Productive Urban Landscape In Developing Home Garden In Yogyakarta City

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Abstract. Home garden is one type of agroecosystem that supports ecosystem services even in the urban settlement. The studies involved literature references and field survey along with a framework of the productive urban landscape that support ecosystem services in home garden. Productive urban landscape provided environmentally, socially and economically benefits that contained in ecosystem services. Problems on limited space in the urban settlement have to be managed by modified home garden system in order to work for ecosystem service in developing productive landscape. This study aimed to assess home garden (Pekarangan) system in a cluster of high density settlement in Yogyakarta City. Structured interview and vegetation identification of home garden have been conducted on 80 samples in Rejowinangun Kotagede District, Yogyakarta City. People showed enthusiasm in ecosystem services provided by home garden “Pekarangan Produktif” through developing productive urban landscape. Some benefits on ecosystem services of home garden were revealed on this study consisted of food production for sale (4.7%), home industry (7.69%), aesthetics (22.65%), food (14.10%), biodiversity (10.68%), ecosystem (12.82%), education (2.56), social interaction (11.54%), recreation (4.70%), and others (8.55%). Nevertheless, vegetation and other elements of home gardens have been managed irregularly and in particularly, the planned home gardens were only 17.07%. Actually, home gardens provided a large set of ecosystem services including being cultural services those are the category most valued. The urban people almost hided the understanding of the cultural benefit of ecosystem services of home garden, even though Yogyakarta has known the cultural city. Thus, urban home garden, as way as “Pekarangan Produktif” in the limited space that managed and planned sustainably, provide many benefits of ecosystem services in a productive urban landscape.

1. Introduction

Urban green space covers a range of landscape types of varying complexity and morphology that influence of comfort living. Urban people have high effort to consider any kind of limited space around their life as well as their home. Productive urban landscapes have accommodated the intensity of quality ecosystem that involve benefits of ecosystem services. Ecosystem services were correlated by the landscape productive even any ecological problems in city. Home gardens were existed on limited space of urban settlement that has constructed people think about linking to ecosystem. Even though the ideas of utilized space have been not supported yet by recognizing of productivity and effectiveness of utilization of home gardens.
Productive urban landscape is open urban space planted and managed in such a way as to be environmentally, socially and economically productive, for example, providing food from urban agriculture, pollution absorption, the cooling effect of trees or increased biodiversity from wildlife corridors [9]. Productive Urban Landscapes performed the elements that support ecosystem services. Ecological intensification worked by prioritizing environmental urban layers, which were either connected to open space use, or to implementing sustainable technology and activity patterns. Usually, these environmental layers were then superimposed with other locally appropriate layers, such as economic, social, cultural, historical, etc. Urban home garden system provides tightly key ecosystem services that may be conceptualized as supplying, regulating, cultural, and supporting services. In the wide meaning, home gardens serve as habitat for a large range of flora and fauna and thus help in biodiversity conservation. Provisioning services are those resources supplied by home gardens to human communities, which include food products, natural medicines, aromatic, relaxing, and educating.

Yogyakarta Province provides opportunity on living comfort. Otherwise, Yogyakarta is a favorite tourism destination in Indonesia. Some reasons have supported Yogyakarta as well as having ecologically life quality. It means people should have home sweet home as well home garden with all supporting life. Activities, productiveness, services, all human well-being needs should be provided by surrounding home. In specifically, home garden “Pekarangan Produktif” were revealed as response of the human well-being needs, by integrated conceptual productive urban landscape and ecosystem services. Recently, Yogyakarta local settlements have changes to urbanized settlement that indicate the rate houses increase to high price, followed by smaller and smaller place for home garden. Some reasons have to be considered by thinking productive home garden (Pekarangan Productive) on the limited space of urbanized settlement because of the needs of human well-being in which supported by ecosystem services. Because of several reasons to reveal the understanding of productive urban landscape and ecosystem services applied by home garden, this study aimed to assess potential development of productive home garden system in a cluster of high density settlement in Yogyakarta city.

2. Methods
The research was conducted in high density settlement in Rejowinangun Kotagede district, Yogyakarta city. Based on research objective, the methodological approach for this work included observations, interviews and literature study. Observations and interviews were implemented at 80 samples of household from two clusters of neighborhood (Rukun Tetangga) at Rejowinangun Kotagede district Yogyakarta (Figure 1). Observations covered vegetation, space situation (size, form) in home garden/pekarangan. Interviews were conducted by questioners that contained questions regarding to variables of research. Data were collected by census of all samples from the two clusters. The survey methods were conducted on May – June 2015, continued on May – June 2016. Data were analyzed by statistical descriptive and facts correlation matrix that showed home garden system at the study area. The matrix showed interrelation home garden element, mainly vegetation, to development of productive home garden and ecosystem services. Literature study was involved to understand productive urban landscapes aspects that support ecosystem services.

