

## Farmers' Independence Level in the Urban Area of Subak Sembung Denpasar City, Bali Province, Indonesia

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### ABSTRACT

**Purpose:** Subak is an organization owned by the farming community in Bali which specifically regulates traditional rice field management. Subak Sembung is one of the Subak organizations that is engaged in the production to date. The novelty of this research as well as the purpose of the research is to observe the independence of urban farmers from various sides. The purpose of this research is to increase the independence of farmers in adapting to urban situations.

**Research Method:** Sixty-six members of Subak Sembung participated as study participants. Data were collected by observation and interview sessions. The qualitative analysis was employed to address the first, second, and third aims of the study.

**Findings:** Results revealed that the majority of the farmers had a high level of independence in the aspect of cultivation tool preparation, crop production, capital, capital provider, and type of cultivated commodity. However, lack of independence was identified in the aspect of post-harvest handling, management, self-development, collaborating to provide agricultural services, and technology adoption.

**Originality/ Value:** We suggest delivering training, workshops, and technology adoption to improve the level of independence of farmers in adapting to urban agriculture.

**Keywords:** Denpasar City, Independence, Urban Farmer, Subak, Sustainable Agriculture

### INTRODUCTION

Agricultural land in urban areas is decreasing gradually due to rapidly increasing population, urbanization, and land conversion for non-agricultural uses (Prasada and Masyhuri, 2019; Azadi *et al.*, 2021; Chai *et al.*, 2021; Rustiadi *et al.*, 2021; Thi *et al.*, 2021; Suardi *et al.*, 2022). Urban farming delivered beneficial effects in the midst of urban life. Artmann and Sartison (2018) and Dona *et al.*, (2021) highlighted that urban farming is essential to enhance urban land use and natural resources. Additionally, findings from a study done by Setyo and Damaijanto (2019) on the urban farmer population showed a poor level of knowledge about the urban farming model. Therefore, the implementation of urban

farming was relatively simple and mostly did not align with the actual situations.

Grand challenges offered by urban agriculture demanded farmers' high level of independence in running their crop production. A study had explained that active engagement in updating agribusiness information and consistent interaction with agricultural advisors owned essential key in improving the level of independence (Malta, 2016). Independent farmers would have an

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urgency to do integrated pest control. In contrast, a low level of independently produced ignorant farmers who have no clue in running proper crop production (Ramadan *et al.*, 2020). Emery (2015) defined the nature of independence as a “natural” trait to cut structural dependence encountered by the farmer (for instance, dependency on money lenders and wholesalers). Decisions to do crop production independently depended on the income distribution and non-financial attributes. Farmer independence is attributed to crop management decisions and the type of commodity cultivated.

It becomes a big problem for farmers in *Subak Sembung* to survive independently in order to remain farming in the midst of the rapid development of Denpasar city. Denpasar City is an urban area in Bali Province. As the capital city of Bali, Indonesia, and the second-largest city in East of Indonesia, Bali has been designated as the center of business in the province. Denpasar City had 12,778 Ha of land that composed of 2,409 Ha (18,85%) of rice paddy field and 510 Ha (3,99%) of non-agricultural land. Studied by Pradnyadewi *et al.*, (2021), Arisena *et al.*, (2020), and Darmawan *et al.*, (2021) identified an urban farming in Denpasar City, namely *Subak Sembung*. Utilizing the 104 Ha of land areas, *Subak Sembung* consistently shows vibrant agricultural activities amid Denpasar City. Furthermore, Roth (2011) stated that *Subak*, a local genius from Indonesia that manifested in the form of traditional irrigation system, had received international recognition. *Subak* owned a long history as an irrigation institution in Bali Province. Laksmi *et al.*, (2019) also declared that *Subak* had thick existence that represented Balinese authentic culture and known as Balinese tourism icon and established as a world cultural heritage by UNESCO. *Subak* is a very unique part of the culture. It serves the diverse value of life, religion, society, and surrounding environment.

Surviving in the midst of an urban situation is a great accomplishment that has been attained by *Subak Sembung*. Empowerment will be essential to generate independent and resilient farmers for future sustainable urban farming.

