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A Design of Permaculture Farmstead in Ngoro-Oro

REKA RUPA RUANG

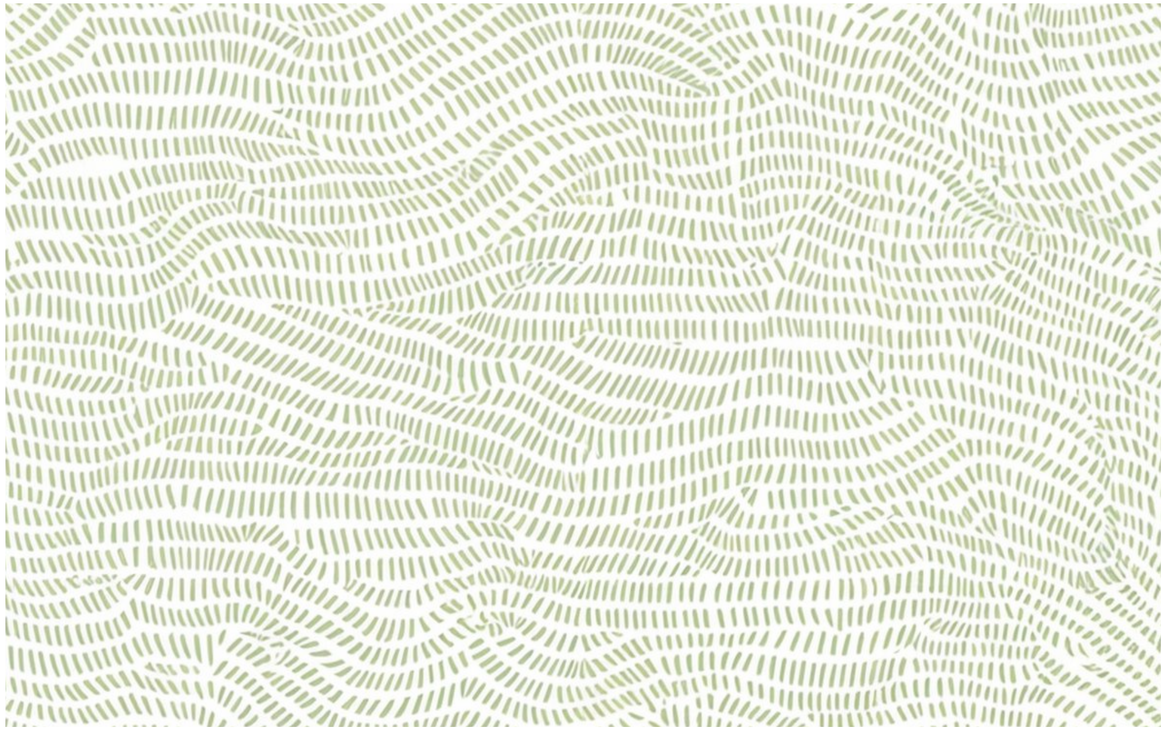


A DESIGN OF PERMACULTURE FARMSTEAD IN NGORO-ORO
PERANCANGAN BANGUNAN PERTANIAN PERMAKULTUR DI NGORO-ORO

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STATEMENT OF AUTHENTICITY

I hereby declare that all parts of this work are my own, except where references are cited. No external assistance, either wholly or partially, has been involved in its creation. I also affirm that there is no conflict of intellectual ownership regarding this work; all ideas and writings contained herein are attributed to the main author and supervisor. The final results are submitted to the Department of Architecture, Universitas Islam Indonesia, for educational and publication purposes.



Yogyakarta, August 15th 2024
Author



Amelia Shafa Kartika

AUTHENTICATION SHEET

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A Design of Permaculture Farmstead in Ngoro - Oro

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PREFACE

Praise and gratitude are offered to Allah SWT, as well as prayers and greetings to our Prophet Muhammad SAW, his family, and companions. By Their grace, the author was able to complete the Final Architectural Design Studio titled "A Design of Permaculture Farmstead in Ngoro-Oro" to the best of their ability. The author received considerable help, input, guidance, and support from various individuals during the preparation of this undergraduate final project. The author wishes to express their appreciation and gratitude to:

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For all the prayers, support, and assistance given, may it be rewarded by Allah SWT. The author acknowledges that this work is not perfect and welcomes constructive criticism and suggestions to improve this undergraduate final project. It is hoped that this project will enhance knowledge and experience for readers, serve as a reference, and provide learning materials and corrections for future improvements.

ABSTRACT

The project titled “A Design of Permaculture Farmstead in Ngoro-Oro” aims to create a sustainable permaculture farming area that empowers the local community in Ngoro-Oro Village. The design is inspired by the village’s rich natural potential, particularly in agriculture, but recognizes that this abundance has not yet translated into improved economic well-being for the local population. Issues such as dependence on chemical fertilizers, which have diminished soil fertility, and the tendency of villagers to seek employment outside the area, serve as the primary motivations for this design.

This project applies the ethics and principles of permaculture, including environmental conservation, community resilience, and economic empowerment. The design features five permaculture zones, each with specific roles and functions, along with three main functional zones: the community zone, the commercial zone, and the production zone. These zones are designed to support local activities, empowering the community both as managers and learners in permaculture farming practices. Thus, this project is expected to make a significant contribution to improving the well-being of Ngoro-Oro Village residents, while also serving as a model for sustainable agricultural development in other regions.

Keyword: farmstead, permaculture, community empowerment

ABSTRAK

Proyek perancangan “A Design of Permaculture Farmstead in Ngoro-Oro” ini bertujuan untuk menciptakan sebuah kawasan pertanian permakultur yang berkelanjutan dan memberdayakan masyarakat lokal di Desa Ngoro-Oro. Desain ini berangkat dari potensi alam yang kaya di desa tersebut, khususnya di sektor agrikultur, namun belum diimbangi dengan kesejahteraan ekonomi masyarakat setempat. Masalah-masalah seperti ketergantungan pada pupuk kimia yang mengurangi kesuburan tanah, serta kecenderungan penduduk desa untuk bekerja di luar daerah, menjadi latar belakang utama perancangan ini.

Proyek ini menerapkan etika dan prinsip-prinsip permakultur, yang meliputi pelestarian lingkungan, peningkatan ketahanan komunitas, dan pemberdayaan ekonomi. Zonasi dalam desain ini terdiri dari lima zona permakultur yang masing-masing memiliki peran dan fungsi spesifik, serta tiga zona fungsi utama yaitu zona komunitas, zona komersial, dan zona produksi. Zona-zona ini dirancang untuk menjadi tempat kegiatan yang memberdayakan masyarakat lokal baik sebagai pengelola maupun sebagai peserta pembelajaran dalam praktik pertanian permakultur. Dengan demikian, proyek ini diharapkan dapat memberikan kontribusi signifikan dalam meningkatkan kesejahteraan masyarakat Desa Ngoro-Oro, sekaligus menjadi model bagi pengembangan pertanian berkelanjutan di daerah lainnya.

Kata kunci: bangunan pertanian, permakultur, pemberdayaan masyarakat

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01 INTRODUCTION

DESIGN PREMISE

The design premise of the project is centered on establishing a permaculture-based eco-tourism farmstead in Ngoro-oro village, utilizing an ecological approach to drive sustainable community development. The objective is to seamlessly integrate permaculture principles design strategies to establish a regenerative farming system that not only bolsters agricultural production but also fosters environmental conservation, community resilience, and economic empowerment. Through the promotion of sustainable practices, ecological awareness, and active community engagement, the farmstead endeavors to enhance the prosperity of the local community, while simultaneously offering recreational experiences for visitors.

PROJECT TITLE

A Design of Permaculture Farmstead in Ngoro-oro

Permaculture

Permaculture is a branch of ecological design science that develops land management, sustainable architecture, and self-sufficiency systems based on natural ecosystems (Tridakusumah et al., 2023). This principle is one of the principles of sustainable agriculture where each sector of agriculture, irrigation, or animal husbandry has a mutually sustainable role so as to create a cycle and pay attention to three main principles, namely earth care, people care, and fair share (Jermias et al., 2023).

Farmstead

A farmstead is a piece of agricultural land along with its buildings. It is also defined as a rural location that can support year-round or seasonal employment with either unpaid labor or hired labor engaged in agricultural activities for livelihood or economic benefit. The relationship between farming and farmsteads is intricate, focusing largely on agricultural systems, settlement patterns, rural housing, farmer classes, agricultural economics, and technical studies including equipment, transportation, and commodities (McHugh, 2017). On these farmsteads, raw materials from the fields are collected, processed, stored, or fed, and prepared for sale. Assuming there is an abundance, variety, and quality of required raw materials, the profitability and satisfaction derived from farming greatly depend on the efficiency, organization, and appeal of agricultural crops represented by the farmland (Trewartha, 1948).

Ngoro-oro

Ngoro-oro is one of the villages or sub-districts located in Patuk District, Gunungkidul Regency, Yogyakarta Special Region Province, Indonesia.

DESIGN PROBLEM STUDY

Agriculture as the Lifeblood of Ngoro Oro Community

Ngoro-oro Village is a village located in Patuk Sub-district, Gunungkidul Regency, Special Region of Yogyakarta. The village is approximately 7 kilometers from the capital of the sub-district and 25 kilometers from the capital of Gunungkidul Regency. With its location near the Nglanggeran Ancient Volcano, the village is faced with rocky yet fertile soil conditions. This unique geological condition makes most of the land in the village designated for agricultural activities. Agriculture has been the foundation of the community's civilization to provide food, livelihood, and community development. Thus, it is not a wonder that the economic activities that revolve in this village are also dominated by its local commodities.

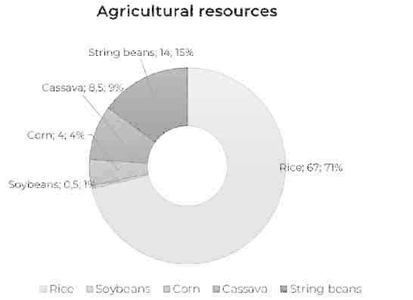
The fertile soil conditions cause this village to have a very large agricultural land. Based on data from the RPJMD 2018-2024, the two most extensive types of land in the village are rain-fed rice fields and moor land. Rain-fed rice fields can usually be planted with rice plants twice in one year. On the other hand, moorland fields are usually cultivated for rice-palawija farming activities in a tumpang sari pattern.