We tried to refer the Millennium Ecosystem Assessment framework [5], showed by Figure 2, to be related to CPULs (Continuous Productive Urban Landscapes) concept [9] that be applied in home garden system in study area. The interaction among various services provided by the home garden
system and environmental benefits were evaluated to understanding home garden level system. The research variables of ecosystem services were referred to Calvet-Mir, et al., (2012) research [2]. The most valued ecosystem service, as indicator of research, was provision of food, followed by hobby, maintenance of landraces, heritage value of home gardens and associated traditional ecological knowledge and enjoyment of home gardens aesthetic features.

Figure 2. Linkage of analyzing methods aspects between Productive Urban Landscapes and Ecosystem Services to human well-being in home garden system [5][9]

3. Results and Discussion
Yogyakarta city has been famous as tourism destination and cultural place in Indonesia and also known as place for high education. People come from any places of Indonesia come to Yogyakarta for recreation and it has been like a magnet for people surrounding the city. Therefore, Yogyakarta with 32.5 km² has come urbanized area with high density population of 421,704 inhabitants. Study area was an urban high density settlement with limited space around house as home garden.

Previous research by Irwan, et al., 2015, home gardens were grouped by garden size, as way; small (<50 m²), medium (50-100 m²) and large (>100m²) [3]. People though to plant fruit trees, vegetables, and aesthetic plants. Based on garden sizes, it was relatively no difference in reasons of vegetation choice, but there was difference on quantity of trees. People have planted less trees in small garden than medium or large size. Vegetation were planted pots or polybag (Figure 3), because of limited space in small garden, even a few small garden were also planted trees or small trees. In medium and large garden people were easier to arrange trees or fruit trees and shrubs, such as vegetable and aesthetic plants.

Urban trees are considered for productive landscape elements because a major factor in providing cooling, via shade and evapotranspiration. The extent to which gardens contribute to cooling is unclear, because varieties of home garden situation, such as size, vegetation, and maintenance. The trees function was also productive. Productive urban landscape is urban green space planted and managed in such a way as to be environmentally, and economically productive, for example, providing food from urban agriculture, pollution absorption, the cooling effect of trees or increased biodiversity from wildlife corridors. Ecological intensification worked by prioritizing environmental urban layers, which were either connected to open space use, or to implementing sustainable technology and activity patterns. Usually, these environmental layers were then superimposed with other locally appropriate layers, such as economic, social, cultural, historical, etc [9]. It means productive home garden needs conceptual development of environment, socio-culture and economics. Actually, Continuous Productive Urban Landscapes (CPULs) started to develop in London around
2005. Forty years later they were everywhere, having reached a maturity that enables us to study their success in relation to the very initial design intention.

Figure 3. Limited space of home garden at study area

Figure 4 showed answers of questioner about functions of home garden. They said aesthetics is important (22.65%) but actually the planned home gardens were only 17.07%. Several reasons can explain that people may not care to design, people don’t have knowledge and skills, people think no need design in limited space. It was interesting, people think about food for eating (14.10%) and social economic (11.54% and 4.7% food for selling) facilitated by home garden. Local culture play important roles to influence people think about home garden. Thus Pekarangan Produktif has been a cultural activities of Yogyakarta City, also as Indonesian culture. Unfortunately, limited space in cities face a big question mark for home garden. How can Pekarangan Produktif can be applied. Otherwise, other functions on home garden showed at Figure 4.

Urban settlement of area study covered from 28m² to 1650 m² of home area size. Home garden filled the area from 0% (no space) to 80.15% (134 m²), see Figure 3. There are many houses without space around house. Some reasons try to develop the no space home garden. Models of vertical garden covered vertical space (wall) and around house as narrow street/alley (gang). Problems on the alley and limited spaces were not optimum of sun light catching for vegetation photosynthesis [4]. Recreation and education were some kind of activities in home garden, whether with family members or neighbors. Provisioning food, showed in Figure 4, was delivered for home industry (like handmade snack), for eating and for sale in neighborhood. People have enthusiasm on Pekarangan Productive in selling and buying vegetable, fruits and herbal. In this case, social interaction, educational, healthy activities were conducted in settlement. Experiences have been held in study area that on Sunday morning people gathered with family on field to do exercises, jogging or other sports. After the activities, they purchases some fresh vegetable, fruits and herbal. Other way, nutrients contained in fresh materials have richness in vitamin, fiber and enzyme. People also met each other in home garden area talk anything and to care children any way. It was seen daily activities in local characteristics of Kampong in study area. People used limited and alley around house in urban high density in study area. Other people surrounding the study areas have often visited Kampong Pilahan, Rejowinangun
Kotagede for buying fresh vegetable. The Kampong was familiar with “Kampung Wisata Agro” (Agrotourism Kampong).