This empowerment directs the farmer to be independent and capable of managing the agribusiness without any subsidies or protection provided by the government. Sucitayasa *et al.*, (2018) in their study on the vegetable farmer population in Denpasar City, had reported a moderate level of independence in the aspect of financial, production, and marketing. Furthermore, Ruhimat (2014) in his study, identified a low level of independence among the farmer population. They showed a lack of independence in training, information-seeking, and intellectual aspect in managing community-based forestries.

This recent study’s novelty was the investigation of the level of independence of farmers in the urban area (*Subak Sembung*) that precisely identified through several aspects of independence: 1) intellectual, 2) management, 3) self-development, 4) financial, 5) cultivated commodity, 6) collaboration, and 7) crop production. The objectives of the study were: 1) identifying the profile of the farmer, 2) assessing the level of independence of farmers in the urban area of *Subak Sembung*, and 3) designing a model to improve the level of independence of the farmers to adapt in the urban area.

## MATERIALS AND METHODS

This study was conducted in *Subak Sembung*, Peguyangan Village, North Denpasar, Bali. *Subak Sembung* is considered as an area of *subak* that consistently showed vibrant agricultural activities in the midst of the congested urban area of Denpasar City. The targeted study population was 198 members of *Subak Sembung*. Slovin formula with a maximum 10% margin of error applied to set the number of participants required for the study. Hence, there were 66 farmers from the total of 198 farmers elected as study participants.

Observation and interview sessions were conducted to gather the study data. The technique used was a direct observation by watching,

hearing, and perceiving the level of independence of the farmer in the di *Subak* Sembung. To assure the accuracy of data collected, we also actively involved in the farmers' daily life. Actual data were expected through direct involvement in the studied agricultural activities. We believed that the level of independence could be appropriately identified through this direct observation and involvement. We applied structured and standardized interviews in this study. The question lists, interview procedures, gestures, and words were previously prepared before the data collection. A questionnaire consisting of written questions and statements were given to the participant. The enrollment of this technique aimed to collect data directly from farmers in *Subak* Sembung.

The qualitative analysis method was employed to address the first, second, and third aims of the study. The analysis was conveyed according to the local community/farmer perspectives and ideas as the main observed object in the study. We yearned to gather valid data from the targeted population through keen observation and data collection of actual farming situations. We also collected quantitative data to support the qualitative evaluation. Editing, coding, and tabulation procedures were enrolled prior to the data analysis to prevent avoidable errors. The editing process involved data review and adjustment. The coding process enrolled to label the data according to codes, classifications, or categories. Data were also arranged in rows and

columns as part of the tabulation process. The level of independence was classified according to the range of scale, as shown by Table 01.

According to the range of scale presented in Table 1, the level of independence of farmers in *Subak* Sembung classified into five categories. It ranged from the scale of 1.00-1.79 (total dependence) to 4.20-5.00 (high independence). The scale for each indicator was obtained from the tabulation of data from the interview sessions.

## RESULT AND DISCUSSION

### *Profile of Farmer in Subak Sembung*

The majority of the farmers was classified into the working-age population (15-64 years old). Being a farmer was a choice they decided due to the inherited land. However, they only put this job as a secondary job or seasonal affairs and picked another job as their primary stream of income. They stated that they could not depend entirely on farming to meet their daily need. They viewed farming as low-wage manual labor that covered living expenses inadequately. Therefore, they decided to do another job to meet their need and provide capital for the agricultural works. The majority of the participants were working as security staff and construction workers (Table 02).

