak institutions, the role of government, and land conversion on the existence of Subak; (2) the influence of the water availability crisis, Subak institutions, the role of government, land conversion, and the existence of Subak on the welfare of farmers; and (3) the mediating role of Subak existence in the relationship between the water crisis, institutions, the role of government, and land conversion on the welfare of farmers. The approach used is associative quantitative with a sampling technique of 120 people or 40% of the total population. Data were collected through observation, structured interviews, and in-depth interviews. Data analysis was carried out using Structural Equation Modeling based on Partial Least Square (SEM-PLS). The results showed that the water availability crisis, Subak institutions, the role of government, and land conversion had a significant effect on the existence of Subak. The four variables also had a significant effect on the welfare of farmers, where land conversion had a negative effect. However, the existence of Subak does not have a significant influence on farmer welfare and does not act as a significant mediator in the relationship between these variables.

KEYWORDS: subak existence, farmer welfare, water crisis, institutions, land conversion

I. INTRODUCTION

Subak is a traditional irrigation system that has developed in Bali for centuries and has a very important role in managing agriculture in the region. Subak is not only a water management system, but also a social organization formed by groups of farmers to regulate the distribution of water for their agricultural land. This system is based on the principle of mutual cooperation and customary regulations that regulate the use of water fairly among subak members. Subak not only focuses on agricultural production, but also on preserving the environment, culture, and social life of the community. Kreuzer (2017) in his journal entitled "Subak: The Traditional Irrigation System of Bali", subak integrates technical aspects of agriculture, social, and spirituality in one harmonious system. Subak also plays an important role in the management of natural resources in Bali, especially water, which is a major factor in the success of agriculture. Subak is a real example of how local wisdom can form an adaptive and sustainable resource management system. Since the 9th century, subak has been an integral part of Balinese life. In its historical development, subak emerged thanks to the influence of Hinduism which brought the concept of harmony between humans and nature. Each subak not only functions as an irrigation system, but also as a place to carry out traditional ceremonies involving all members of the community who are members of the subak. This subak system is passed down from generation to generation and is implemented with the principle of cooperation and equality in the use of natural resources, especially water.

Badung Regency is one of the areas with the fastest growing tourism sector in Bali. This development has a significant economic impact, but also has consequences for the sustainability of the agricultural sector. Most areas that were previously agricultural land are now being transformed into commercial and residential areas. This condition not only has an impact on the reduction of productive land area, but also suppresses the existence of the subak system which has been a pillar of traditional agricultural management in Bali.

The legal basis for rice field printing in Indonesia is stated in Presidential Decree Number 54 of 1980 concerning the policy on rice field printing. The Government of the Republic of Indonesia also issued Law Number 12 of 2012 concerning Food which strengthens the rice field printing program in Indonesia. Based on this Law, the Ministry of Agriculture created a rice field printing program

whose development stages are stated in the 2013 Rice Field Expansion Technical Guidelines and the SelfManaged Rice Field Printing Technical Guidelines (Directorate General of PSP, 2018). Based on the potential of human resources and natural resources, the Indonesian government's ability to print new rice fields is 20,000 - 30,000 hectares per year (Directorate General of PSP, 2013). The need for land and water resources tends to increase due to population growth, development interests, and changes in lifestyle, so that competition in its utilization is also increasingly sharp both between the agricultural sector and the nonagricultural sector and between users of the agricultural sector itself. Competition for land and water use will ultimately shift its availability for agriculture (Rai, 2011). This condition is a serious challenge for traditional agricultural systems such as subak, which are highly dependent on the availability of land and water for the continuity of their operations. The increasing welfare of rural communities encourages farmers to continue to maintain their agriculture, the image of agriculture is also raised and is expected to be able to encourage the interest of rural youth to pursue agriculture and reduce the flow of urbanization.

Subak plays a vital role in maintaining environmental balance by efficiently managing water resources, which is essential for the sustainability of agriculture in Bali. In a region where rainfall is uneven and the dry season can be prolonged, Subak ensures the fair and equitable distribution of water among all member farmers. This traditional water management system, founded on the principles of collectivity and equality, significantly contributes to the long-term sustainability of Balinese agriculture.

