



# Landscape Character Assessment of *Pekarangan* towards Healthy and Productive Urban Village in Bandung City, Indonesia

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## ABSTRACT

*Pekarangan*, one of the Indonesian homestead agroforestry systems has been recognized as a small-scale landscape unit that can be developed as a mitigation and rehabilitation area by providing a variety of medicinal plants as well as outdoor activity. Thus, a study of the importance of *pekarangan* is crucial to identify its utilization and to recommend a landscape management strategy. About 90 *pekarangan* were identified to elaborate their spatial characteristic. Results show that the limited land is a determining factor to build *pekarangan*. However, no matter how small the remaining space is potentially functioned as a *pekarangan*. This finding suggests that the *pekarangan* can be carried out in a multi-scale landscape. Further, the owner's preference to utilize the remaining limited space with a more productive function is an important direction in the development of the *pekarangan* for the context of the urban village area. In this case, the production function needs to be strengthened compared to the aesthetic function. Considering the importance of *pekarangan* landscape, further study is important to proceed the planning and design simulation stage. Through a spatial planning and design approach, it can be developed into design guidelines based on local context and wisdom to be realized in a multi-scale landscape.

**Keywords:** *Pekarangan*, Urban-Village, Landscape Management, Productive Landscape.

## 1. INTRODUCTION

*Pekarangan*, as the smallest landscape unit on a homestead agroforestry system [1,2] compared to neighborhood and community parks, even urban parks and urban forests on a broader urban scale, is thought to have enormous potential as a mitigation and rehabilitation area for urban environmental health issues. A multi-scale green and blue open space with high aesthetic value can be further improved as a provider of crops, medicine, fruit, vegetables, spices, industry, ornamentals, and other functions [2,3].

*Pekarangan* has excellent potential in efforts to increase community immunity during the Covid-19 pandemic [4]. *Pekarangan* can be developed as a

mitigation and rehabilitation area by providing a variety of medicinal plants as well as outdoor activity spaces with healthy space quality [5,6]. This fact underlines the importance to study of its significance. It starts from the identification of the level of utilization to the recommendation of its landscape management strategy. Thus, this study specifically aims to examine the important value of the *pekarangan* landscape in the context of the surrounding environment through a spatial planning and design approach. The research focused on identifying the existing physical condition of the *pekarangan* at the study site as an illustration of the characteristics of the *pekarangan* landscape to be further analyzed as a model for sustainable *pekarangan* landscape management.

## 2. METHODS

The spatial planning and design approach is used as a research basis to show the importance of the landscape in the context of the surrounding environment, both on a local, city, regional, to global scale. This spatial study was carried out using a mixed-method where data were obtained through social and biophysical surveys. The social survey was conducted through structured interviews to obtain user perceptions and preferences regarding the quality of the landscape. The biophysical survey was carried out through an identification and mapping process related to a measurable and accurate layout of the landscape units studied and their environmental factors. The research was conducted from April to November 2021 in three urban villages (*kampung-kota*) in Bandung, namely Ledeng, Hegarmanah, and Lebak Siliwangi, with the Bandung City Government's Program of *Buruan Sae* as the unit of analysis (Figure 1).

The study was conducted using a survey method and structured interviews with a sample of 90 respondents (30 respondents for each village) who were selected by purposive sampling based on the criteria that the respondents were part of the *Buruan Sae* program. The selected sample is assumed to have a *pekarangan*, but with various characteristics according to the physical condition of the land and other non-physical aspects such as social, cultural, and economic.

Interviews were conducted directly through face-to-face methods or online by telephone. The list of questions is compiled in a questionnaire format with closed-ended and open-ended questions consisting of 3 (three) parts, including (1) a physical survey of *pekarangan*; (2) species and individual plant diversity; and (3) perceptions and preferences of owners.

## 3. RESULTS AND DISCUSSION

### 3.1. General Condition of Study Sites

The survey was conducted to determine the physical condition of each sample of *pekarangan*, including the size, zoning, shape, hardscape, and softscape elements of *pekarangan*—besides the conditions around the *pekarangan* as well as the perceptions and preferences of owners. The following results show the essential findings related to physical and non-physical attributes found in three study sites (Figure 1).

