KEY VARIABLES FOR FARMING BUSINESS SUSTAINABILITY IN URBAN SUBAK

Putu Riska Wulandari 1
Ida Ayu Nyoman Saskara 2
I Gusti Wayan Murjana Yasa 3
Anak Agung Istri Ngurah Marhaeni 4

ABSTRACT

Objective: Sustainability of farming is an effort to manage resources to meet economic, social, and aesthetic needs while maintaining cultural integrity and, most importantly, ecological processes that support life. The challenge currently faced by farming in urban Subak is farming on narrow land but with high productivity in meeting the needs of urban communities. This research aims to analyze the key variables for the sustainability of farming in urban Subak.

Method: Data was collected through field visits, interviews, and focus group discussions (FGD). MICMAC analysis is used to analyze variables that influence the sustainability of farming in urban Subak.

Results and Discussion: The research results show that twelve variables influence the sustainability of farming in urban Subak, which are covered in five dimensions: economic, ecological, social, institutional, and cultural. The variables that are key drivers are land area from the ecological dimension, product types and prices of inputs from the economic dimension, and agricultural ceremonies from the cultural dimension.

Research Implications: The variables from these findings are likely to be a view of the future (foresight), that is, the choice of stakeholders in the sustainability of farming in Subak in urban areas in the future.

Originality/Value: Previous studies on subak focused on the cultural aspects of subak in Bali in rural areas, while this study focuses on urban subak and not only sees it from the cultural point of view.

Keywords: Sustainability, Farming, Urban Subak, Prospective.

RESUMO

Objetivo: A sustentabilidade da agricultura é um esforço para gerir os recursos para satisfazer as necessidades econômicas, sociais e estéticas, mantendo ao mesmo tempo a integridade cultural e, mais importante, os processos ecológicos que sustentam a vida. O desafio atualmente enfrentado pela agricultura em Subak urbano é a agricultura em terras estreitas, mas com elevada produtividade para satisfazer as necessidades das comunidades urbanas. Esta pesquisa tem como objetivo analisar as variáveis-chave para a sustentabilidade da agricultura na área urbana de Subak.

1 Udayana University, Denpasar, Indonesia. E-mail: riskawulandari2@gmail.com
Orcid: https://orcid.org/0009-0008-9385-3059
2 Udayana University, Denpasar, Indonesia. E-mail: saskara@unud.ac.id
Orcid: https://orcid.org/0000-0001-8003-7871
3 Udayana University, Denpasar, Indonesia. E-mail: murjanayasa@unud.ac.id
Orcid: https://orcid.org/0009-0001-2704-0884
4 Udayana University, Denpasar, Indonesia. E-mail: mahaeni_agung@unud.ac.id
Orcid: https://orcid.org/0000-0001-5491-7576
Método: Los datos se recopilaron a través de visitas de campo, entrevistas y discusiones de grupos focales (DGF). El análisis MICMAC se utiliza para analizar variables que influyen en la sostenibilidad de la agricultura en Subak urbano.

Resultados y Discusión: Los resultados de la investigación muestran que doce variables influyen en la sostenibilidad de la agricultura en Subak urbano, las cuales se abordan en cinco dimensiones: económica, ecológica, social, institucional y cultural. Las variables que son impulsores clave son la superficie terrestre desde la dimensión ecológica, los tipos de productos y precios de los insumos desde la dimensión económica y las ceremonias agrícolas desde la dimensión cultural.

Implicaciones de la investigación: Es probable que las variables de estos hallazgos sean una visión del futuro (previsión), es decir, la elección de las partes interesadas en la sostenibilidad de la agricultura en Subak en áreas urbanas en el futuro.

Originalidad/Valor: Estudios anteriores sobre el subak se centraron en los aspectos culturales del subak en Bali en áreas rurales, mientras que este estudio se centra en el subak urbano y no sólo lo ve desde el punto de vista cultural.

Palabras clave: Sostenibilidad, Agricultura, Subak Urbano, Prospectivo.

RESUMEN

Objetivo: La sostenibilidad de la agricultura es un esfuerzo por gestionar los recursos para satisfacer las necesidades económicas, sociales y estéticas manteniendo al mismo tiempo la integridad cultural y, lo más importante, los procesos ecológicos que sustentan la vida. El desafío que enfrenta actualmente la agricultura en la zona urbana de Subak es cultivar en tierras estrechas pero con alta productividad para satisfacer las necesidades de las comunidades urbanas. Esta investigación tiene como objetivo analizar las variables clave para la sostenibilidad de la agricultura en la zona urbana de Subak.