No	Description	Area (ha)
1	Rain-fed rice fields	253,43
2	Moor-farm land	329,78
3	Yard	139,08
4	Community-owned forest	15,23
5	Fisheries	0,08
6	Critical or fallow land	10,25

The village has a diverse flora resource that is characterized by dryland and hilly ecosystems. This diversity of flora depends on the climate of the season and year, each of which has its own harvest period. Some of the crops that flourish in this village are rice, secondary crops, vegetables, fruits, and forestry timber. The crops are then taken to the market for sale. Thus, it can be said that the economic cycle in this village is driven by the crops harvested by the community.

The geographical condition where most of the land is cultivated for rice fields and farms has a big influence on the lives of the people. This makes most of the community work in rice fields or fields for a living. A total of 1166 people in this village or 56 percent of the residents work as farmers (RPJMD Ngoro-oro, 2019).



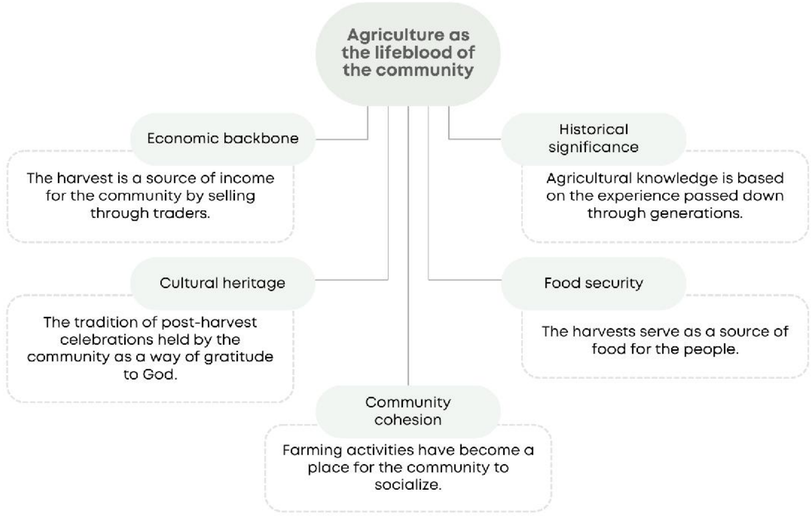


Usually, the harvest is sold directly to traders in the market. The people in this village sell their crops to the nearest market traders. Not only that, forest products in the form of wood are also cultivated by residents to be resold as firewood or processed into charcoal. The products are then used by the community itself or sold to residents to be used as cooking fuel.

Table 1.1
Table of agricultural area in Ngoro-oro Village
Source: RPJMD Ngoro - Oro, 2019

Figure 1.1
Diagram of total population by occupation in Ngoro - Oro
Source: RPJMD Ngoro - Oro, 2019

Figure 1.2
Diagram of agricultural resources in Ngoro - Oro
Source: KKN UAD, 2019



Agriculture as the economic backbone

Agriculture has become a pillar of the Ngoro-oro Village community's economy. This is because harvested agricultural products become a source of income for the community by being sold to traders.

Agriculture as a cultural heritage

The Rasulan or Merti Desa tradition is associated with a mass ceremony. This ceremony is held once a year after the harvest as a form of gratitude to God.

Agriculture as historical significance

Agricultural practices in this village are based on knowledge passed down from generation to generation. This is based on the experience of the ancestors regarding agricultural practices under the natural conditions of Ngoro-oro Village for many years.

Agriculture as food security

The harvest is a source of food for the community itself. Usually, the harvest will be stored by people in their own house for daily consumption so they don't need to buy anymore.

Agriculture as a community cohesion

Often when they are farming, people will meet in the rice fields. This leads to an informal socialization process between people.



Figure 1.3
Schematic on the role of agriculture as the lifeblood of Ngoro - Oro community
Source: Author, 2024

Figure 1.4
Rasulan tradition in Gunungkidul
Source: radarjogja-jawapos.com

The existence of long market chain

A market chain is a network used to describe a number of connections that link all relevant actors and transactions that take place in the movement of agricultural commodities from farm to consumer (Lundy, 2024). Based on Lundy's (2004) research, there are three components of the commodity market chain, namely production, post-harvest management processing, and marketing. As a village with relatively high agricultural yields, the economy in this village is based on the harvest. However, what happens in this village is that the role of farmers is at the lowest level in the supply chain or as a production component.

In this case, the harvested commodities will be directly sold by farmers to intermediaries without further handling. The intermediaries will then carry out post-harvest management processing and distribution. The distribution process usually covers distribution within the city and outside the city. In the process, many of the crops will experience quality degradation and even spoilage. The longer the supply chain, the more likely the quality of the vegetables or fruits will decline.

Not only that, a long market chain will also cause inefficient information flow. This is because each market chain is disjointed. The lack of marketing information on farmers in the village leads to exploitation by certain market chain actors. This exploitation is usually in the form of excessive profit taking by certain market chain actors.

Thus, there is a necessity for a place that can shorten the market chain. This aims to increase information to farmers in Ngoro-oro Village regarding marketing information. In addition, the existence of such a place can reduce the market chain, which means that commodity products will be sold to the community with good quality. This will increase the value of commodities in Ngoro-oro Village.

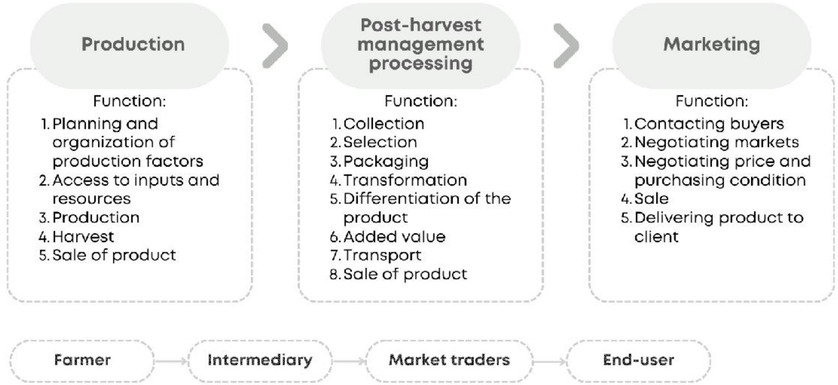


Figure 1.5
Components of market chain
Source: Lundy, 2024
Figure 1.6
Existing market chain
in Ngoro - Oro community
Source: Author, 2024

The deterioration of soil fertility and farmers' awareness of the balance of nature

Fertilizer is a basic need in agricultural activities. The level of agricultural productivity is strongly influenced by the fulfillment of the amount of fertilizer. However, until now farmers still have a high demand for chemical fertilizers. This is because chemical fertilizers are relatively more practical to use. Farmers in Ngoro-oro Village also find that chemical fertilizers are still the number one choice. This is unfortunate because the use of chemical fertilizers has a negative impact on the environment. It was also mentioned by the PPL of Ngoro-oro Village that the level of soil fertility in Ngoro-oro Village has decreased. Not only that, agriculture becomes more susceptible to pests and crop yields are not optimal.

- *The soil becomes hardened*
- *Increased degree of acidity*
- *The balance of nature is disrupted*
- *Soil polluted by residual fertilizer chemicals*
- *Water contamination due to residue run-off*



Figure 1.7
Sedyo Makarti,
local farmer community
Source: Ristanto, 2022

Ngoro-Oro and the preserved fertile area



Land-use map in Ngoro-oro

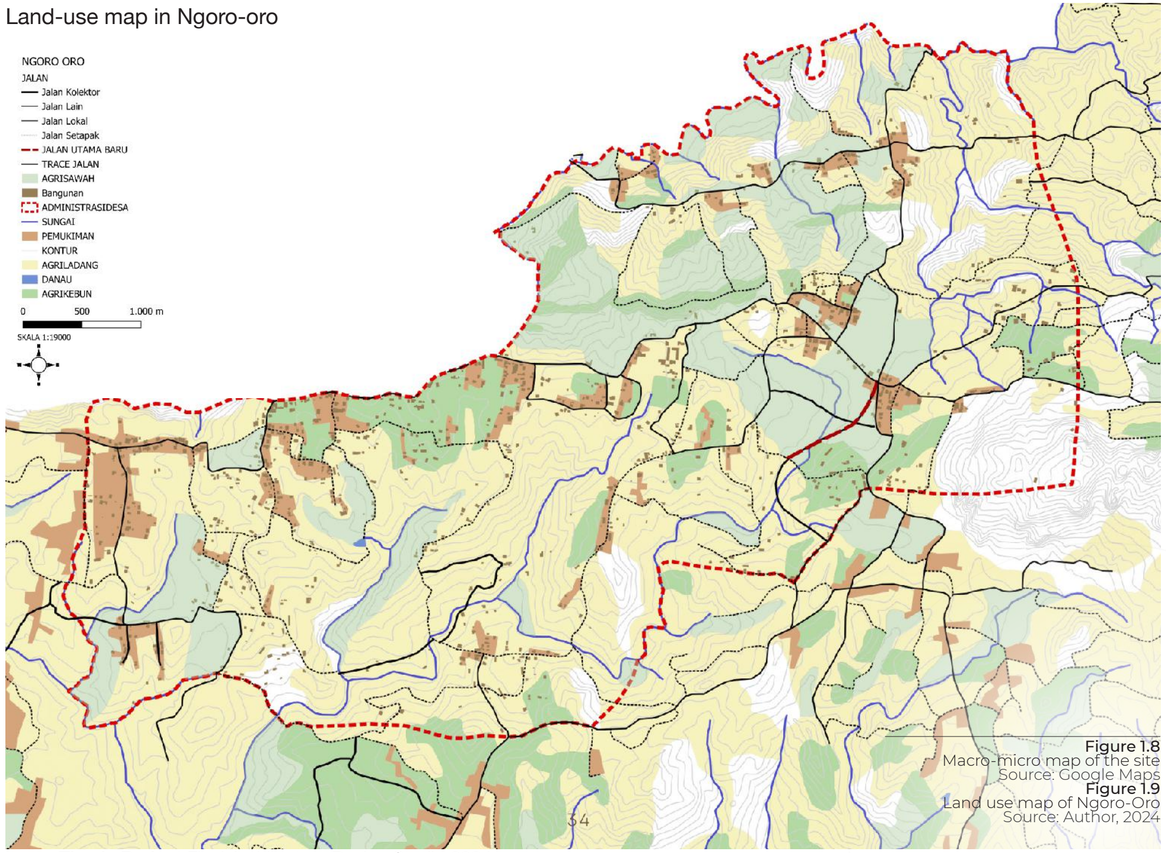


Figure 1.8
Macro-micro map of the site
Source: Google Maps
Figure 1.9
Land use map of Ngoro-Oro
Source: Author, 2024

Ngoro-Oro Village is located in the hilly region of northern Gunungkidul. The village is characterized by contoured land with high soil fertility. Ngoro-Oro Village is located quite far from the center of Gunungkidul Regency, Wonosari. This makes the village far from the hustle and bustle of the city. Its location which is far from the city center makes not many buildings and infrastructures have been established in this area. This makes the land in this village still natural and filled with greenery both forests, gardens, and rice fields.