In economic terms, subak provides direct benefits to farmers' welfare by increasing sustainable agricultural yields. Fair distribution of yields and wise management of natural resources enable farmers to obtain stable and equitable income. Sutrisna (2019) in the journal "Economic Impacts of Subak on Rural Communities in Bali" shows that subak contributes to the economic stability of farmers, especially in areas that still rely on agriculture as their main source of livelihood. Subak also strengthens social ties between farmers and the Balinese community in general. Social solidarity formed through participation in subak activities strengthens social cohesion in rural areas, strengthens relationships between farmers, and enables them to face various challenges together. The existence of subak also plays a role in maintaining Balinese cultural traditions involving traditional rituals related to agriculture.

Uncontrolled land conversion has the potential to destroy the socio-ecological order that has been formed through the subak system. Conversion of Agricultural Land, One of the biggest challenges facing Balinese agriculture is the conversion of agricultural land to non-agricultural land, such as housing, tourism, and industrial development. This change in land use threatens the sustainability of agriculture in Bali, including the subak system that has existed for centuries. The Bali Central Statistics Agency (BPS), there is a decrease in the area of rice fields in Bali every year. For example, data shows that between 2010 and 2015, the area of rice fields in Bali decreased by around 5,000 hectares. Urbanization Pressure The increasingly rapid urbanization process, especially in the Denpasar area and its surroundings, has also accelerated the conversion of agricultural land to non-agricultural land.

Decline in Agricultural Land, Data from BPS Bali shows that in 2019, the area of rice fields in Bali was around 72,000 hectares, but in recent years, many rice fields have been converted into non-agricultural land. Therefore, the creation of new rice fields in areas that still have potential, as well as the rehabilitation of abandoned agricultural land, are very important steps. The creation of new rice fields in Bali has great potential, especially in areas that still have quite extensive agricultural land and have not been converted into non-agricultural land. With the support of appropriate policies, agricultural technology, and preservation of the subak system, the creation of these rice fields can improve food security and the welfare of Balinese farmers. However, it should be noted that this must be done while still paying attention to the sustainability of the existing environment, society, and culture, especially in involving the Balinese indigenous people in land and irrigation management. In addition to land conversion, the agricultural sector in Bali also faces serious challenges in the form of a water availability crisis. Uneven distribution of rainfall, increasing domestic and tourism water needs, and damage to irrigation infrastructure have reduced the supply of water to agricultural land. The subak system, which has so far relied on collective water management based on local wisdom, must face the reality of increasingly competitive water needs.

In the southern part of Badung Regency, especially in North Kuta District, the phenomenon of land conversion is very striking. The growth of tourism accommodation development such as villas, resorts, hotels, and cafes has shifted the existence of productive rice fields. According to the Rice Field Conversion Report of North Kuta District in 2013-2015, there was a reduction in rice fields of 178.55 hectares originating from the five subaks that experienced the largest land conversion. This phenomenon raises concerns about the reduction in the living space of subaks as a social and cultural system. According to the Rice Field Conversion Report of North Kuta District in 2013 to 2015, out of 18 subaks, there were 5 subaks that carried out the largest land conversion since 2013 to 2015. The reduction in rice fields over the past three years occurred due to the conversion of 178.55 hectares of land. This condition threatens the existence of subaks, both functionally as an irrigation system and culturally as a world heritage. When the conversion of rice fields occurs, the existence of subak which is a world cultural heritage will slowly decrease and its existence will