**Table 01:** Range of Scale of Farmer's Independence

No	Level of Independence	Range of Scale
1	High independence	4.20-5.00
2	Independence	3.40-4.19
3	Light dependence	2.60-3.39
4	Moderate dependence	1.80-2.59
5	Total dependence	1.00-1.79

Source: Mulyandari (2001)

**Table 02: Profile of Farmer in Subak Sembung**

No	Type of Data	Number (Person(s))
1	Age (Years)	
	≤ 14	0
	15-64	52
	≥ 65	14
	Total	66
2	Educational Background	
	Did Not Go to School/Ungraduated from Elementary School	12
	Elementary School	20
	Junior High School	9
	Senior High School	21
	Diploma/Bachelor	4
	Total	66
3	Number of Household Member (Person(s))	
	≤ 1	1
	2-5	46
	≥6	19
	Total	66
4	Land Area (Are)	
	≤ 10	10
	11-50	28
	≥50	8
	Total	66
5	Land Ownership Status	
	Private Ownership	30
	Land-Sharing (nyakap)	29
	Tenancy	7
	Others	0
	Total	66
6	Type of Commodity Cultivated in a Year	
	Rice Paddy	19
	Vegetable	24
	Corn	0
	Mixed	23
	Total	66

Source: Primary Data Processed 2021

Ramdhan *et al.*, (2020) in their study, reported that the majority of farmers (48.5%) was aged between 45 to 53 years old. They declared that this category of age was appropriate for the bokashi-raw-fertilizer workshop/training. Their study also reported no association between the age of farmers and their level of independence.

Young or older farmers tended to develop diverse attitudes and levels of independence toward new technology, depending on multiple factors. In line with these findings, Sucitayasa *et al.* (2018) found a significant correlation of age and level of independence among vegetable farmers in Denpasar City, especially in the aspect of capital,

with a correlation of coefficient of 0.326. This finding confirmed that participants aged between 25 to 40 years were relatively independent in managing their financial/capital planning.

Finding revealed that 19 participants had more than six household members. This handful number of participants was elderly farmers. Despite their old age, they had a powerful desire to participate consistently in agricultural activities. They lived with their wives, children, sons/daughters-in-law, and grandchildren, in a total of 2-4 persons in a household. Sometimes, some relatives also lived in the same household. Therefore, the total of more than six persons lived in the same household. This situation showed that the head of the family could take up a high economic burden. Hence, they demanded to pursue higher income. They coped with this issue by improving their cropland productivity and working in another sector to obtain multiple streams of income. A good collaboration between the family members on agribusiness management is required to generate optimal results. Furthermore, Pujakesuma and Karyani (2020) stated that an intact family is commonly composed of husband, wife, and children. In the recent study, the number of economic burdens in a family classified into moderate level (2 to 8), consisted of participants themselves, their wives, and children. This situation indicated a higher economic burden carried by the head of the family that had driven them to work harder and increase their productivity to meet their family needs.

The farmers utilized a mixed farming system to cultivate their agricultural commodity during the study. They planted rice paddy and horticulture commodities such as green vegetables, water spinach, pepper, and spinach. The application of the mixed farming system aimed to diversify the cultivated plant in the land. Moreover, it

increased the farmers' income while they were waiting for three to four months for the result of rice grain sales. The price of this rice grain was commonly set by slayers with the application of a *pajeg* system. In spite of this well-known system of cultivation, a few farmers preferred vegetable commodity cultivation. Despite the intensive maintenance required, they claimed vegetable commodity cultivation was cheaper than rice paddy cultivation. Furthermore, they elaborated that the profit of rice grain sales was rarely worth the wait and the complexity of processes had conducted to obtain the grain. These reasons drove the minority of farmers to concentrate on vegetable or horticulture, such as pepper, eggplant, marigold flower, etc. They required a lower cost of cultivation and only three to four weeks' duration before the days of harvest.

### ***The Level of Independence of Farmer in Subak Sembung***

Table 03. presents the level of independence of farmers in the intellectual aspect. The indicators showed that the participant was dominantly classified into the category of independent. The farmer was classified into the high independence category in the cultivation tool preparation indicator (land, seed, irrigation channel, fertilizer, pesticide). Farming tool suppliers around Subak Sembung provided the need for tools, seeds, or pesticides required for the agricultural activities for the farmer. The government also provided free seed and subsidized fertilizer for the rice paddy farmer. Unfortunately, the agricultural subsidies were given only to rice paddy farmers, but horticulture farmers (vegetable, flower, fruit) have to prepare the cultivation tools independently. They have conducted the crop production independently without help from the government parties or other agencies.