#### 3.1.1. Ledeng Village in Upstream

Ledeng Village is one of the villages in the Cidadap District, with 189 ha. Ledeng is at an altitude of 892 m above sea level with a topography that varies from flat to steep heading to the Cipaganti River area. The average rainfall is more than 191 mm/month, with an

average temperature of 23 °C and a humidity of 77%. Ledeng is directly adjacent to Hegarmanan Village in the south, Cimbuleuit Village in the east, Isola Village in the west, and West Bandung Regency in the north. The dominant land use in Ledeng is a built-up area in the form of settlements and trade-in services, with some areas still functioning as areas for agriculture and food crops. The survey and interview were accompanied directly by a community representative named CAI (*Cinta Air Indonesia*).

The results show that many *pekarangan* are found to have a small size, with a variety of ornamental, food, and medicine plants [1,2]. In addition, some residents also have livestock in the form of poultry, such as chickens, and some people have fish farming ponds in their *pekarangan*.

Some *pekarangan* were used as a place to trade, such as stalls, kiosks selling various foods, etc. Some residents have a hobby of farming, which can be seen from their knowledge and ability to explain the types of plants, how to plant them, fertilization, and the process of propagation. The *pekarangan* in Ledeng Village is dominated by ornamental plants, especially plants that are currently trending. Usually, residents share information about these ornamental plants and barter.

For crop plant species, many types of simple food are cultivated, such as for the needs of kitchen spices. Most residents cultivate these food crops as a reserve if the price of these plants is rising in the market. In addition, this is also another form of utilization of kitchen waste which is usually immediately thrown away, but people reuse or recycle it [1,2].

#### 3.1.2. Hegarmanah Village in Midstream

Hegarmanah Village is part of the Cidadap District with an area of 125 ha. Hegarmanah is located at an altitude of 802 m above sea level, directly adjacent to Ledeng Village in the north, Lebak Siliwangi Village in the south, Cimbuleuit Village in the east, and Sukasari District in the west. The average rainfall is more than 191 mm/month, with an average temperature of 23 °C and a humidity of 77%. The dominant land use in Hegarmanah is a residential area and trade-in services. However, it was found in several locations, such as the Cikapundung River border area; small areas still function as agriculture and horticulture.

The results in Hegarmanah show that many residents are active in planting both ornamental plants and plants that can be consumed daily. Either have limited land or do not have a *pekarangan* but still try to produce, whether in pots, planting in a marginal area, or remaining open space near their homes. The reasons were just hobbies or those that are well managed for high productivity.



**Figure 1.** Study sites in Bandung City as part of Citarum Watershed

A Kampong Tjibarani represents a community-based movement who active in supporting people by growing edible plants. Some crops are distributed to needy people, and others are consumed. Moreover, they take advantage of unused land and use open dumping.

Hegarmanah's topographical conditions vary with the elevation of the road leading to the *pekarangan* object in several locations quite steep. Not all land ownership is private property; some *pekarangan* are in the shared use area and the unused area. Due to limited land, many residents use the second-floor area of their house as a roof garden with more consumption plants than ornamental plants.

All respondent owners report the existence of *pekarangan* is essential to provide freshness, experience hobbies, relaxation or stress relief, and as a source of family food [3,6,7]. Residents feel the benefits of having plants or *pekarangan* in their homes, ranging from plants that can be used as cooking spices, medicines, fruits, and ornamental plants to reduce stress [3,5,6]. Some residents feel the benefits of having a *pekarangan* during a pandemic, even getting income from selling fish and ornamental plants kept in their *pekarangan* [7].

Some respondents prefer growing plants that can be consumed (edible plants), such as vegetable crops, fruit plants, spice plants, and medicinal plants. Respondents said plants in the *pekarangan* could help save costs for buying food ingredients, can be harvested at any time, and can be consumed daily. Residents are enthusiastic about planting, and there is still a desire to develop their *pekarangan* to plant medicinal plants and fruit trees and even add ponds for fish cultivation, at least for their consumption.