Based on the land use map, Ngoro-oro Village is divided into four zones: residential zone, agricultural zone, agricultural zone, and agricultural zone. Each of these zones has a specific function. Agriladang is an area of land that is cultivated and planted with commodities without any existing water flow. Agrisawah is an area of land that is cultivated and irrigated to grow paddy. Agrikebun is an area of land planted with seasonal trees. Settlement is the area where people live. There are several local commodities grown in the agri-farm zone.

Agriladang Commodities

1. Cassava
2. Palawija
3. Banana
4. Herbs or spices

Agrikebun Commodities

1. Rambutan
2. Durian
3. Mango
4. Stinky beans
5. Cacao

Agrisawah Commodities

1. Corn
2. Longbean
3. Rice

Forest Commodities

1. Teak tree
2. Sengon tree
3. Sonokeling tree
4. Acacia tree
5. Cashew tree
6. Mahogany tree

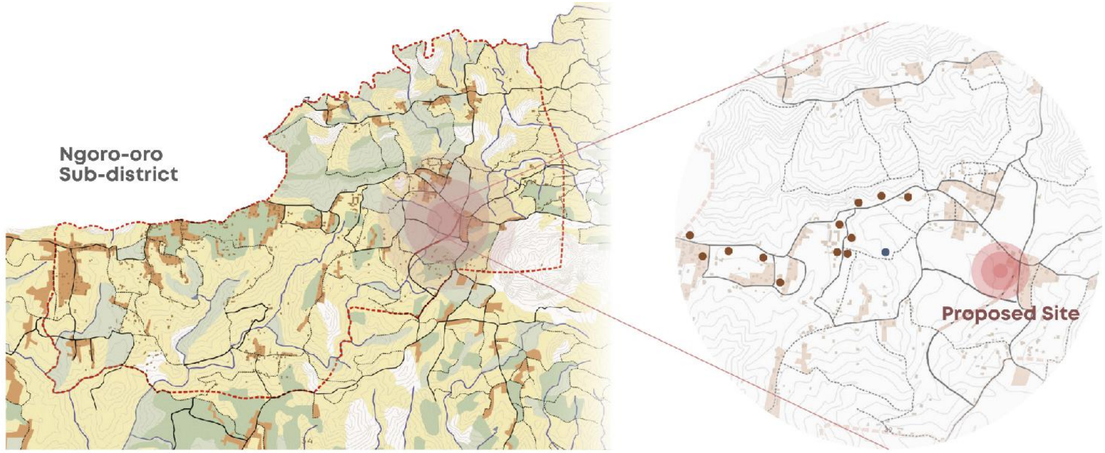


Figure 1.10
Local commodities of Ngoro-Oro
Source: RPJMD Ngoro-Oro, 2019
Figure 1.11
Mezzo map of the proposed site
Source: Author, 2024

Local community in Ngoro-Oro

The natural conditions of an area may affect the lives of the communities. Ngoro-Oro Village has natural resources such as agriculture and plantations that the community considers potential to utilize. In addition, the needs to create additional income can encourage the community to start initiatives in economic independence. One form of community business is SMEs or Small and Medium Enterprises. SMEs are productive businesses that drive the economy of both individuals and groups within the region. In developing their business, the village community often maintains local cultural heritage and traditions that have grown in the community. There are several SMEs that have grown and developed in Ngoro-Oro Village in the fields of agriculture, agribusiness, and culinary. Some of them are:

UKM Sedyo Makarti



Gapoktan Sedyo Makarti is a community-owned business engaged in agriculture or rice fields. Some types of local commodities worked on are rice, corn, secondary crops, and others.

UKM Ngudi Makmur



Gapoktan Ngudi Makmur is a community-owned organization engaged in plantation commodities. Some of the local commodities cultivated are cavendish bananas, cacao, and others.

UKM Sedyo Maju



Sedyo Maju UKM is a community business engaged in the culinary field. The group is dominated by housewives who produce traditional packaged food on a micro scale.

Bank Sampah HPM



HPM (Himpunan Pemuda Muttaqin) Waste Bank serves as a place for waste collection, waste processing, as well as a community center for the community to learn about sustainable waste management.

Titanichi Farm



Titanichi Farm is a farm that provides a farmer's life experience by providing the opportunity to interact with cows by directly watching, feeding and caring for them.

Mitra Jaya Mina



Mitra Jaya Mina is a catfish fishery group dedicated to developing catfish fisheries in a sustainable and community-based manner.

Figure 1.12
"Panen Raya" event preparation
Source: desangoro-oro.gunungkidulkab.go.id
Figure 1.13
HPM Waste Bank building in Ngoro-Oro
Source: desangoro-oro.gunungkidulkab.go.id
Figure 1.14
Government and UKM collaboration of cavendish banana cultivation
Source: desangoro-oro.gunungkidulkab.go.id
Figure 1.15
Cattle farming as community business
Source: desangoro-oro.gunungkidulkab.go.id
Figure 1.16
Local culinary community business
Source: suryapos.id
Figure 1.17
Fish pond business area by local
Source: desangoro-oro.gunungkidulkab.go.id

Local Vegetation and Commodities

FRUIT AND VEGETABLES



HERBS AND SPICES



Figure 1.18
Local commodities of fruit, vegetables, herbs, and spices in Ngoro-Oro
Source: BPS Kabupaten Gunungkidul, 2023



Figure 1.19
Local commodities of annual fruit
Source: BPS Kabupaten Gunungkidul, 2023

PROBLEM MAPPING

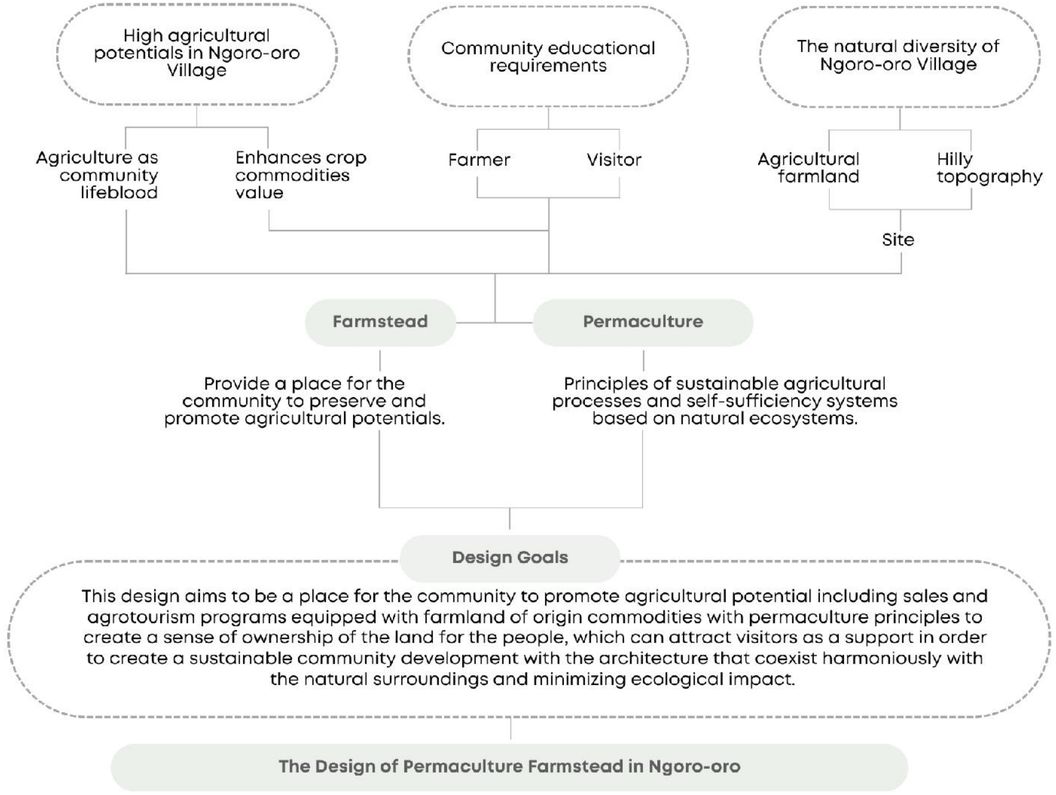


Figure 1.20
Diagram of problem mapping
Source: Author, 2024

PROBLEMATIQUE

The Design of Permaculture Farmstead in Ngoro-oro

NON - ARCHITECTURAL PROBLEMS

- High agricultural potential without further crop processing by the community.
- The selling price of crops is relatively low because the community acts as the lowest level of the supply chain.

ARCHITECTURAL PROBLEMS

- The absence of adequate infrastructure buildings that can accommodate the agricultural potential and economic activities in it, as well as being a main attraction for the village.