**Table 03: Intellectual Independence**

No	Indicator	Score	Category
1	Cultivation Tool Preparation	4.24	High Independence
2	Crop Production	4.25	High Independence
3	Marketing Process	3.51	Independence
4	Post-Harvest Handling Management	3.20	Light Dependence
	Mean	3.80	Independence

Source: Primary Data Processed 2021

The majority of the farmers have distributed the harvested horticulture commodity (green vegetable, water spinach, spinach, pepper, watermelon, and pineapple) to the wholesaler. They did not manage the post-handling process independently. They preferred to sell harvested commodities directly to the wholesaler. They also took some of the harvested fruits or vegetables to their house to be cooked or processed. The existence of wholesaler allegedly extended the marketing distribution line of the agricultural product. It possibly reduced the efficiency, sometimes the profit earned by the farmer (Affandi and Handayani, 2020). However, their role was considered essential in connecting farmers and buyers/companies through the various marketing lines, such as assemblers, rural wholesalers, urban wholesalers, urban retailers, and processors (Do, 2017; Kaimba *et al.*, 2020). Further, the collective traders also helped the farmers in sorting the harvested commodity, distributing product according to their quality,

paying the marketing transportation cost, and providing capital loans for the production and harvesting process (Lisarini and Adillah, 2020).

Table 04. explained that the majority of the participants had moderate dependence on the aspect of agricultural management. Findings revealed that no planning organized prior to the crop production in *Subak Sembung*. No specific plans related to the production volume, capital or resources, cost, or plant sustenance were arranged by the farmers. They performed the crop production spontaneously or only guided by the previous planting season. At some points, some processes are being canceled due to resources and irrigation limitations. Weak water irrigation issues frequently happen and block the water supply for the cultivated land. To cope with this situation, farmers should locate a better source of water to irrigate the land. Sometimes this situation shifted the type of commodity planted on the land.

**Table 04: Management Independence**

No	Indicator	Score	Category
1	Planning	3.23	Light Dependence
2	Implementation	3.33	Light Dependence
3	Evaluation	3.20	Light Dependence
	Mean	3.25	Light Dependence

Source: Primary Data Processed 2021

Participants stated that evaluation was conducted according to hindrances found during crop production. No matter how good or poor the final result of the harvest is, this evaluation was arranged periodically by farmers. They mostly tried to identify the best approach to deal with rat attacks in the cultivation land. The alternative adopted to deal with this pest attack was a conventional rat trap by using food. Through the execution of consistent evaluation, they also discovered the significance of adequate spaces for rice paddy planting and land for irrigation. Responding to the evaluation, they set certain spaces between the rice paddy seed in the cultivation land. They also successfully controlled the rice paddy crabs on the cultivation land. This finding indicated that consistent evaluation had provided proper spaces for the farmer to share and solve issues encountered during crop production.

Table 05 shows that the aspect of self-development among the farmers was classified into light dependence. Our study identified the motivation of the farmers to discover updated information related to their agricultural works. Unfortunately, the participants had no decent gadgets or technology to access the information, especially from social media platforms, such as youtube, google, etc. The farmers collected information of agricultural works from fellow farmers, agricultural field advisories, or academicians from state or private universities. The most common topic shared was pest and disease control on rice paddy or horticulture commodities cultivation, such as controlling rodents and crabs attack in the irrigation channels.

The majority of participants claimed that they

had participated in trainings or workshops. Farmers who never participated in a training stated that lack of information of the training and limited seats offered was the main reason for not participating in the training. The common topic of trainings or workshops were on pest and disease control, the new variety of rice paddy seed, and rice paddy cultivation method. The majority of farmers was wishing to participate in training. However, the training events were rarely conducted during the pandemic. Even though one was being conducted, not all farmers could join the event. Njine, 2014; Saleh *et al.*, 2016; Gondwe *et al.*, 2017; Wonde *et al.*, 2022; Wordofa and Sassi, 2017 explained that the objective of the training is not only introducing a new technology or science, but also improving the attitude, skill, knowledge, and motivation toward an effective and efficient crop production with high and constant productivity.