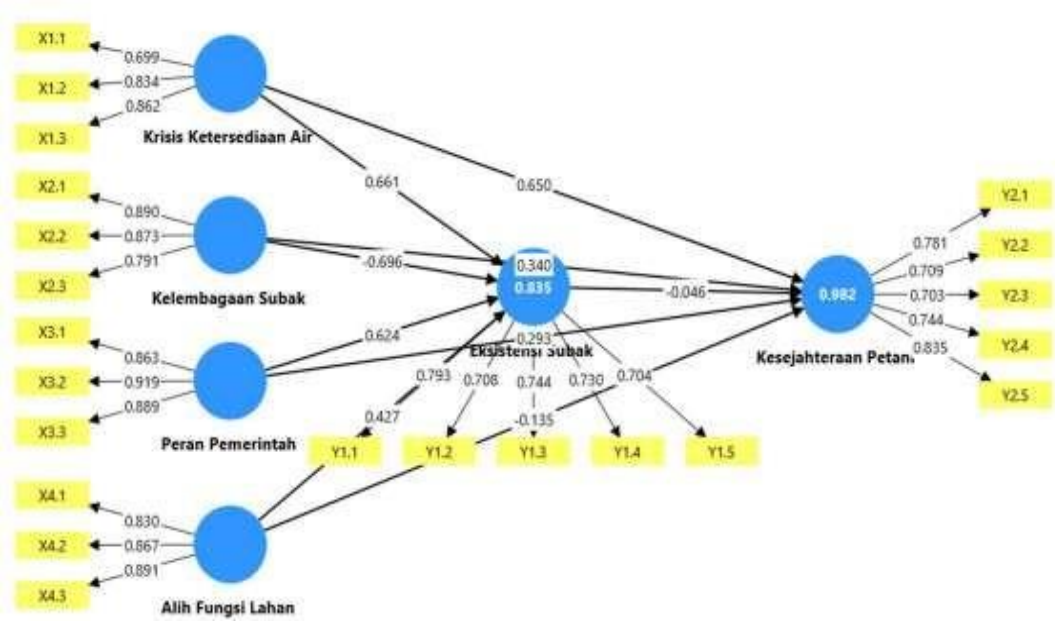
be questioned. This is what interests researchers to find the relationship between farmer status and sustainability of farming with the existence of subak in North Kuta District.

II. RESEARCH METHOD

This study uses an associative quantitative approach. The scope of this study is subak farmers in North Kuta District, Badung Regency with the variables of farmer status, subak existence, and farmer welfare, and the subak existence variable as an intervening variable. The population in this study amounted to 300 respondents who met the criteria according to the research objectives. Of this number, the researcher determined 120 people as research samples, or equivalent to 40% of the total population. The sampling technique used in this study was quota sampling, which is a non-probability technique that takes samples based on a certain number or quota from the population, according to certain criteria that have been previously determined. The criteria for respondents who were used as samples in this study are as follows: (1) Are farmers who are members of the Subak system in North Kuta District. (2) Have been actively farming for at least 3 consecutive years.
(3) Domiciled and farming in the North Kuta District, Badung Regency. (4) Willing to provide information according to research needs.
The types of data used in this study are quantitative data and qualitative data. The data sources collected in this study consist of primary and secondary data. The Data Collection Methods used are Observation, Structured Interviews, and In-depth Interviews. The Data Analysis Techniques used are Descriptive Analysis and Quantitative Analysis with Structural Equation Model (SEM) with Partial Least Square (PLS) software. The PLS evaluation model consists of three parts, namely the evaluation of the measurement model (outer model) which is more specific regarding the relationship between indicator blocks or question items with variables, evaluation of the structural model of indicator blocks or question items with variables, evaluation of the structural model (inner model) which specifically connects latent variables with hypothesis testing.

III. RESULTS AND DISCUSSION

Evaluation of this model was carried out using the Coefficient of Determination (R2), Goodness of Fit Test, and Hypothesis Test (Direct Effect and Indirect Effect), the following is a schematic of the proposed PLS program model.



Source: Data processing results with SEM PLS, 2025

Figure 1 Structural Model (Inner Model)

Based on the processing results, the R-Square value for the Subak Existence variable is 0.835 and Farmer Welfare is 0.982. This shows that the model can explain 83.5% of the variation in Subak Existence and 98.2% of the variation in Farmer Welfare, which is included in the strong category. Then the Q-Square value is 0.997 or 99.7%. This shows the large diversity of research data that can be submitted by the research model of 99.7%, while the remaining 0.3% is explained by other factors outside this research. Thus, from these results, this research model can be stated to have good goodness of fit.