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1 INTRODUCTION

Sustainable agricultural development is an effort to achieve the 2015–2045 Agricultural Development Master Strategy in the form of Sustainable Agriculture-Bioindustry (Kementerian Pertanian, 2014). In the development targets section, the national food sovereignty target is no later than 2025, and community food sovereignty is no later than 2045 (Syahyuti et al., 2015). The basic principle of farming sustainability is that it is economically, ecologically, and socially sustainable, where these three aspects must develop in harmony. Social and environmental issues have emerged since the UN World Commission reported that the condition of human development is experiencing very rapid development and requires anticipation to withstand the negative impacts that will arise (WCED, 1987).

The agricultural sector has problems related to food conditions, which are still a major global concern. Food insecurity occurs not only in underdeveloped and developing countries but also in countries currently experiencing rapid growth in all areas of life (Babu & Gajanan, 2022; FAO, 2013; Opschoor, 2003). Food security aims to provide food availability, price stability, and affordability. Suppose there is no effort to increase food production due to increasing population but limited natural resources. The increasing population will affect the amount of food needed and the availability of residential land, affecting the conversion of rice fields and the production of food commodities (Fraser, 2020; Prosekov & Ivanova, 2018; Surata, 2014). Apart from food problems, problems will arise regarding agricultural land, which is increasingly shrinking, especially in urban areas. Around 52 percent of Indonesia's population lives in urban areas, which is estimated to reach 70 percent in 2025. Apart from that, the younger generation's interest in the farming profession has also decreased (Adam et al., 2022; Bakri, 2021; Hatta et al., 2023). The principle of sustainability of farming not only explores the economic side but is also important to maintain the social side and preserve natural resources.

The only agricultural institution in Bali is Subak. Subak is a traditional irrigation organization in the agricultural sector with a dual function, including as a unique Balinese cultural asset known internationally (Okura et al., 2022; Risna et al., 2022). Institutions are not static but dynamic, following economic interactions that bring together interests. The dynamic characteristics of institutions are caused by changes in society's values and culture caused by changing times. Institutional changes in society mean changes in regulatory and organizational principles, behavior, and interaction patterns (Schindler et al., 2015; Yustika, 2012).

The highest level of rice demand and rice deficit is Denpasar City (BPS Provinsi Bali, 2013). Denpasar City has the greatest need for rice because it is the government center in Bali.
Province. Hence, most of the population is more concentrated in Denpasar City, so the need for rice and land conversion is also high (Denpasar, 2022; Lanya et al., 2013). Based on the characteristics of Subak in urban areas, namely that it has limited land, it is carried out by sharecroppers who are members of Subak, so farming in Subak in urban areas is faced with various challenges both now and in the future. The challenges of farming in urban Subak currently faced are farming on narrow land but with high productivity, saving water, practical and efficient in time, excellent quality, hygienic, not depend on the season, the harvest can be regulated and is aesthetically attractive, it requires a touch of technology and creativity starting from production, distribution to consumption which is not easy to realize without government assistance or agricultural institutions in coordinating (Opschoor, 2003; Schindler et al., 2015).

One of the Subaks in Denpasar City, which the government designated as the Subak Abadi Area consists of five Subaks, namely Subak Umadesa, Subak Umalayu Anggabaya, Subak Intaran Barat and Subak Intaran Timur. These five Subaks were used as the beginning of a sustainable Subak pilot model. One of the considerations was the emergence of commitment from the Subak-Subak members (krama) to maintain their Subak areas as agricultural land, especially rice fields. So, the five Subaks were abbreviated as Subak Lestari Made Ayu Intan. Identifying the role played by various variables in current conditions according to the perceptions of local communities who base their livelihoods on this is known as a prospective approach (Serano, 2014). Various considerations, both qualitative and quantitative, are of concern and consideration in the prospective approach so that it can map important variables in the dimensions of influence and dependence so that the results of these findings can be used as a future view in making policies in the sustainable management of farming in urban Subak in the future.

2 METHOD

The research was conducted at Subak Lestari Made Ayu Intan which consists of five Subaks, namely Subak Anggabaya, Subak Umadesa, Subak Umalayu, Subak Intaran Barat and Subak Intaran Timur where these five Subaks are in Denpasar City. This research used a prospective approach. The prospective approach is qualitative and quantitative (Bradfield et al., 2005; Rialland & Wold, 2009). This research used two approaches, namely a combination of qualitative and quantitative approaches (Mixed Methods) with a Sequential Exploratory design (Creswell, 2019). The researchers determined the informants using the Puposive Sampling method.
The data used were primary data obtained from interviews and focus group discussions (FGD) conducted in March 2023 in Denpasar City with FGD participants consisting of four elements, namely Academicia (A), Businessman (B), Government (G), and Community (C) (Prastyadewi, 2021) which is considered to be directly or indirectly related to the sustainability of farming in urban Subak. Secondary data were also used in this research; namely data on cultivating farmers who are members of Subak as well as data related to the operations of Subak Lestari Made Ayu Intan. Data analysis in this research used the Matrix of Cross Impact Multiplication Applied to a Classification (MICMAC) introduced by Godet, focusing on sustainability analysis where MICMAC carries out mapping analysis of sustainability variables (Fauzi, 2019).