Table 06 explains that the aspect of finances among farmers was classified into independence level. The majority of the farmers provided all capital for their agricultural works from their own money. It was usually originated from the profit of the previous planting season. Only a few farmers used loans to manage their agribusiness. No financial accounting was conducted to record the financial management of the business. They could not mention the exact number of money required to purchase the seed cultivated in their land. Some of the farmers were retired civil servants. They applied their pension fund as resources to run the agribusiness. In really rare cases, they would decide to take a loan from the local cooperative, friends, or relatives to cover and manage the agribusiness.

**Table 05: Self-Development Independence**

No	Indicator	Score	Category
1	Information Seeking	3.28	Light Dependence
2	Information Exchange	3.45	Independence
3	Workshop/Training Participation	2.62	Light Dependence
	Mean	3.12	Light Dependence

Source: Primary Data Processed 2021

**Table 06: Financial Independence**

No	Indicator	Score	Category
1	The Amount of Capital	4.42	High Independence
2	Capital Sources	4.47	High Independence
3	Source of Income (Off-Farm)	4.17	Independence
4	The Total of Income from Off-Farm Sectors	4.06	Independence
5	Occupation of the Wife	3.74	Independence
	Mean	4.17	Independence

Source: Primary Data Processed 2021

The most common off-farm occupation recognized was the sector of construction workers. Other occupations identified were laid-off tourism workers, security guards/officers, teachers, grocers and merchants of means for traditional Hindu ceremonies. The range of income from the off-farm sector produced was IDR 1,000,000 to 5,000,000 per month or IDR 50,000 to 75,000 per day. We also found that participants' wives actively participated in the agricultural works. Some of the farmers' wives were also opening home-based stalls, working in garment factories, or staying at home to take care of household chores and the family. A few farmers had no wives, hence no additional income existed at their household level. Income from the wives' jobs was applied to fulfill their daily needs. Frequently, their wives also assisted farmers in distributing the harvested product. The income gained from this distribution was also spent on their household need.

This finding was similar to Pogoy *et al.*, 2016 that found multidimensional roles of women in improving the wellness of their family. Women in a family had an essential role in increasing agricultural productivity and product distribution. They were also consistently taking care of their family need while working on those roles. Further, studies by Glazebrook *et al.*, 2020 and Anderson *et al.*, 2021 had explained that different decision-making methods between men and women in meeting their family nutritional

and educational needs of the family while simultaneously running sustainable agribusiness was the main reason for the significance of women empowerment. Sraboni *et al.* (2014) also found that women's empowerment in the agricultural field was positively correlated with the availability of adequate calories and food diversity at the household level. Camalin and Setiawan (2017) also emphasized that women who were involved in farmer groups gained more information and a higher level of health and financial improvement.

Table 07 shows that the aspect of cultivated commodity selection was classified in a high independence level. The main commodity recognized in the *Subak* Sembung was rice paddy. The planting season of rice paddy was selected together with the *subak* members. The planting season of horticulture commodities (green vegetables, pepper, eggplant, marigold flower, etc.) depended on farmer personal favors. In conclusion, *subak* dan farmer decision would contribute to the planting season of the selected commodity. The local or national government also had delivered several agricultural aids for rice paddy commodity cultivation. Unfortunately, it did not equally distribute to all areas. Contrary to this situation, no agricultural aid had been given for the horticulture commodity. *Subak* members (*krama subak*), farmers, and farmers' family members involved in selecting the type of commodity cultivated in the land. No



participation from the owner of the land (for the tenanted or land-shared) in picking cultivated commodities identified in this study. In addition, some farmers did not need to pay for the land (for the tenanted or land-shared) because the owner of the land only needed a well-maintenanced land, without the need of sharing the result of the harvested crop.

Table 8 explains that the aspect of partnering was classified in independence level. The similar sense of mutual need, kinship, responsibility, and the need of preserving the subak had driven the farmer to work together in one organization. Only a small number of farmers were able to deliver agricultural services in Subak Sembung. The majority of farmers tended to recruit agricultural workers independently for operating the tractors, cultivating rice paddy, and distributing their harvested crops. We also found that farmers were executing decisions agreed in the *subak* very well.