### 3.1.3. Lebak Siliwangi Village in Downstream

Lebak Siliwangi Village is located in the administrative area of Coblong District, Bandung City, with 100 ha. Lebak Siliwangi is directly adjacent to

Hegarmanah Village in the north, Citarum Village in the south, Lebak Gede Village in the east, and Cipaganti Village in the west. The land use in Lebak Siliwangi is dominated by built-up areas in the form of settlements. However, some areas have functioned as academic areas with the existence of ITB and a conservation area for wildlife reserves with the Bandung Zoo (Figure 1).

The survey and interview activities in Lebak Siliwangi were accompanied directly by local government representatives. The findings from the research in Lebak Siliwangi showed the community's enthusiasm for ornamental plants. Especially during the pandemic, many residents deliberately bought ornamental plants to care for in their *pekarangan*. In addition to buying directly at the shop/seller of ornamental plants, the culture of the people who like to share is shown by sharing or exchanging plants. In general, the size of the *pekarangan* in Lebak Siliwangi is small or even very small. Residents take advantage of the remaining land by planting plants with media pots, plastic bottles, paint cans, etc.

## 3.2. General Characteristic of Pekarangan

The following results from collecting 90 samples of physical *pekarangan* data in all study sites (Table 1).

### 3.2.1. size

Based on the results of the identification of the characteristics of the *pekarangan* in the three study sites, the average area was 62.19 m<sup>2</sup> (58.19%) in Ledeng, 66.56 m<sup>2</sup> (58.27%) in Hegarmanah, and 19.43 m<sup>2</sup> (30.91%) in Lebak Siliwangi. This shows that the *pekarangan* is maintained as open space from the land owned. The existence of *pekarangan* with a percentage of more than 50% of the land area strengthens the vital function of the *pekarangan*. This is reinforced by the positive perception of respondents when asked about how important the *pekarangan* is to the owner. Different

conditions were found in Lebak Siliwangi, with an average of 30.91% of the land area due to being relatively closer to the center of Bandung City, where the need for land use for the built area is getting bigger.

According to the categorization of the *pekarangan* area [1], most *pekarangan* is narrow (size 120 m<sup>2</sup>) because it is part of the pavement and equipped with potted plants or other artificial planting media. The data shows that in both Ledeng and Lebak Siliwangi, there are no *pekarangan* with a size of more than 400 m<sup>2</sup> (Table 1). This is different from the conditions in Hegarmanah, where a medium-sized *pekarangan* (3.33%) is still found with an area of 664 m<sup>2</sup>. The location of *pekarangan* is located in front of the owner's house, which is used as a planting space [9] and a small poultry farm (chicken coop) [1,7,10] (Figure 2a, 2b, and 2c).

### 3.2.2. zoning

Besides, according to the position of the *pekarangan* [5], most of the *pekarangan* are in the frontyard, both in Ledeng (83.33%), Hegarmanah (100%), and Lebak Siliwangi (100%). This fact is under the condition of the research location with the character of a dense residential area, so it is rare to find houses with *pekarangan* on the side and backyard of dwellings. Owners tend to optimize the available land area for building functions and leave a front yard for the reception room, which can then be used as a *pekarangan*. Some houses have a *pekarangan* in the side zone, usually found in dwellings with openings on two sides, or houses that use the front zone as a built area. For example, in Lebak Siliwangi, there is a house with a land area of 281.5 m<sup>2</sup>, a side *pekarangan* area of 67.7 m<sup>2</sup>, and a backyard of 80 m<sup>2</sup>. With a total