3 RESULTS

Denpasar City, the capital of the Level II Badung Regional Regency and the Level I Regional Province of Bali is experiencing rapid physical and non-physical development because all government activities take place in the Denpasar City area. The city of Denpasar is developing well in economic, political, socio-cultural, and educational aspects, but it is also one of the areas with a high level of land conversion (Ardhana et al., 2005). In terms of official areas, Subak Umadesa, Subak Anggabaya, and Subak Umalayu are included in the Penatih Village area, East Denpasar District. In contrast, East Subak Intaran and West Intaran Subak are included in the Sanur Kauh Village area, South Denpasar District, where these five Subaks are used as the Subak Abadi Area, known as Subak Lestari Made Ayu Intan.

Data analysis related to key factors that determine the sustainability of farming in Subak Lestari Made Ayu Intan using MICMAC analysis to identify the main influential and dependent factors. Twelve factors are identified as the main factors for the sustainability of farming in Subak Lestari Made Ayu Intan: land area, product type, sales method, price of inputs, and availability of product buyers, availability of agricultural laborers (Labourer), the effectiveness of Subak (ef_Subak), the effectiveness of regulations (regulation), the effectiveness of mentoring (ef_PPL), the effectiveness of government policy (ef_policy), availability of farmer cooperatives (Koptan), and agricultural ceremonies (culture). The results displayed by MICMAC are formulations obtained from interviews and confirmed based on the results of FGD implementation by experts.

The relationship between variables through quadrant mapping of urban Subak farming sustainability variables can be seen in Figure 1, showing that the factors of land area, type of
Key Variables for Farming Business Sustainability in Urban Subak

agricultural product, price of agricultural inputs, and agricultural ceremonies are in quadrant I, which is the influencing variable or determinant variable which describes the variable as having a very strong influence with little dependency. The factors of buyer availability, effectiveness of Subak, availability of farm workers, and effectiveness of regulations have a very high dependence (dependent) in quadrant III at the bottom right, namely the dependent variable or outcome variable quadrant. The sales method factor is in a variable relay position. It is influential and dependent, categorized as a system instability factor. The factors of availability of farmer cooperatives, effectiveness of assistance, and effectiveness of government policy are excluded variables often known as autonomous variables, located in quadrant IV and characterized by little influence and little dependence. This variable will not stop a system from working or take advantage of the system itself. So, based on the picture, it can be seen that the variables of land area (ecological dimension), type of agricultural product, and price of inputs (economic dimension), as well as agricultural ceremonies (cultural dimension), are the main factors that are most influential in the sustainability of farming in urban Subak.

Figure 1 shows that four main factors are key drivers or factors with high influence and low level of dependence: land area, type of product, agricultural ceremonies, and prices of inputs. The variables of land area, type of agricultural product, price of agricultural inputs, and agricultural ceremonies are the main factors most influential in the sustainability of farming in Subak Lestari Made Ayu Intan. Farmers with large areas of land find it easier to access extension activities than farmers with small areas of land. Besides, the area of land cultivated also affects farmers' income (Kusumo et al., 2018). Apart from that, in Bali, rice fields are considered a heritage, where the land must be utilized and maintained for the survival of the next generation, which must be preserved, not sold and not converted (Suasih et al., 2018). That kind of belief has become the commitment of members in Subak Lestari Made Ayu Intan.

The type of agricultural product based on buyer demand also influences the sustainability of the farming business in terms of the type of commodity planted, which will, of course, also be adjusted to the type of land where the farming business is carried out. With a variety of products, including rice, horticultural, and secondary crop products, this will certainly create sustainability in farming businesses. This is also supported by research conducted by Agustina (2012), who found that planting varieties suitable for the land is one indicator of the sustainability of farming businesses.