This study proposes 9 hypotheses Hypothesis testing uses bootstrapping analysis techniques. Through the statistical results obtained, the influence of the level of significance between the independent variable and the dependent variable can be obtained. If the statistical value> 1.979 (= TINV (0.05,120) (t-table significance 5%) then the influence is significant. Furthermore, through the results of the P Value obtained if the P Value value on each variable <0.05 then H0 is rejected. Positive influence can be seen through the Original Sample. The summary results of the direct influence test are as follows:

Table 1 Direct Influence Test Results

No.		Size of influence	T statistic	table	P value	Description
1	Land conversion subak existence	0,427	2,809	1,979	0,005	Positive and significant
2	subak institution subak existence	-0,697	2,640	1,979	0,008	Negative and significant
3	water availability crisis subak existence	0,661	10,340	1,979	0,000	Positive and significant
4	role of government subak existence	0,624	3,526	1,979	0,000	Positive and significant
5	Land conversion farmer welfare	-0,135	2,291	1,979	0,022	Negative and significant
6	subak existence farmer welfare	-0,046	1,182	1,979	0,237	No effect
7	subak institution farmer welfare	0,340	3,121	1,979	0,002	Positive and significant
8	water availability crisis farmer welfare	0,650	15,123	1,979	0,000	Positive and significant
9	role of government farmer welfare	0,293	3,737	1,979	0,000	Positive and significant

Source: Data processing results with SEM PLS, 2025

The results of the study show that the water availability crisis has a positive and significant effect on the existence of Subak, with a coefficient value of 0.661, t-statistic of 10.340, and p-value of 0.000. This indicates that the higher the level of water crisis felt by farmers, the higher the need and strengthening of the existence of Subak as a traditional irrigation management institution. This study strengthens the findings of Suryani & Susilawati (2021) which state that the Subak system plays a strategic role in water management during droughts and uncertain planting seasons. This is also in line with the Common Pool Resources theory by Ostrom (2009), which explains that local institutions such as Subak have high effectiveness in managing limited resources if supported by collective rules that are mutually agreed upon. In addition, this study is also in line with the findings of Wijaya et al. (2020) who emphasized that in a water crisis situation, traditional social structures tend to become more solid and functional as a form of adaptation. In fact, Putri & Santosa's (2023) study in Tabanan Regency showed that the role of Subak increased significantly in ensuring fair water distribution amidst the pressures of urbanization and climate change.

Furthermore, the role of the government has also been shown to have a positive and significant effect on the existence of Subak, with a coefficient of 0.624, t-statistic of 3.526, and p-value of 0.000. This finding confirms the importance of policy support and government facilitation in maintaining the sustainability of traditional institutions. Rohman & Suartika (2022) stated that synergy between the government and Subak is key to overcoming agrarian conflicts and environmental degradation. The government, which provides legal space, technical assistance, and agricultural infrastructure development, has proven to be able to strengthen the existence of Subak. This is in line with the concept of institutional hybridity put forward by Cleaver (2017), that local institutions can develop when they are able to interact dynamically with formal institutions.

Subak institutions actually have a negative and significant effect on their existence, with a coefficient value of -0.696, tstatistic 2.640, and p-value 0.008. This finding indicates the possibility that the internal structure of Subak faces challenges, both in terms of trust, member participation, and organizational effectiveness. These results strengthen the findings of Yuliana & Astawa (2021) which state that in several areas Subak has experienced functional erosion due to the weakening of collective spirit and the dominance of personal interests. The study by Ananda & Wardana (2020) even shows that modernization and the entry of a bureaucratic system into Subak management can reduce local wisdom which is the main strength of the system. This finding is contrary to classical studies such as Sutama & Windia (2015) which emphasize the central role of Subak institutions in maintaining the sustainability of traditional agricultural systems. However, in the current context, the results of this study reflect that the

structural strength of institutions is not always linear with the existential strength of institutions, especially if it is not followed by adaptation to the social and economic dynamics of farmers.