PROBLEM FORMULATION

How to design a farmstead using permaculture principles on the agricultural scope that enhances potential value of the village while also boosting visitor enthusiasm for community's sustainable development using ecological architecture?

PROBLEM LIMITATION

The types of plants that are grown in permaculture farmsteads are the local commodities from Ngoro-oro Village.

APPROACH

PERMACULTURE

An agricultural design that simulates nature in a closed-loop, waste-free system.

DESIGN GOALS

This design aims to be a place for the community to promote agricultural potential including sales and agrotourism programs equipped with farmland of origin commodities with permaculture principles to create a sense of ownership of the land for the people, which can attract visitors as a support in order to create a sustainable community development with the architecture that coexist harmoniously with the natural surroundings and minimizing ecological impact.

METHODOLOGY

Permaculture Approach

Permaculture is the management of farming and animal husbandry in a sustainable improvement of land quality and supports cooperation with local culture and environment (McKenzie & Lemos, n.d). According to Mollison (2002), permaculture is the conscious design and maintenance of productive agricultural ecosystems that have the diversity, stability, and resilience of natural ecosystems. The goal of permaculture is to maintain harmony between the environment and humans.

Data Collection Method

Primary Data

Primary data was collected using field observation and interviews with residents of Ngoro-oro Village. Primary data collected in the form of existing sites and issues experienced by the community.

Secondary Data

Secondary data collection was conducted by conducting literature review and mapping the region. Secondary data collection was conducted to obtain regional statistical data related to agriculture.

Design Approach Method

The design approach is carried out after observation and literature review which then found the design problem. The design uses a typological and thematic approach in designing a farmstead that involves permaculture agriculture.
This design includes:

1. Design a permaculture farmstead that is in accordance with the principles of permaculture in terms of agriculture.
2. A design that responds to the surrounding site and creates an outdoor experience.
3. Design a building that suits the community activities inside the building.
4. Building design that prioritizes the balance of nature with the use of renewable materials by minimizing the use of excessive carbon emissions so as to create a sustainable building.

Matrix of Design Thinking

The programming of the permaculture farmstead room is based on the needs of the user. Based on the analysis that has been done with user flow analysis, it can be found that the space needs of each activity flow carried out by each user role.

Matrix of Design Thinking	Practical	Formal	Symbolic	Radical
Regulation Regional Regulation of Gunungkidul Regency Republic of Indonesia Government Regulation	**Regional Regulation of Gunungkidul Regency No. 6 Year 2011 about RTRW 2010 - 2030 Chapter VII Article 73 Section 1** Zoning regulations for nature reserve areas prioritize the preservation of biodiversity by limiting space utilization to activities that support ecosystem diversity. These include nature tourism while restricting natural resource exploitation and the utilization of protected biota. Prohibited activities aim to maintain environmental carrying capacity and prevent landscape and ecosystem alterations.	**Regional Regulation of Gunungkidul Regency No. 6 Year 2011 about RTRW 2010 - 2030 Chapter II Article 11 Section 1a** Strategies for developing and optimizing the orientation of regional economic development based on agriculture, fisheries, forestry and tourism as well as other cultivation activities in an efficient, effective, competitive, sustainable and environmentally sound manner as referred to in Article 10 letter a include: a. developing agricultural designation areas and encouraging increased production and productivity through agricultural revitalization and protection of sustainable food agricultural land towards the realization of regional food independence, security and sovereignty;	**Regional Regulation of Gunungkidul Regency No. 74 Year 2018 about Development Plans for Agropolitan Rural Area, Special Interest Tourism, and Coastal Tourism Chapter I Article 3** a. Develop agriculture-based activities. b. Develop nature-based tourism activities. d. Manage natural and other resources in the sub-district. e. Empowering the strategic and priority values of rural areas. f. Adapting development between regions within the district. g. Develop local wisdom-based areas.	**NRepublic of Indonesia Government No. 16 Year 2021 about Building Chapter II Article 112 Section 1** The provisions of the technical planning stage of Green Building as referred to in Article 109 paragraph (2\ letter b consist of: a. site management; b. energy use efficiency c. water use efficiency d. air quality in the space; e. use of environmentally friendly materials f. waste management; and g. waste water management.
User Farmer (Farmer UKM: Sedyo makarti & Ngudi Makmur) Ngoro-Oro Community	The design should consider ease of use and comfort for them in carrying out their daily farming activities while also consider the well-being of the users, including their health and safety while working on the farm.	Farmstead designs that take into account local cultural elements can help identify and maintain the cultural heritage of villages, as well as inspire a sense of pride in their surroundings.	The sense of cultural pride and identity with symbols that reflect their cultural heritage and the community's important values that makes the community feel more connected.	Community adaptation to adopt innovative farming techniques that differ from conventional practices to improve the productivity and ecological resilience of the land. Design that can facilitate active participation of the community in decision-making and implementation of agricultural practices.
Client Badan Usaha Milik Desa (BUMDES) Ngoro-Oro	The design should consider the ability of the farmstead to generate income and improve the economic well-being of the clients and has legal and regulatory requirements that must be adhered to.	A farmstead design that appeals to visitors or potential customers thus enhancing the client's reputation and their brand image.	Farmstead to be a symbol of local economic success or sustainable agricultural practices, also the symbol of empowerment and pride for village communities, encouraging active participation and a sense of belonging.	Encourage radical agricultural practices as part of their commitment to environmental and economic sustainability, and support innovation in local agriculture and support new experiments that lead to more resilient agricultural systems.
Designer Architect	Responsible for creating efficient and sustainable design solutions, while work closely with the local community to understand their needs and aspirations and ensure that the farmstead design reflects their values and interests.	Create aesthetically and visually appealing design solutions by ensuring that farmstead design respects and enriches its cultural and natural context.	The use od symbols in the design to express the creative ideas and philosophy behind the permaculture farmstead while promoting environmental awareness and nature protection.	Implement innovative designs and build relationships with communities to support their participation in design and implementation processes, while encouraging experimentation and adaptation in agricultural practices that reflect permaculture principles.

Figure 1.21
Matrix of Design Thinking by Bryan Lawson
Source: Author, 2024

DESIGN HYPOTHESIS

The Role of the Community

In this permaculture-based farmstead building, the role of the local community must be included. This is because the concept of local community involvement is also the main concept of permaculture. According to Mollison (1998), permaculture design elements include site, energy, abstract, and social. In this case, the social component is the local community.

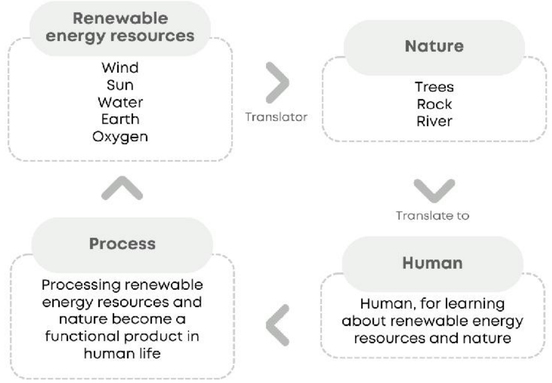


Figure 1.22
Permaculture system concept
Source: Mollison, 1998

In this case, the role of the community is essential in the farmstead system. This includes agricultural production processes, harvesting, post-harvest processing, marketing, and even recycling. The agricultural production process up to harvesting is carried out by the community, especially farmers. Then, it continues with post-harvest management processing. At this step, the role of the community is not only from farmers but also from the general village community. The process involves washing, sorting, and packaging of agricultural products, which will then proceed to the next process. The products will then be processed into three parts: cooking process intended for restaurants, direct sales to consumers intended for the farmstead store, and processing into food or crafts intended for restaurants, farmstead store, workshop procurement, and cooking classes. Each process will produce waste. Inorganic waste will be sorted and transformed into recyclable items that can be used or even sold again. Organic waste will be converted into organic fertilizer or processed into biogas for reuse in agricultural systems. The entire process will form a closed-loop cycle that aligns with the principles of permaculture.

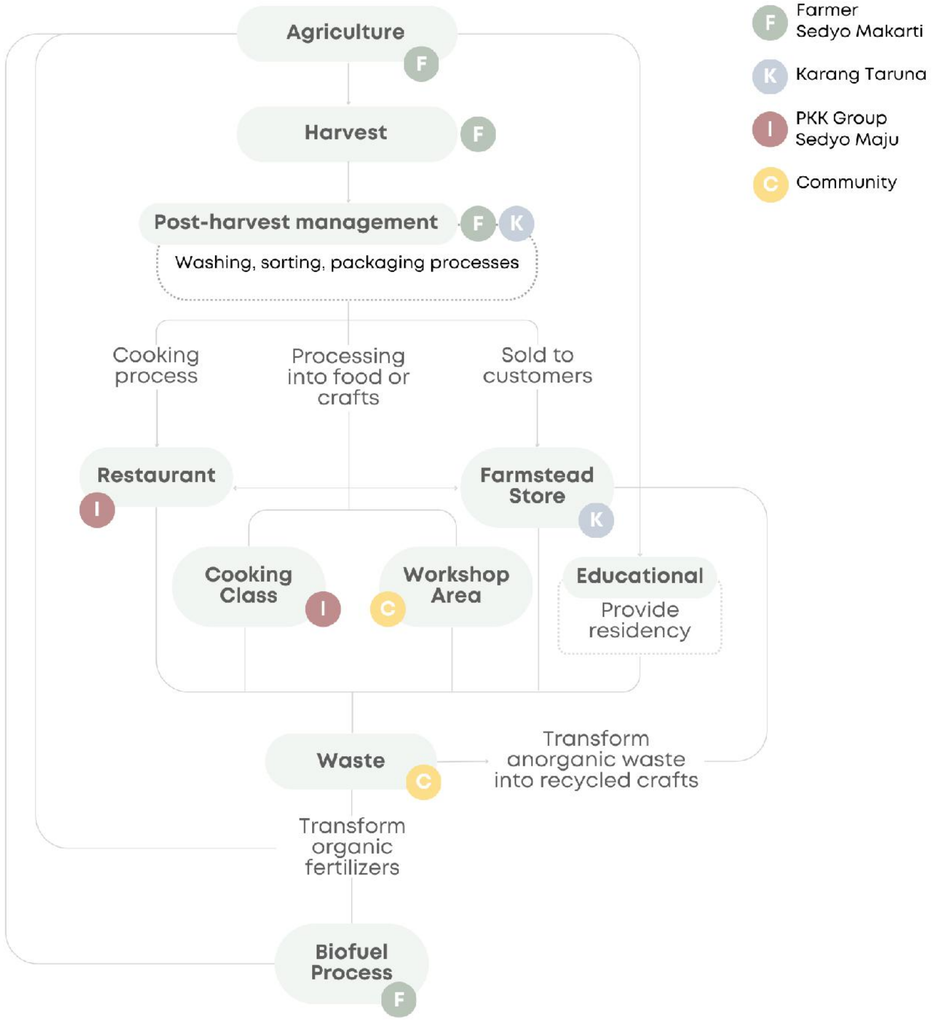


Figure 1.23
The role of farmer and the community inside farmstead
Source: Author, 2024

How Permaculture can solve the issues?