Common agreements discussed in the *subak* were rice paddy cultivation season, fertilizer distribution and sale for *krama subak*, and the number of contributions required. Results showed the majority of the agricultural land status was tenanted and land-shared. Hence, the compliance of the land-conversion policies could not rely completely on the farmer parties. The decision of the landowner would contribute to the highest portion of the final decision taken for the land conversion. The high demand of daily life needs and debts, job transition among farmers, lack of infrastructure and poor solidarity have pushed the landowners to sell their agricultural land (Pratiwi and Fatchiya, 2021; Sunarta *et al.*, 2019).

Table 09 showed that the majority of farmers was running the crop production independently. The majority of farmers has been participating in the agricultural business for more than 15 years. These experiences contributed to the high level of independence in crop production activities.

**Table 07: Independence of Cultivated Commodity Selection**

No	Indicator	Score	Category
1	Type of Commodity Cultivated (Rice Paddy or Other Commodities)	4.24	High Independence
2	Considerations Applied in Selecting Cultivated Commodity	4.24	High Independence
3	Parties Involved in Selecting Cultivated Commodity	4.39	High Independence
	Mean	4.29	High Independence

Source: Primary Data Processed 2021

**Table 08: Partnering Independence**

No	Indicator	Score	Category
1	Consideration of Collaboration with Subak	3.48	Independence
2	Partnering in Providing Agricultural Services	3.36	Light Dependence
3	Decision Execution	3.47	Independence
4	Work Together in Executing Plans and Obeying the Policies	3.47	Independence
	Mean	3.44	Independence

Source: Primary Data Processed 2021

**Table 09: Farmer Level of Independence in Crop Production**

No	Indicator	Score	Category
1	Crop Production Experience	4.12	Independence
2	Educational Background	3.71	Independence
3	The Level of Pest Control Implementation	3.72	Independence
4	The Level of Cultivation Technology Implementation	2.57	Moderate Dependence
	Mean	3.53	Independence

Source: Primary Data Processed 2021

They also tended to feel familiar with hindrances that probably occurred during crop production. There was a handful of farmers with five or under five years of crop production experience. They were running the agricultural business due to massive layoffs in non-agricultural sector companies. They were choosing to work in crop production to pay their living cost.

The majority of the participants were graduated from elementary school. However, they were able to fluently explain the crop production activities according to their experiences in crop production. Farmers who just participated in crop production and graduated with a diploma or bachelor's degree improved their knowledge using social media platforms.