Land conversion was also found to have a positive and significant effect on the existence of Subak, with a coefficient value of 0.427, t-statistic of 2.809, and p-value of 0.005. Although land conversion is generally considered a threat to agriculture, in this context it can actually trigger an increase in collective awareness to maintain Subak as a symbol of local culture and identity.

Indrawati & Setiawan (2020) stated that pressure on agricultural land actually encourages the emergence of social resistance and revitalization of Subak's role in protecting Balinese agrarian values. This finding is also supported by Kusumawati et al. (2023) who found that Subak is increasingly playing a role in advocating for farmers against the threat of land capitalization and property investment. Based on the results of the analysis, it can be concluded that the existence of Subak is not only determined by the internal strength of its institution, but also by external pressure and forms of external support. Subak shows a resilient and adaptive character to changes in the physical, social, and policy environments. This reinforces the idea that the sustainability of traditional institutions such as Subak depends on their capacity to adapt, negotiate, and strengthen social legitimacy amidst the challenges of the times.

Farmer welfare as one of the important indicators in the sustainability of the agricultural system is influenced by various structural, institutional, and environmental aspects. The results of this study indicate that several independent variables, namely the water availability crisis, Subak institutions, the role of government, and land conversion, contribute significantly to farmer welfare, although not all of them show the same direction of influence. Based on the results of the analysis, it shows that the water availability crisis has a positive and significant effect on farmer welfare, with a coefficient value of 0.650, a t-statistic of 15.123, and a p-value of 0.000. This finding seems contradictory on the surface, but contextually it can be understood that the more severe the water crisis is felt, the more active farmers become in arranging planting schedules, creating alternative irrigation, and optimizing the role of traditional institutions such as Subak. In the long term, this adaptation can actually increase production efficiency and strengthen farmers' capacity to manage risks. This is in accordance with the findings of Yudhistira et al. (2020), which shows that adaptation to the climate and water crisis in local farming communities encourages the emergence of innovations that have an impact on farmers' economic resilience. This finding is also supported by Puspitawati & Arifin (2022), who stated that farmers in Bali showed high adaptive capacity to water limitations through adjustments to cropping patterns, use of drought-resistant varieties, and strengthening cooperation through Subak. Thus, the water crisis is not only a threat, but also an opportunity for farmers to increase efficiency and social solidarity, which ultimately leads to improving their welfare.

The government role variable also showed a positive and significant influence on farmer welfare, with a coefficient value of 0.293, t-statistic of 3.737, and p-value of 0.000. This emphasizes the importance of state intervention in creating a conducive agricultural ecosystem. Government support can be in the form of infrastructure (farm roads, irrigation channels), fertilizer subsidies, price guarantees, to extension and training. Research by Nugroho & Setiawan (2022) confirmed that agricultural assistance programs from local government agencies play a significant role in encouraging the efficiency of farming businesses, increasing production, and improving the standard of living of small farmers. Furthermore, Rohman & Suartika (2022) stated that the integration of government programs with local institutional structures such as Subak creates synergies that increase the economic resilience of farmers. In the context of this study, the role of the government appears to be successful in increasing access to agricultural technology, markets, and social security, all of which have a positive impact on the welfare of farmers in North Kuta.

The institutional variable of Subak also has a positive and significant effect on farmer welfare, with a coefficient value of 0.340, t-statistic of 3.121, and p-value of 0.002. This shows that although the Subak institution has weaknesses in supporting its own existence, this structure still makes a real contribution to the welfare of its members. Through fair water distribution, cooperation in mutual cooperation, and the implementation of traditional ceremonies that strengthen social cohesion, Subak becomes a source of stability and solidarity for the farming community. Research by Darmawan & Hartati (2019) supports this finding by showing that Subak not only functions in the technical aspects of agriculture, but also in maintaining cultural identity, a sense of belonging, and social support between farmers. In fact, according to Setyawati et al. (2021), Subak plays a role as a social protection network at the micro level which is very important when the formal system (for example, state social security) has not reached all farmers.