In this hypothesis, it is explained how the permaculture approach can be a solution to existing social and environmental issues. This diagram illustrates the differences between the permaculture method compared to most present-day methods. The diagram is based on the book "Permaculture - A Designer's Manual" by Bill Mollison.

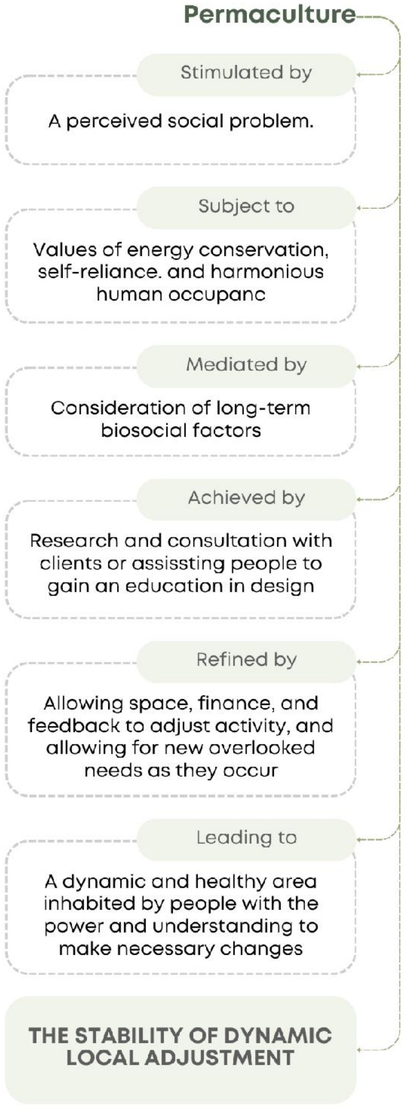


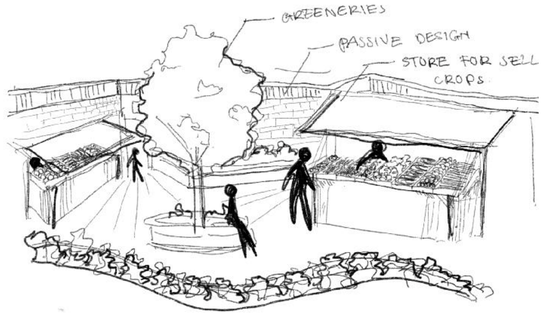
Figure 1.24
Permaculture as solution
Source: Author, 2024

FIGURATIVE DESIGN

The initial conceptual design emphasizes the typology of the building as a permaculture farmstead. This farmstead will function as a complementary building to the existing agricultural land at the site location. The main function of this building is as a place to conduct post-harvesting process on agricultural products from the community as well as a place for selling commodity products. In addition, there will be several supporting functions that can be an attractive value for visitors who come. The permaculture principle in it will be used in the cultivation of each farm in the site location. This principle will also be-

-used in the processing of crops with the concept of close cycle.

Adjusting to the context around the site with natural authenticity, the ecological architecture approach is the appropriate option. This is because the ecological architecture approach will adapt the creation of an environment that consumes less and produces more natural resources. Some concrete applications that can be used are planning that responds to the local climate with vegetation, minimizing energy use by maximizing passive design, utilizing local materials, and providing energy sources and waste disposal.



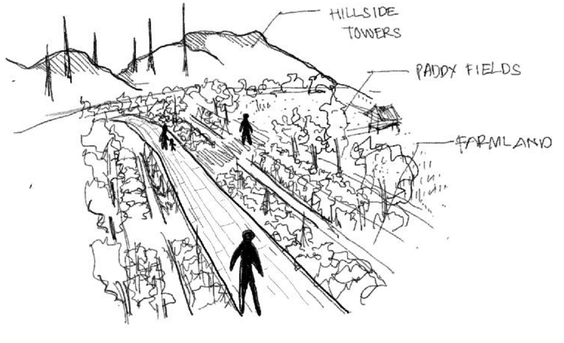


Figure 1.25
Figurative design of the farmstead store to sell harvested organic product
Source: Author, 2024
Figure 1.26
Figurative design of the farmland with the hillside of "Thousand Towers"
Source: Author, 2024

EXCELLENCY, ORIGINALITY, & NOVELTY

Project Title	Lesson Learned	Difference
Perancangan Permaculture Institute Terban melalui Pendekatan Tata Ruang Wisata Edukatif di Kali Code, Yogyakarta Author: Endah Kurnia Saputri Year: 2022	This project designs a permaculture educational place that supports the socio-cultural activities of the community on the banks of Kali Code with a permaculture approach and educational tourism.	There are differences in the site context where this project is located in an urban area and directly adjacent to the river. On the other hand, the researcher is more focused on areas located in agriculture and sub-urban areas with a small population with a lower middle economy.
Ecovillage untuk Petani di Kota Machakos, kenya: Pemukiman Mandiri yang Berintegrasi dengan Permakultur Author: Adhe Nurtsani Octavia Year: 2016	The design of Farmer Ecovillage aims to develop an alternative settlement model for farmers that is truly built independently using an ecovillage approach that integrates with permaculture, so that they can start their own decent settlements rather than waiting to be provided by the government or developers.	The difference in concept is in the function of building typology and the target of this project. This project prioritizes the comfort of residents to be able to live and stay for a long time with the concept of self-efficiency permaculture.
Desa Wisata Lingkungan dengan Lansekap Pedesaan sebagai Pengolahan Land Use yang Berbasis Pelestarian Lingkungan Author: Citra Nova Puspitasari Year: 2009	This design prioritizes tourism attraction by integrating natural landscapes through green development to establish conservation-focused rural communities. It offers cultural adventure tourism, agriculture, animal husbandry, and fisheries, supported by necessary facilities. The design adopts a village landscape concept, with nature incorporated into the outer layout and landscape to enhance tourist accessibility and enjoyment of attractions. The underlying goal is to maintain nature conservation and cultural integrity within the village.	This project focuses on the development of environmental tourism villages with rural landscapes as land use based on environmental conservation. This research highlights sustainable environmental management in the context of tourism villages, with an emphasis on preserving the rural landscape and surrounding natural environment. On the other hand, the researcher focuses more on the design and implementation of permaculture principles in the management of agricultural fields, with an emphasis on environmentally friendly architecture.
Perancangan Taman Budaya Bambu di Janturan Sleman dengan pendekatan Arsitektur Ekologis Author: Bellinda Chairunnisa Year: 2021	The research provides an in-depth insight into the application of natural materials such as bamboo, eco-friendly building design, and integration with the surrounding natural environment. With attention to the sustainable management of bamboo as a building material, the study also provides an overview of how local projects can provide economic, social, and cultural benefits to the community, through collaboration with the local government, cultural institutions, and local communities.	The difference is in the typology of building functions where this project focuses on a cultural park dominated by the use of bamboo materials.

Table 1.2
Table of excellency, originality, and novelty
Source: Author, 2024



02
PROBLEM STUDY

STUDY OF LOCATION, SITE, AND CONTEXT

Patuk District

Gunungkidul - Patuk Map





Kapanewon Patuk or Patuk District is one of the sub-districts located in the northern part of Gunungkidul Regency. Based on historical stories, this area has been established since the time of Panembahan Senopati, in 1831. It was told that the king's son and his mistress, Joko Umbaran, traveled eastward through the vast forests, large rivers, and mountains and then stopped in an area. The area was then given a "pathok" or landmark that was intended as a place to live which has developed to this day. Another story also states that this area was the result of the expansion of the regency during the leadership of KRT Dirjodiningrat, the twelfth regent of Gunungkidul, which was marked with a "pathok" or boundary.

Geographically, Patuk District is located in the northern part of Gunungkidul with coordinates 070 55' 11.4" south latitude and 1100 31' 11.0" east longitude. The area is divided into 11 villages with a total land area of 4.85 percent of the entire area of Gunungkidul Regency or 72.04 square kilometers. The village with the largest area is Beji Village with a total area of 1010.8 ha or 14.03 percent of the total land area of Patuk District, while the smallest village is Patuk Village with a land area of 291 ha or 4.04 percent.

Administratively, Patuk District borders Gedangsari District to the north and east, Prambanan District Sleman Regency to the southwest, Piyungan District and Dlingo District Bantul regency to the west, and Playen District to the south and east.

The potential natural resources in Patuk District are agriculture, plantations, and tourism. This is because this area is supported by natural topographic conditions that are dominated by karst hills.

In addition to its diverse natural resources, the region also has abundant cultural potential. The local arts have grown and developed in the lives of the people since long ago until nowadays they have taken the form of organizations. Some types of arts include karawitan, keroncong, reog, jatilan, wayang orang topeng, emprak, and theater. In addition to the potential of the arts above, there are also traditions organized by the community every year, such as rasulan or village harvesting ceremonies held between the months of Suro or Sapar.