The sustainability of farming businesses for sharecroppers who rent land or are owners will, of course, also be influenced by the price of inputs. For example, an increase in fertilizer prices will affect farmers' income. This aligns with the results of research conducted by Ayesha
(2017), where cultivating farmers who rent land can still meet their fertilizer needs if their land is limited and they can owe money to fertilizer kiosks. The increase in fertilizer prices will force farmers to reduce household consumption because the income is used to pay debts. In research conducted by Kusumo et al. (2018), the price of inputs influences farmers' decisions regarding the sustainability of their farming business in applying technology. So here, the price of fertilizer or other inputs influences the sustainability of farming businesses.

Agricultural ceremonies are a factor that influences the sustainability of farming businesses. Suasih et al. (2018) said that farmers carry out the function of maintaining local values, starting from the process of planting crops to the process of harvesting rice in the fields where all these processes are carried out simultaneously with agricultural ceremonies, which are still traditional. Agricultural ceremonies at Subak in urban areas are still carried out and believed in today. Through agricultural ceremonies, farmers believe that God will protect them when working in the fields to protect the rice planted by farmers so that the harvest can be used for daily survival. According to Suasih et al. (2018), agricultural ceremonies are a long-term legacy where ceremonies or rituals are considered "gugon tuwon" which means something that must be carried out without a clear meaning but is very intense and continuous, similar to the sustainability of farming activities.

**Figure 1**

*Map of Farming Business Sustainability Variables in Urban Subak*

Source: Data Analysis Result
One variable in quadrant II, which is considered a relay variable, is the sales method. Variable relays have a high influence on other variables, but on the other hand, they also have a high level of dependence, so variable relays are often unstable. In farming, sales methods are an important factor that cannot be underestimated for small-scale and large-scale farming. Sales methods are a very important element to support success in running a farming business. This will be very detrimental to farmers if they continue to ignore how to sell the commodity products they have produced (Mubarok, 2021).

Quadrant III is a variable that has a low influence but is very dependent on other variables, so it is called an outcome variable. The variables included in quadrant III are the availability of product buyers, the availability of farm workers, the effectiveness of Subak, and the effectiveness of regulations. The availability of product buyers is an influential aspect of the sustainability of farming businesses. The relationship between producers and buyers will influence the sustainability of farming businesses (Waney, 2014). The availability of farm laborers influences the sustainability of farming businesses. The decrease in the availability of farm labor will ultimately lead to higher production costs, thereby reducing farmers' income. Farm workers also make their work more satisfying and fulfill a sense of humanity (Hidayah et al., 2022; Mirza et al., 2017; Rahaju, 2018; Ratnawati, 2020). Institutional effectiveness influences the sustainability of farming businesses, where the institution in this research is Subak. The effectiveness of Subak is related to farmers' decisions regarding the sustainability of their farming business, where the role of Subak is in unifying perceptions and reducing conflicts with other farmers (Wahyudi & Suci, 2019). Major changes in agricultural patterns from traditional methods to more advanced methods for the sustainability of farming are influenced by regulatory aspects (Rifkian et al., 2017). Related regulations, Quality standards, and monitoring mechanisms influence the sustainability of farming businesses (Wahyudi & Suci, 2019). The effectiveness of regulations in overcoming community conflicts (Taufiqurrohman & Restu, 2022).

In quadrant IV, there are variables whose influence and level of dependence are very small. Therefore, they are excluded because they will not stop a system that, in this case, is related to the sustainability of farming. These variables are the effectiveness of mentoring, the effectiveness of government policies, and the existence of farmer cooperatives. Even though the influence is considered small, the sustainability of farming, both directly and indirectly, will influence the sustainability of farming. PPL's role is to help provide the latest information regarding seeds, fertilizer, and marketing. The interaction of farmers with PPL influences the sustainability of farming businesses (Agung & Aris, 1999; Ali & B, 2013; Malta, 2016; Mirza...
et al., 2017; Pan, 2014). The role of government policy in providing tax freedom for farmers who need this policy. The effectiveness of government policies with several policies that will encourage the sustainability of farming, such as fertilizer subsidies and taxes (A’dani et al., 2021). The availability of farming cooperatives influences farmers’ decisions regarding the sustainability of farming businesses, where the role of farming cooperatives is to help farmers provide farming business needs (Rasmikayati & Rachmat, 2018).

**Figure 2**

*Direct Influence Relationship Between Farming Sustainability Variables in Subak in Urban Areas*

![Direct influence graph](image)

Source: Data Analysis Result

Figure 2 is a network of direct influences between farming sustainability variables in urban Subak, where several factors strongly influence each other. In contrast, some factors have a moderate influence on other factors. The factors of regulatory effectiveness, effectiveness of Subak, availability of buyers, availability of agricultural workers, prices of inputs, and types of agricultural products are strongly influenced by other variables. This follows previous results that show that the type of agricultural product and price of inputs are key factors in the sustainability of farming in urban Subak. The type of plant, land area, price of agricultural inputs, and agricultural ceremonies influence regulations, but there are also variables that influence regulations, namely sales, as shown in Figure 3. Where land area is an intermediate
variable between sales and regulations. Land area influences labor, sales, buyer availability, and Subak effectiveness.