Land conversion has a negative and significant impact on farmer welfare, with a coefficient value of -0.135, t-statistic 2.291, and p-value 0.022. These results reinforce concerns that the conversion of agricultural land to non-agricultural land, both for housing and tourism, has a direct impact on decreasing income and loss of livelihoods for farmers. Rahayu et al. (2021) stated that land conversion in Bali is one of the main causes of declining agricultural production, as well as increasing migration rates of farmers to the informal non-agricultural sector. In the context of North Kuta, which is an area with high urbanization and tourism pressures, land conversion is massive and not fully controlled. This causes farmers to lose their main resources, as well as being socially and economically disadvantaged. Sugiartini & Antara (2020) added that farmers affected by land conversion often experience difficulties in accessing new land, technology, and financing, which ultimately lowers their overall welfare index.

Affecting the Existence of Subak and Farmers' Welfare in North Kuta District, Badung Regency

The surprising result is that the existence of Subak does not have a significant effect on farmer welfare, with a coefficient value of -0.046, t-statistic 1.182, and p-value 0.237. This indicates that the existence of Subak as a customary and social institution does not directly encourage an increase in the economic welfare of farmers. Although Subak has a large influence in social and cultural aspects, its existence has not been able to directly touch the economic dimension, such as increasing income, market access, or added value of agricultural products. This finding is different from the results of the study by Susanti & Yasa (2020) which stated that the existence of Subak is closely related to strengthening farmer welfare, especially in maintaining the sustainability of sustainable agriculture. This difference may be due to the conditions of the research area and the welfare indicators used. In the context of North Kuta, where non-agricultural pressures are very high, the function of Subak has shifted more to being symbolic and cultural, so that it no longer has a direct effect on the economic dimension of farmers. Thus, it can be concluded that the welfare of farmers in North Kuta District is significantly influenced by the water crisis, government support, Subak institutions, and land conversion. While the symbolic existence of Subak remains important, its function in directly influencing farmers' welfare seems to be weakening. Therefore, revitalizing Subak towards a more functional and productive direction is key to restoring its role as a pillar of Balinese farmers' welfare.

Indirect influence testing was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with bootstrapping technique. This analysis was used to see the significance of indirect relationships through the mediation variable of subak existence. The results of indirect testing are presented in Table 2 below.

Table 2 Indirect Test Results

No.		Size of influence	T statistic	t-table	P value	Description
1	Land function change Existence farmer welfare	-0,020	1,065	1,979	0,287	No effect
2	Subak institutions Existence farmer welfare	0,032	1,139	1,979	0,225	No effect
3	Water availability crisis Existence farmer welfare	-0,031	1,201	1,979	0,230	No effect
4	Role of government Existence farmer welfare	-0,029	1,180	1,979	0,238	No effect

Source: Data processing results with SEM PLS, 2025

The analysis of the mediation role was conducted to determine whether the existence of Subak mediates the influence between independent variables (water availability crisis, Subak institutions, government roles, and land conversion) on farmer welfare. Mediation in this context is used to test the extent to which the existence and function of Subak are able to bridge the influence of structural and environmental factors on the final result in the form of increasing farmer welfare.

Based on the results of the indirect effect test, it is known that all indirect effects through the existence of Subak are not statistically significant. The coefficient value of the indirect effect of land conversion on farmer welfare through the existence of Subak is -0.020 with a t-statistic of 1.065 and a p-value of 0.287. The Subak institution shows an indirect effect of 0.032 (t = 1.139, p = 0.255), the water availability crisis is -0.031 (t = 1.201, p = 0.230), and the role of the government is -0.029 (t = 1.180, p = 0.238). All p-values are above the significance level of 0.05, indicating that the existence of Subak does not significantly mediate the influence of these variables on farmer welfare. Theoretically, mediation occurs when the intermediary variable (mediator) is able to explain some or all of the influence of the independent variable on the dependent variable (Baron & Kenny, 1986; Preacher & Hayes, 2008). The insignificance of the role of Subak's existence as a mediator in this study shows that although Subak has a strong social and cultural existence, its existence has not been able to become an effective channel for transforming external influences into improving farmers' economic welfare.