Figure 2.1
District map of Gunungkidul Regency
Source: gunungkidulkab.go.id
Figure 2.2
Sub-districts map of Patuk District
Source: gunungkidulkab.bps.go.id

Macro Zoning

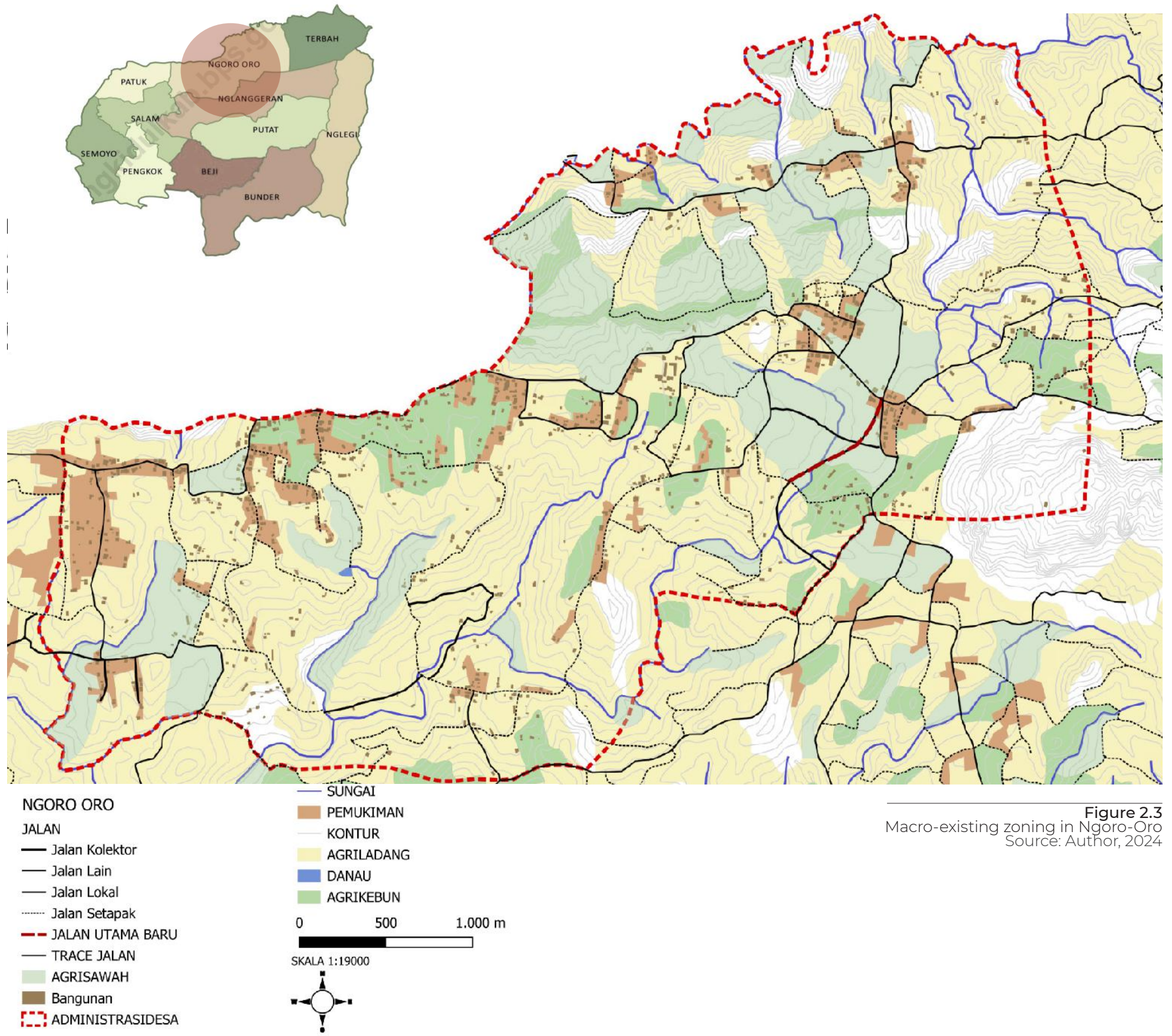


Figure 2.3
Macro-existing zoning in Ngoro-Oro
Source: Author, 2024

Macro Existing Analysis

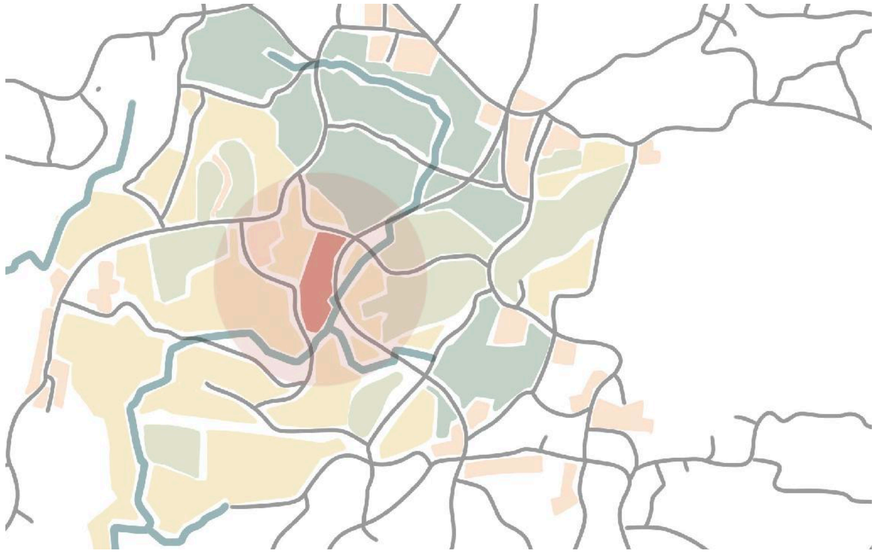
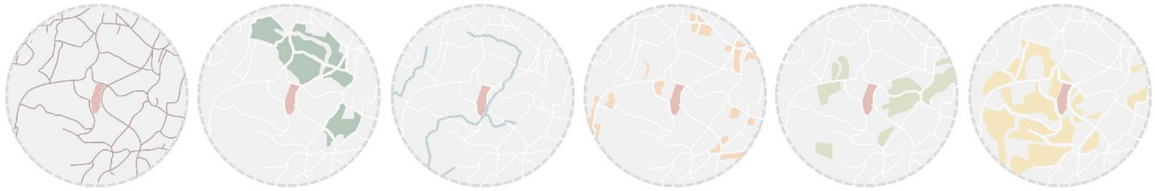


Figure 2.4
Macro-site analysis
Source: Author, 2024

Figure 2.5
Key-map of accessibility
Source: Author, 2024
Figure 2.6
Existing road around the site
Source: Google Earth, accessed in 2024
Figure 2.7
Section and top view of the existing access
Source: Author, 2024



Road

There are several types of roads in this area. The widest road is the provincial road, Sembada Handayani, which connects several districts. There are also collector roads, local roads and neighborhood roads.

Rice fields

In the area around the site there are rice fields owned by the community. Most of the rice fields in this area are rain-fed rice fields that require continuous water flow. This area also considered as wetland agricultural areas.

River

Due to its hilly topography, there are not many rivers that pass through this area. However, it is the headwaters of several major rivers in its southern part, namely the Oya River and the Opak River.

Settlement

The residential areas in this area are relatively scattered in several areas. This is due to the hilly topography of the area and the surrounding environment as a consideration for the community in choosing a place to live.

Plantation

Plantation areas are quite common in this area. In addition to the people's rice fields, plantations are also an option for the community's livelihood.

Forest

Forest land is considered to dominate this area because the area is hilly so trees will be found in abundance for soil reinforcement.

Accessibility Map

Map key



Interprovincial road
Collector road
Local road
Neighborhood road

The growth rate and economy of a region cannot be separated from regional development and infrastructure, especially roads. Roads become infrastructure that serves to distribute various community needs (Nurdin et al, 2013). In this area, there are various types of roads. Based on its function, the roads around the site are divided into four, namely: provincial roads, collector roads, local roads, and neighborhood roads.

1 *Interprovincial road*
2 *Collector road*
3 *Local road*
4 *Neighborhood road*



Sembada Handayani Road | Ngoro-Oro Ombo Road | Sepat Road | Local Pathway



The provincial road, Sembada Handayani, is the widest of all the roads in the area. It has a total width of up to 12 meters and is equipped with a kerb and sign posts on either side of the road. This makes it a major road where large vehicles such as trucks can pass through. The collector road, Ngoro-Oro Ombo, is a smaller road with a total width of 8 meters. This road can two cars can pass - together. This collector road serves as a link between the regional center and the local center. Local roads in this area are relatively small with a width of only 4 meters and serve as a link between local activities. This road also serves to connect between neighborhoods. Neighborhood roads are the smallest roads in the area with two small lanes made of concrete that connect houses.

Site Morphology

Site morphology is an analysis of the physical form in terms of the spatial structure of the area formed due to the relationship between areas (Oliveira, 2016). Morphology can also be interpreted as a physical form that can be seen visually, structurally, and functionally so that it can be used as a shaping element of a city that has characteristics (Slater, 2009). In this case, the morphological analysis of Ngoro-Oro Village shows that over time, the potential of rice fields, plantations, and forests in this area has never changed. This shows that the people in this village have been living with nature, living from nature, and living for nature since a long time ago. This shows that agriculture is part of the life of the people of Ngoro-Oro Village.



2006

In 2006, there was still so much greenery, such as rice fields, plantations and forests. There weren't many settlements and the road infrastructure was lacking.



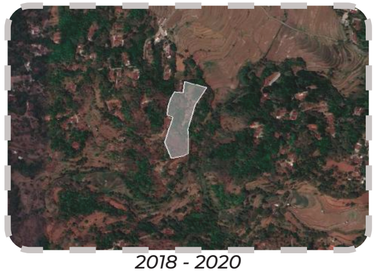
2012 - 2014

Between 2012 and 2014, regional development was already visible. There are new settlements that are starting to emerge. However, overall the area is still dominated by greenery.