**Table 1.** Characteristics of *Pekarangan* identified in study sites

No.	Characteristics	Village		
		Ledeng	Hegarmanah	Lebak Siliwangi
1	Average land area (ha)	106.9	114.2	62.8
2	Average built-up area (ha)	44.7	49.6	43.4
3	Average <i>pekarangan</i> land area (ha)	62.2	66.6	19.4
<b>A Size/Scale</b>				
1	Small ( $\leq 120$ m <sup>2</sup> )	<b>23</b> (76.6%)	<b>28</b> (93.3%)	<b>29</b> (96.6%)
2	Average (120 - 400 m <sup>2</sup> )	<b>7</b> (23.3%)	<b>1</b> (3.3%)	<b>1</b> (3.3%)
3	Large (400 - 1.000 m <sup>2</sup> )	<b>0</b> (0%)	<b>1</b> (3.3%)	<b>0</b> (0%)
4	Very large ( $> 1.000$ m <sup>2</sup> )	<b>0</b> (0%)	<b>0</b> (0%)	<b>0</b> (0%)
<b>B Zoning</b>				
1	Front yard	<b>25</b> (83.3%)	<b>30</b> (100%)	<b>30</b> (100.0%)
2	Left side	<b>0</b> (0.0%)	<b>1</b> (3.3%)	<b>0</b> (0.0%)
3	Right side	<b>5</b> (16.6%)	<b>0</b> (0.0%)	<b>3</b> (10.0%)
4	Backyard	<b>1</b> (3.3%)	<b>1</b> (3.3%)	<b>1</b> (3.3%)
<b>C Shape</b>				
1	<i>Block</i>	<b>2</b> (6.6%)	<b>14</b> (46.6%)	<b>1</b> (3.3%)
2	<i>Strip</i>	<b>25</b> (83.3%)	<b>16</b> (53.3%)	<b>23</b> (76.6%)
3	<i>Irregular</i>	<b>3</b> (10%)	<b>0</b> (0.0%)	<b>6</b> (20.0%)
<b>D Hardscape Element</b>				
1	Fence	<b>17</b> (56.6%)	<b>27</b> (90.0%)	<b>24</b> (80.0%)
2	Road/Footpath	<b>5</b> (16.6%)	<b>4</b> (13.3%)	<b>4</b> (13.3%)
3	Garage	<b>1</b> (3.3%)	<b>8</b> (26.6%)	<b>0</b> (0.0%)
4	Garden lamp	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
5	Fishpond	<b>3</b> (10.0%)	<b>0</b> (0.0%)	<b>4</b> (13.3%)
6	Trash bin	<b>1</b> (3.3%)	<b>2</b> (6.6%)	<b>0</b> (0.0%)
7	Others	<b>11</b> (36.6%)	<b>14</b> (46.6%)	<b>2</b> (6.6%)
<b>E Ground Cover Element</b>				
<i>Non-permeable</i>				
1	Asphalt	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
2	Concrete	<b>25</b> (83.3%)	<b>23</b> (76.6%)	<b>30</b> (100%)
3	Others	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
<i>Permeable</i>				
1	Soil	<b>13</b> (43.3%)	<b>13</b> (43.3%)	<b>0</b> (0.0%)
2	Grass	<b>7</b> (23.3%)	<b>1</b> (3.3%)	<b>0</b> (0.0%)
3	Paving Block	<b>0</b> (0.0%)	<b>2</b> (6.6%)	<b>0</b> (0.0%)
4	Grass Block	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
5	Porous Paving	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
6	Porous Asphalt	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)
7	Others	<b>0</b> (0.0%)	<b>0</b> (0.0%)	<b>0</b> (0.0%)



**Figure 2** Optimization of various size of pekarangan: (a) planting on the pot, (b) direct planting into the soil, (c) planting on the rooftop, and (d) livestock production or (e) fish cultivation

*pekarangan* area of 147.7 m<sup>2</sup> or 52.46% of the land area, it shows an excellent opportunity for landowners to improve the function of the *pekarangan* on their land [7,10]. This is indicated by the initial data collection of the various types of vegetation found in the *pekarangan* of 36 species and livestock, such as chickens and catfish (Figure 2d and 2e).

They also found a *pekarangan* in the roof garden in Lebak Siliwangi with distinctive characteristics. The owner said the motivation to provide green open space is very high, even with limited land [7,10]. Early identification of the types of plants planted shows the diversity of plant functions, which include spice (spicy), medicinal (medicine), vegetables (vegetable), fruits (fruit), and ornamental (ornamental). The owner explained that the purpose of growing various plants is to reduce daily needs by buying from outside.