One logical explanation for this finding is that the existential function of Subak is more symbolic or normative than functional in a direct economic context. Research by Wiryawan and Sutrisna (2020) in Gianyar Regency also found that Subak is increasingly positioned as a cultural identity and preservation of tradition, but its contribution to farmers' income or economic welfare tends to decline along with the weakening of the production function and collective management of resources. In other words, the existence of Subak remains strong in terms of value and symbol, but its role in the economic aspect is increasingly marginal. This finding is also reinforced by the study of Permana & Dewi (2022) which states that most Subak are experiencing a functional transition, where the role in water distribution, agricultural decision-making, and profit sharing has begun to shift towards

individual or small group management outside the Subak structure. This causes Subak to no longer be the main channel for institutional influence or environmental pressure on farmer welfare.

Theoretically, the failure of this mediation can also be explained through the neo-institutionalism approach, where traditional institutions that are not dynamically adapted to the modern context tend to experience functional stagnation (Cleaver, 2017). Although Subak remains formally present, if it is not accompanied by a renewal of its role, its existence will only be an "empty" structure operationally. This answers why the existence of Subak is not enough to bridge crucial variables such as the water crisis or government support in promoting farmer welfare. Furthermore, the failure of this mediation role may also be due to differences in farmers' perceptions of the existence of Subak. According to Adnyana et al. (2021), young farmers in peripheral urban areas such as North Kuta tend to see Subak as a ritualistic cultural symbol, not as a system capable of supporting agricultural economic strategies. Therefore, efforts such as extension or infrastructure support channeled through Subak are often ineffective in directly encouraging changes in farmer welfare. The geographical context also plays an important role in interpreting these results. North Kuta District is an area with very high tourism and urbanization pressures. Land conversion, lifestyle changes, and shifts in farmers' economic orientation from agrarian to service sectors have caused Subak to lose its material basis, namely land and farmer solidarity. Suryana and Darma (2019) noted that Subaks in urban areas often experience dualism in leadership, weak participation, and internal conflicts due to differences in member orientations. This can also be the reason why the existence of Subak is no longer an effective path to improving farmer welfare.

Thus, overall it can be concluded that the existence of Subak does not play a significant mediating role in the relationship between the variables of water crisis, Subak institutions, land conversion, and the role of government towards farmer welfare. The existence of Subak is still important in the cultural and social context, but it is not strong enough to bridge or strengthen the impact of other variables on the economic welfare of farmers. This indicates the need for a revitalization approach to the role of Subak, not only as a customary and cultural entity, but also as a local economic institution that is able to accommodate the needs of farmers in the context of modern agriculture.

V. CONCLUSIONS

The results of the analysis show that the water availability crisis, Subak institutions, the role of government, and land conversion have a significant effect on the existence of Subak. The water availability crisis has a very significant positive effect on the existence of Subak. The role of government also has a positive and significant effect. Land conversion has a positive and significant effect, while Subak institutions have a negative but significant effect on the existence of Subak. The water availability crisis, Subak institutions, the role of government, and land conversion also have a significant effect on farmer welfare. Meanwhile, land conversion has a negative and significant effect. However, the existence of Subak does not show a significant effect on farmer welfare. The existence of Subak does not mediate the influence of the four variables on farmer welfare. This means that the existence of Subak does not act as a significant mediator in the relationship between these variables.

Based on the findings and approaches used, this study has several limitations that need to be considered. First, the scope of the study was limited to North Kuta District with a sample size of 120 people, so the results cannot be generalized to other areas in Bali that have different social and institutional characteristics of Subak. Second, the quantitative approach used limits the exploration of qualitative aspects such as cultural and spiritual values in the Subak system. Therefore, it is recommended for further researchers to expand the scope of the area and use a mixed methods approach to gain a more comprehensive understanding. In addition, local governments are expected to strengthen Subak institutions, control land conversion more strictly, and develop adaptive strategies to deal with the water crisis in order to support the sustainability of Subak and improve farmer welfare.

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