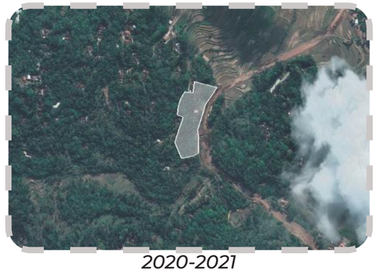
2015 - 2017

Between 2015 and 2017, settlements were built. During this period, it was also observed that the rice fields were not reduced or converted into buildings or other functions.



2018 - 2020

Between 2018 and 2020, many settlements have emerged.



2020-2021

In 2020-2021, it can be seen that the rice fields are still in place and have not been converted. In addition, there is massive road construction in this area to support village development.



2022

The construction of the Sembada Handayani road in this area has been completed and population growth continues to increase. In addition, it is also supported by the infrastructure of public facilities that are starting to stand.

Figure 2.8
Morphological map of the site in years
Source: Google Earth, accessed in 2024

Regulation

Definition

Republic of Indonesia Government Regulation No. 68 Year 1998 about Nature Reserve Area and Nature Conservation Area

Based on the analysis and survey that has been conducted, the agricultural area in Ngoro-Oro is included in the nature reserve area. A nature reserve area is an area with certain characteristics, both on land and in water, which has the main function as an area for preserving the diversity of plants and animals and their ecosystems which also functions as a life support system area.

Zone Regulation

Regional Regulation of Gunungkidul Regency No. 6 Year 2011 about RTRW 2010 - 2030

Zoning regulations for nature reserve areas are prepared with the following provisions:

1. Utilization of space is dominated for activities that support the main function of the area as preserving the diversity of plant and animal species based on their ecosystems.
2. Space utilization for nature tourism activities.
3. Restrictions on natural resource utilization activities.
4. Prohibition of the utilization of biota protected by laws and regulations.
5. Prohibition of activities that can reduce the carrying capacity and capacity of the environment.
6. Prohibition of activities that can change landscapes and ecosystems.

Building Utility Regulation

Regional Regulation of Gunungkidul Regency

Based on Gunungkidul government regulations, the intensity of land use in this area or the Building Coverage or KDB is 60 percent. In addition, the Building Setback or GSB where if the building height is less than 12 meters, the building clearance from the outermost point of the land is 2 meters, while if the building height is more than 12 meters, the building clearance from the outermost point of the land is 3 meters. In addition, the maximum KLB or Floor Area Ratio is 6.4 with a Green Area Ratio or KDH of 40 percent of the land. Regulations regarding building height are also regulated where the maximum building height is 32 meters from the ground floor.

BCR	FAR	GAR
60%	6,4	40%

Building Height	GSB
32m	3m

Site Analysis

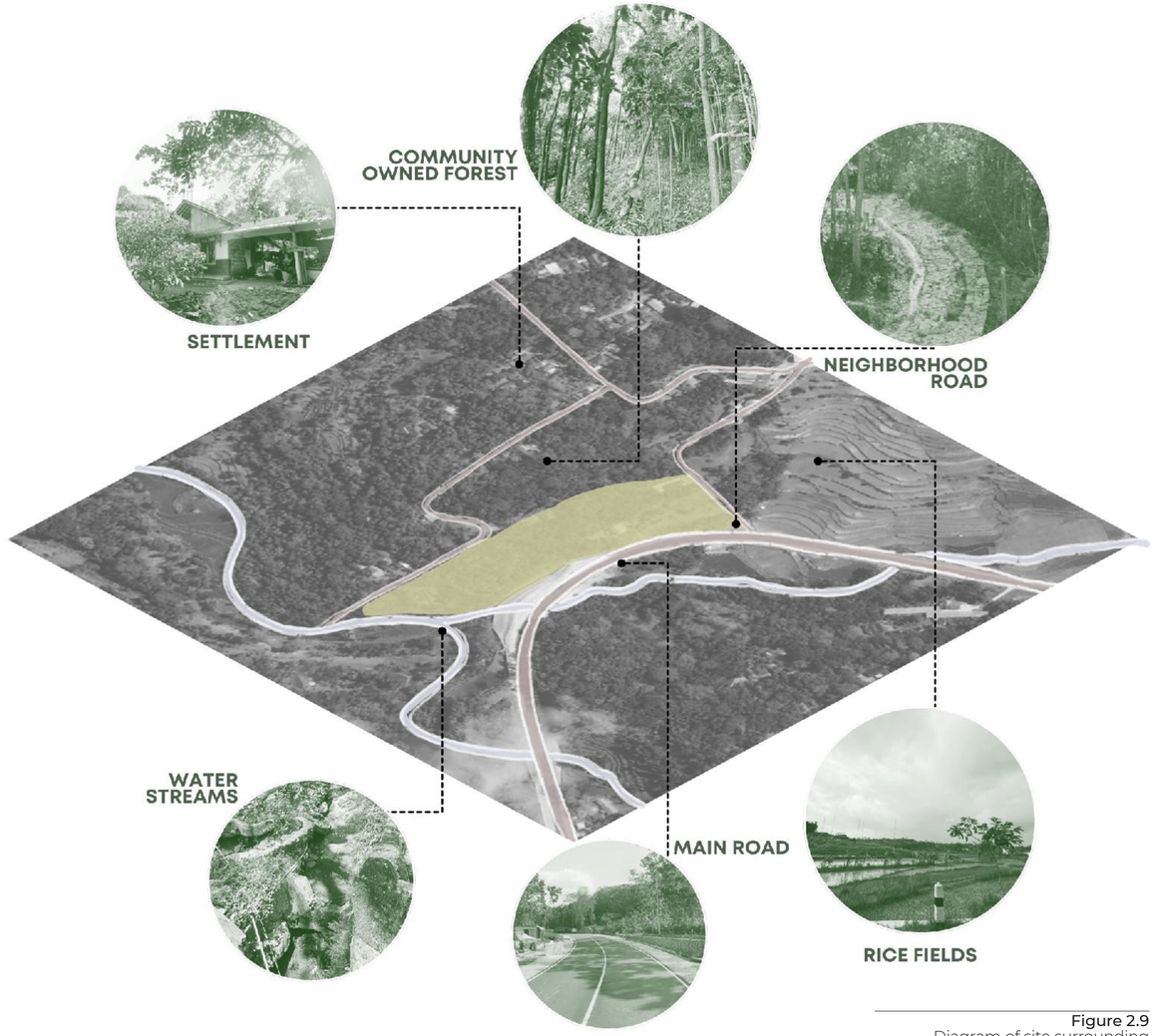


Figure 2.9
Diagram of site surrounding
Source: Author, 2024

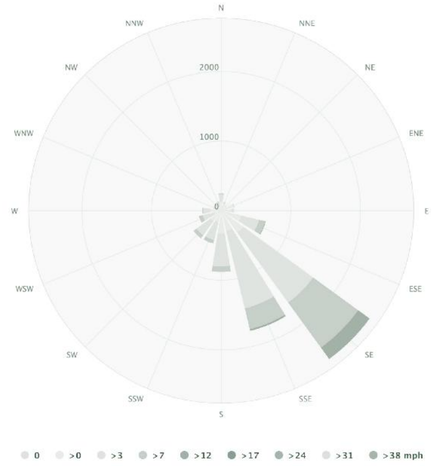
Topography Condition



The Ngoro-Oro area has a hilly topography. These hills are called the Baturagung Mountains. The Baturagung Mountains are a mountain range that spans the eastern side of Bantul Regency and the northern side of Gunungkidul Regency and parts of Wonogiri Regency. This mountain range starts from the western part, Mount Sudimoro (507 meters) then north to Patuk, Gunungkidul and turns to Nglanggeran Volcano then Mount Baturagung (828 meters) to Mount Gajahmungkur (737 meters). Specifically, the topographic conditions in the site area are still relatively flat with the highest elevation of 360 meters above sea level, while the lowest elevation of 350 meters above sea level.

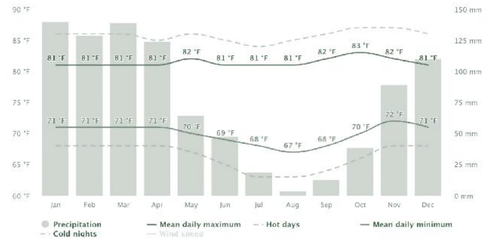
Climatic Condition

Windrose



The wind rose for Ngoro-oro shows how many hours per year the wind blows from the indicated direction. Based on the graph, it can be seen that the strongest winds blow from northwest to southeast and from north-northwest to south-southwest with a relatively low strength of 17 mph.

Humidity and Precipitation



Based on the graph above, it is known that season affects the humidity in the Ngoro-Oro area. The highest humidity occurs from December to April, while the lowest humidity occurs from May to November. The average air temperature in this area is similar to the average Indonesian air temperature with the highest temperature reaching 28.3 degrees Celsius or 83 degrees Fahrenheit, while the lowest temperature is 19 degrees Celsius or 67 degrees Fahrenheit.

Figure 2.10
Topography map of the site
Source: Author, 2024
Figure 2.11
Diagram of windrose
Source: meteoblue.com
Figure 2.12
Diagram of humidity and precipitation
Source: meteoblue.com



Based on site location analysis and discussions with the local community, this site is considered strategic enough to become a permaculture farmstead area. This is due to several important points

1. ***The site is located on the main road, the provincial road.*** This is an important point to consider in the permaculture design strategies. It is because the wide road facilitates access for large vehicles in supplying commodities. In addition, adequate access will make it easier for everyone to come to the building, and good access will make it easier in the event of an emergency.
2. ***The site is located close to the rice fields.*** It offers an enriching experience, deeply rooted in the local culture and environment. This closeness fosters a strong sense of community and an appreciation for the agricultural traditions that sustain the region. In addition, this land is already fertile without any further tillage.v
3. ***Incorporating the existing community forest.*** The landscape design enhances the ecological value of the area by preserving existing vegetation. It allows for a seamless integration of the built environment with nature.

SWOT Analysis of Site Location

S

1. Located near the water streams represents the existence of two ecosystems.
2. Strategic location from the residential area, rice fields, and the main interprovincial road.

W

1. Contoured sites create challenges for access abd connectivity within the site.
2. The natural contours can restrict the size and layout of the building.