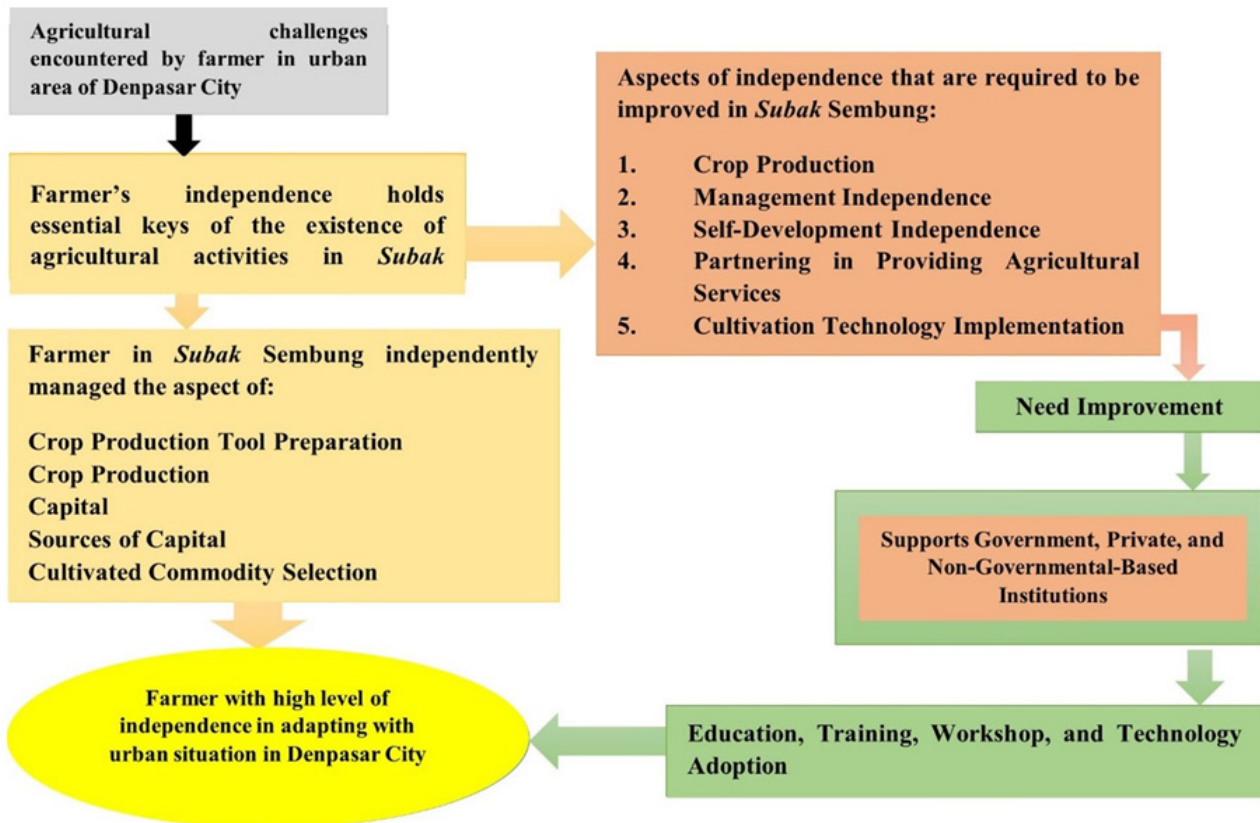
Pest control was conducted independently by farmers. Chemical pesticides and traditional mousetrap were applied for pest control. Years of experience had led farmers to independently deal with the pest attack issues during the crop production.

Farmers in Subak Sembung were not capable to adopt the tools provided for the land tillage. For instance, they could not operate the tractors given by the local stakeholders. They stated that they had not been trained to operate the machinery and no technicians were provided to assist them. Moreover, it was claimed that the tractors were not appropriate for land tillage process in Subak Sembung area. This situation was the reason behind the leasing of tractor services for the rice

paddy field. In the other hand, land tillage process for horticulture commodity was conducted conventionally.

The Image Is a Model Formed from The Analysis of Objectives One and Two (Primary Data 2021)

Figure 01 showed that sufficient education, training, workshops, and technology adoption are required to be an independent farmer in the urban area of Denpasar City. Agricultural education or training as tools targeting farmers and their families introduces novel information or ideas systematically for knowledge improvement. Poor agricultural education or training could lead to poor agricultural productivity due to a lack of access and services. Furthermore, new practices or technology in agriculture from research institutions need to be adapted in the real field of practice by the farmer. Positive adaptation will provide a greater impact, if it accompanies effective education or training (Danso-Abbeam *et al.*, 2018; Desiana and Aprianingsih, 2017). Today's challenge is the capability to transfer creativity, introduce novel technology, and utilize an effective approach to the farmer population (Mgendi *et al.*, 2021; Rasanjali *et al.*, 2021). A study by Jamil *et al.*, (2021) confirmed that farmers' perspectives toward education or training were associated with their participation intensity.



**Figure 01:** Venture to Improve the Farmer’s Level of Independence in Adjusting with the Urban Area of Denpasar City

## CONCLUSIONS

The result showed that farmers in the Subak Sembung area were able to independently manage their cultivation tool preparation, crop production, capital, capital provider, and type of cultivated commodity. However, their lack of independence was identified in the aspect of post-harvest handling, management, self-development, partnering to provide agricultural service, and technology adoption.

## RECOMMENDATION

Future research accenting the culture of agriculture and motivation among farmers is essential to elucidate the motive of consistent agricultural activities during the rigorous land conversion activities in the urban area of Denpasar City. The local stakeholders should also take initiatives

to deliver intensive training and workshops for farmers. Introduction to technology adoption in the area of agriculture is also necessary for empowering local farmers.

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