Figure 2 shows methods for analyzing, ecosystem services aspects (Figure 5) are relevant in connecting to productive landscapes. Those differ that conceptual productive landscape turn in objects or elements and ecosystem services focus on services. Both of those concept are supporting each other in human well-being as well. Linkages between Ecosystem Services and Human Well-being [5] is connecting four broad strands of ecosystem service functions (provisioning, regulating, cultural and supporting) are incorporated, although much of the literature is mainly focussing on the first three of these (provisioning, regulating and cultural). The services are connecting to security, basic material for good life, health, good social relations. Regulating involves most strong intensity of linkages to security, basic material for good life and health. Then, provisioning only has high potential for mediation by socio-economic to security and basic material for good life. In case, Mango trees, in home garden, showed services of provisioning fruits. It strongly influenced health and potential for selling (socioeconomic factors). In developing productive urban landscape, Mango trees in pekarangan produktif also in charge in environmentally (ecosystem), economically and socio-culturally.

Future challenges for further research include how to enhance the resilience of home garden systems against socioeconomic and global climate changes by integrating traditional home garden systems, modern technology, and the global economy [7]. Ross et.al. [8] resumed researches on domestic garden, including home garden, regarding functions for regulating of climate, water and soil in ecosystem services [8]. Due to the close proximity to the home and hence accessibility for many, possibly the greatest benefit of home garden is on human health and well-being. Beyond trees, a wider range of vegetation has potential to improve cooling, e.g. through planting next to a house. There is a suggestion that the strategies to conserve energy in temperate climates cannot be generalized, due to the complex interactive effects of shade and wind reduction. Little information specifically identifies the role of the home garden in carbon dynamics, but the effectiveness of garden plants and soils for carbon storage will strongly depend on design. Vegetation, trees especially, intercept intense precipitation, hold water temporarily within their canopy thus reducing peak flow and easing demand on urban drains.
Varieties of vegetation were dominated by papaya, chili, longan (lengkeng), mango, banana, guava and lime. The vegetation were edible plants and have services of provisioning food. The fruit tress serve ecologically to human well-being. The fruits are favorite for the owner and other people in neighborhood, it means economically can reduce family expenses. As kampong area, people often change fruits or other home garden production (barter) that will socially interact each other and as a local culture. Even Yogyakarta has known as a cultural city, there are cultural plants that should be exist in any kind of place, also in urban settlement. Unfortunately, cultural tree of Yogyakarta, Kepel tree (Stelechocarpus burahol), was planted by 2 respondents/houses from 80 respondents/houses. The reason was not recognized, people might not care to plant or did not understand the cultural trees. Other cultural plants of Yogyakarta malay maple Jambu darsono (Syzygium aqueum) was not exist in study area.

Developing productive urban landscape (PUL) on home garden has potential in study area. People need improvement knowledge and skills. Local government support is important to correlate the programs of community empowerment to the development home garden. As ecosystem services, home gardens are an essential element of life providing opportunity for engagement with nature, self-actualization, creativity or wellbeing; to others, they are at best a parking lot, or worse, represent an additional chore to an already busy lifestyle. Conversely, there may be little point in every house having a garden if their potential is not realized. Educational processes may be required to encourage engagement, especially as society becomes increasingly displaced from the natural world and food cultivation, but evidence is required of the clear benefits before such activity could be undertaken.

According to people needs to develop productive home garden model concept (Pekarangan Produktif), linkage between productive urban landscape (PUL) and ecosystem services (ES) could be thought in arranging and design of home garden. Components of PUL and ES should be combined as PULES to proceed the model concept of productive home garden (Pekarangan Produktif) to continue the research, see Table 1.

Table 1. Linkage between Productive Urban Landscape and Ecosystem Services in Productive Home Garden (Pekarangan Produktif)

| Ecosystem Services | Provisioning | Regulating | Cultural | Supporting |
|--------------------|--------------|------------|----------|------------|
| Productive Urban Landscape | Economically | Socially | Ecologically | Provisioning | Regulating | Cultural | Supporting |
|                      | Low linkage  | High linkage | Low linkage | High linkage |
4. Conclusion

Productive urban landscape (PUL) in developing home garden in Yogyakarta has components that it has provided ecosystem services (ES) in urban settlement environment. Home gardens have shown ecologically, socially and economically potential to be developed as Pekarangan Produktif, even limited space. The limited and or narrow space around home can use vertical (green wall) and horizontal (ground) garden. This study also found that some benefits on ecosystem services of home garden were food production for sale, home industry, aesthetics, biodiversity, ecosystem, education, social interaction, and recreation. The detail and quantitative study on productive urban landscape in relation to ecosystem services should be carried out in order to identify the potential to develop the home garden and alley (gang) area in urban settlements as a more productive urban landscape.

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