### 3.2.3. Shape

The data shows that 83.33% of the *pekarangan* in Ledeng, 53.33% in Hegarmanah, and 76.67% of the *pekarangan* in Lebak Siliwangi have an elongated shape (strip). This is because the function space of the *pekarangan* only utilizes the remaining space after being used as a building. Also, the dominant position of the *pekarangan* in the front yard affects the shape of the *pekarangan* to follow a linear pattern relative to the fence or road.

### 3.2.4. Hardscape Element

This study found no hardscape elements arrange the structure of *pekarangan* due to the limited land. Many owners optimize the space for planting plants rather than adding other features such as garden lights, trash bins, benches, etc. Most of them add a fence (75%) with

the primary function as a land barrier. In addition, several *pekarangan* have an entrance that functions as an entrance and a parking area for motorbikes (14.44%) [1,2]. Suppose the size of the *pekarangan* is relatively large; the owner tends to use it as a productive space, such as adding a fishpond or chicken coop (7.7%) [7,10] compared to hardscape elements.

### 3.2.5. Ground Cover Element

Identification of ground cover elements shows that most *pekarangan* are covered with concrete pavement (86.66%). Even the data in Lebak Siliwangi shows that the entire *pekarangan* is in the concrete pavement area. However, a small portion of the *pekarangan* with a large enough space is fully covered by soil (28.88%), grass (8.88%), and paving blocks (2.22%). These facts indicate that environmentally friendly ground cover materials such as grass block, porous paving, porous asphalt, and others have not been used but have the potential to be promoted.

## 3.3. Future Development of Pekarangan

Several facts can describe the characteristics of *pekarangan* in the urban village area. Limited land is a determinant factor of the use of space for *pekarangan* [10]. However, about 90 sites have been optimally used as *pekarangan*, which not only functions as an open space but can be used as a space for planting, producing livestock, and service functions such as a place for drying clothes or a parking lot. Limited land does not become an obstacle for owners to utilize the remaining space for *pekarangan*. The data shows that most *pekarangan* (88.88%) have an area smaller than 120 m<sup>2</sup> and are classified as a small category. In other words, *pekarangan* can be developed in a multi-scale space, ranging from small, medium, wide, to very wide [1,2].

Another important finding is the landowner's preference for hardscape and ground cover elements. None *pekarangan* had hardscape elements in the form of garden lights; even in some *pekarangan*, other features such as chicken coops or birds were found to shape the *pekarangan* landscape. This is reinforced by the owner's preference to utilize the remaining space with more productivity and affects the owner's intention to raise chicken or fish that tend to be consumed, shared, or sold [7]. These findings propose the direction of *pekarangan* development for the context of the urban village area by strengthening the production function rather than the aesthetic.

In addition, the use of concrete for ground cover elements (86.6%) was primarily found in the research location. Using more environmentally friendly materials has not been widely used. This is an excellent opportunity for the dissemination of science and technology in addition to being a water and soil conservation strategy, especially for disaster-prone areas. A ground cover material that is more environmentally friendly is needed to maximize water absorption into the soil.

#### 4. CONCLUSION

This research aims to examine the critical value of *pekarangan* space in the context of the surrounding environment, both on a local, city, regional, and global scale, with a spatial planning and design approach. The study results show that limited land determines the use of *pekarangan*. All sample sites were identified as *pekarangan*, which functions as a space for agriculture, animal husbandry [7,10], service area such as a place to dry clothes or to park vehicles, and social space. In addition, the development of *pekarangan* can be implemented on a multi-scale ranging from small to very large.

The owner's preference to utilize the remaining limited space with more productive/productive functions is an essential direction in developing the *pekarangan* for the context of the urban village area. In this case, the production function needs to be strengthened compared to the aesthetic function [3,6,7,9]. In addition, the use of more environmentally friendly landscape elements, especially the latest technological materials such as porous paving or porous asphalt, needs to be pursued as a strategy for disseminating knowledge and technology and strengthening environmental conservation efforts. Finally, further research needs to be carried out to develop design guidelines based on the local wisdom of the community to be realized on a larger spatial scale.

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