Several regulations have not helped the problems faced in Subak Lestari Made Ayu Intan, such as regulations regarding land, which is an important thing to pay attention to for the sustainability of farming businesses in Subak Lestari Made Ayu Intan. This can be seen in Figure 3 regarding the indirect influence between farming sustainability variables in Subak Lestari Made Ayu Intan, where the strongest indirect influence is the regulatory effectiveness variable.

**Figure 3**

*Indirect Influence Relationship Between Farming Sustainability Variables in Subak in Urban Areas*

![Indirect influence graph](image)

Source: Data Analysis Result

Figure 4 and Figure 5 show the ranking of variables based on influence and dependence. This change describes the ranking position of the variables in the initial conditions (MDI matrix) and after iteration with MDII. Level shifts in variable rankings can be caused by changes in influence during direct influence (MDI) and after iteration on indirect influence (MDII). Based on Figure 5, it can be seen that there is a shift in the level of dependence on
several variables. The variable that experienced an increase in the level of dependence was agricultural ceremonies from the 11th to the 9th. Some variables have experienced a decrease in the level of dependency, namely the effectiveness of government policy (previously ranked 9th to 10th) and the availability of farmer cooperatives (previously ranked 10th to 11th).

**Figure 4**

*Ranking of Variables Based on Influence*

<table>
<thead>
<tr>
<th>Rank</th>
<th>Variable</th>
<th>Rank</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 - land</td>
<td>12</td>
<td>10 - ef_policy</td>
</tr>
<tr>
<td>2</td>
<td>2 - product</td>
<td>11</td>
<td>9 - ef_PPL</td>
</tr>
<tr>
<td>3</td>
<td>3 - sale</td>
<td>10</td>
<td>8 - regulation</td>
</tr>
<tr>
<td>4</td>
<td>4 - price</td>
<td>9</td>
<td>7 - ef_subak</td>
</tr>
<tr>
<td>5</td>
<td>5 - buyer</td>
<td>8</td>
<td>6 - laborer</td>
</tr>
<tr>
<td>6</td>
<td>6 - laborer</td>
<td>7</td>
<td>5 - buyer</td>
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<td>7</td>
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<td>6 - laborer</td>
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<td>8 - regulation</td>
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<td>5 - buyer</td>
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<td>10</td>
<td>10 - ef_policy</td>
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<td>3 - sale</td>
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<tr>
<td>11</td>
<td>11 - kptan</td>
<td>4</td>
<td>2 - product</td>
</tr>
<tr>
<td>12</td>
<td>12 - culture</td>
<td>3</td>
<td>1 - land</td>
</tr>
</tbody>
</table>

Source: Data Analysis Result

**Figure 5**

*Ranking of Variables Based on Dependency*

<table>
<thead>
<tr>
<th>Classement par dépendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
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<td>------</td>
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<td>11</td>
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<td>12</td>
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</tbody>
</table>

Source: Data Analysis Result

The variable shift still occurs in the same quadrant but changes in magnitude due to iteration of other factors with indirect influence. Land area is a variable in the effectiveness of Subak. For Balinese people, land has a very high value, far beyond the literal meaning of land.
On land, humans are born to live their lives and eventually die, carrying out ceremonies, so it is not an exaggeration if people coin the term tanah palekadan (birth land), which has a very deep meaning. Here, ritual and land ceremonies are closely related and are also related to agricultural ceremonies. Without agricultural land, agricultural ceremonies will not exist; likewise, without agricultural land, Subak will not be under the auspices of the Agriculture Service but rather under the auspices of the Culture Service. So, the role of Subak as an agricultural institution will only play a role if agricultural land exists.

4 CONCLUSIONS

The sustainability of farming in Subak in urban areas must receive attention from various parties. This study provides an overview of variables that can influence the success of Subak management in urban areas in the future. The key variables for the sustainability of farming in Subak in urban areas come from the economic dimension, namely the type of agricultural product and the price of inputs. The sustainability variable from the ecological dimension is land area, and from the cultural dimension, it is agricultural ceremonies. The variables from these findings are likely to be a view of the future (foresight), that is, the choice of stakeholders in the sustainability of farming in Subak in urban areas in the future.

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