O

1. Contoured sites offer picturesque views of the surrounding and visually attractive from far away.
2. The site location has some possibilities of extension in the long term.

T

1. Contoured site increase the risk of landslide or land erosion.
2. The location at the interprovincial road can cause noise pollution.

Figure 2.13
Existing condition of the site
Source: Google Earth, accessed in 2024
Figure 2.14
Diagram of SWOT analysis of the site
Source: Author, 2024

STUDY OF BUILDING TYPOLOGY

Farmstead Building

Introduction

A farmstead is a farm area consisting of a farmhouse and farm buildings where some farms can be located in areas far from the main steading (English Heritage and Kent Downs AONB, 2012). In addition, according to the Merriam-Webster Dictionary, farmstead is the building and surrounding agricultural area. Farmstead buildings began to develop in the 19th century in England. People at that time had market gardening, nurseries, orchards, and even storehouses.

Farmstead requirements

In the context of civilization, the existence of farmsteads has emerged since the 19th century, but until now the function of farmsteads is still applicable and has even evolved with the times. It is also related to several aspects that need to be considered in designing farmsteads over time, namely:

1. A proper access to and from the building.
2. The size of the room and the circulation in it according to the function of each room.
3. Having routes and paths with adequate access.
4. Classifying rooms inside and outside the farm area, such as areas for storing and sorting crops, plantations, ponds, and livestock pens.

Farmstead characteristics

Housing

The arrangement of owner-occupied housing buildings in this farm area is often separated from the farm area. In terms of facing direction, housing buildings often face directly to the farm area. Apart from housing for "owners", there are living spaces provided for workers. Usually, workers' living spaces are spread across the plantation area.

Crop storage and processing

There is a barn that is used to store, sort and process the harvest. The layout of this room is usually separate from the farm or even located at the end of the area.

Horses and cattle

The presence of livestock in agricultural areas acts as a close cycle of the farmstead. One example of its use in horse farms is straw which is agricultural waste used as bedding horse bedding. Usually these cattle buildings are characterized by open-fronted sheds that face the sun. Openings in the cattle area usually face towards the plantation or large yard.

General movement and storage

In livestock areas, the presence of storage is necessary for the operation of the farmstead. In addition, it is also important to have a space to park transportation equipment to move large quantities of crops.



Farmstead typical plans

Loose courtyard plans

Detached buildings facing one or more sides of a cow yard are featured in loose courtyard layouts, together with or without straggles of nearby farm buildings. Typical characteristics include the following:

1. Structures with few external entrances that face the garden.
2. An L-shaped structure is occasionally formed when subsequent expansions, such as cow sheds, are joined to older barns.
3. Stables and cartsheds are examples of ancillary structures that are placed distant from the yard and face roads and railroads.

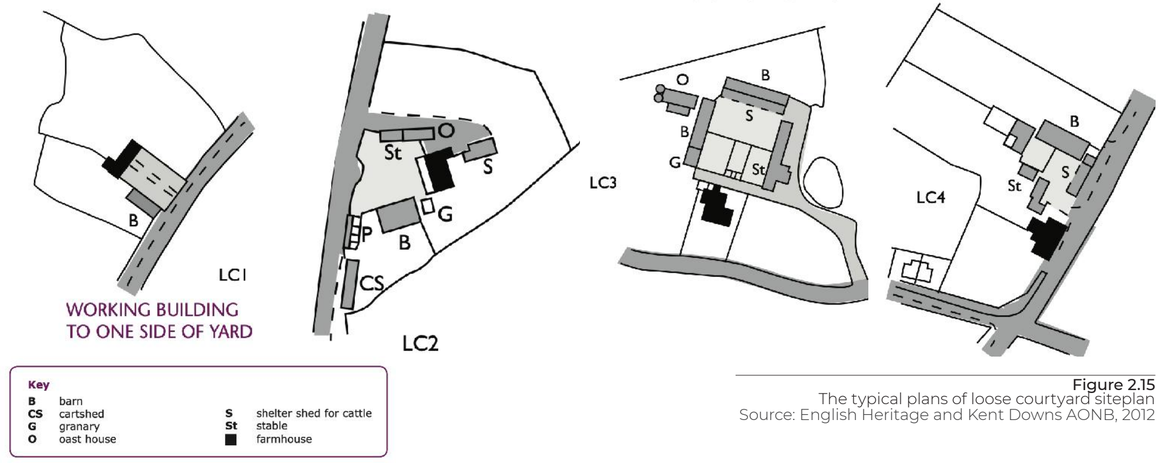


Figure 2.15
The typical plans of loose courtyard siteplan
Source: English Heritage and Kent Downs AONB, 2012

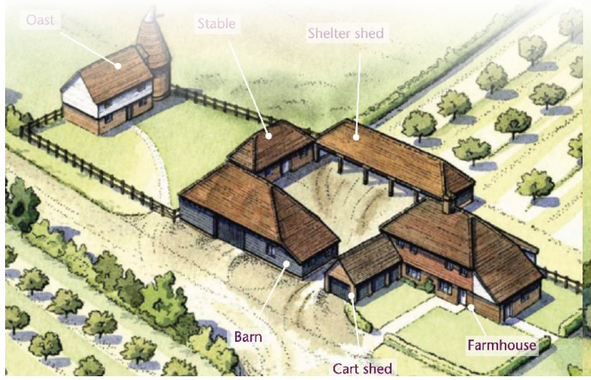


Figure 2.16
Loose courtyard with working buildings to 3 sides of the yard
Source: English Heritage and Kent Downs AONB, 2012

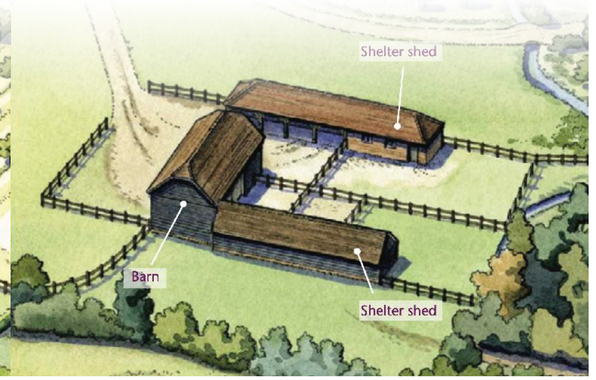


Figure 2.17
Loose courtyard with L-shaped barn and shelter shed, and additional shelter shed to third side of
Source: English Heritage and Kent Downs AONB, 2012

Regular courtyard plans

These layouts are made up of connected structures centred on one or more yards. Usually, they are arranged with straight walls and borders in a regular manner. Regular courtyard plans, in contrast to other farmhouse designs, frequently employ materials such as Welsh slate, suggesting a higher level of regularity in construction.

1. Usually these buildings are shaped like an L or U where the barn, cattle, and stable functions are located in the same building.
2. Buildings with a regular courtyard plan have several openings in the exterior walls. In addition, the "house" is separated from the main area and faces the farm.

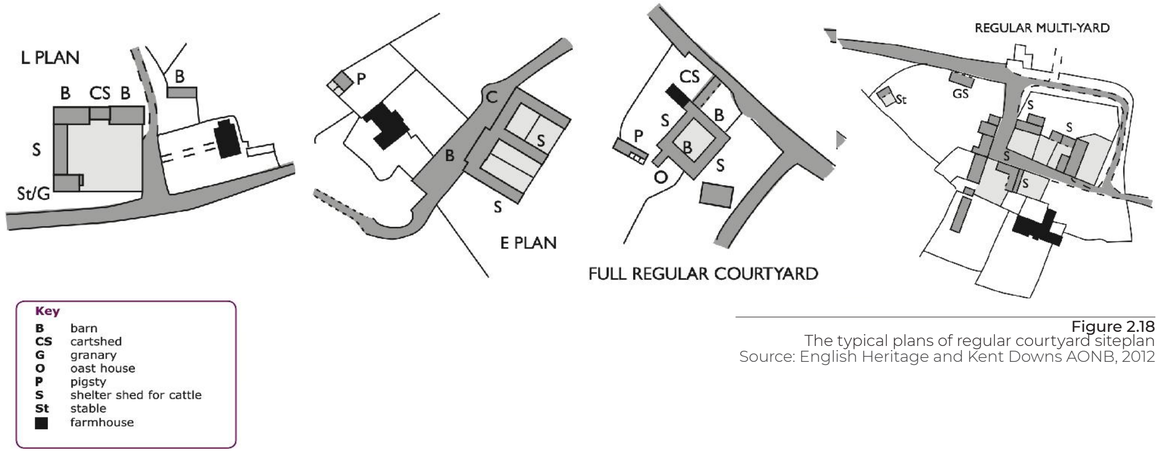


Figure 2.18
The typical plans of regular courtyard siteplan
Source: English Heritage and Kent Downs AONB, 2012



Figure 2.19
Regular courtyard "U" plan
Source: English Heritage and Kent Downs AONB, 2012



Figure 2.20
Regular multi-yard
Source: English Heritage and Kent Downs AONB, 2012

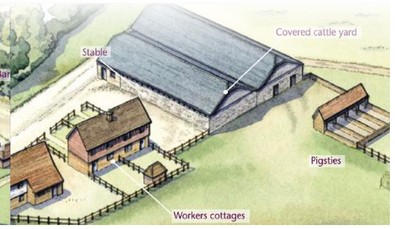


Figure 2.21
Regular covered yard as used on some farmsteads from the 1860s
Source: English Heritage and Kent Downs AONB, 2012

Dispersed courtyard plans

The dispersed layout of farmsteads is often the result of a lack of careful planning. One characteristic is the small-scale plan consisting of groups of "houses" and farms to large groups with several large yards. The design of these areas is often divided by access or road routes that result in the public having access to the farm. There are several variations of dispersed courtyard plans, namely:

1. Dispersed clusters, which are groups of buildings designed to be spread out with irregular boundaries.
2. Dispersed multi-yards, which consist of several courtyards spread out over a long distance.
3. Driftways, which are areas arranged along driftways so that they can have several yards, short rows of linked buildings, and even free-standing buildings.

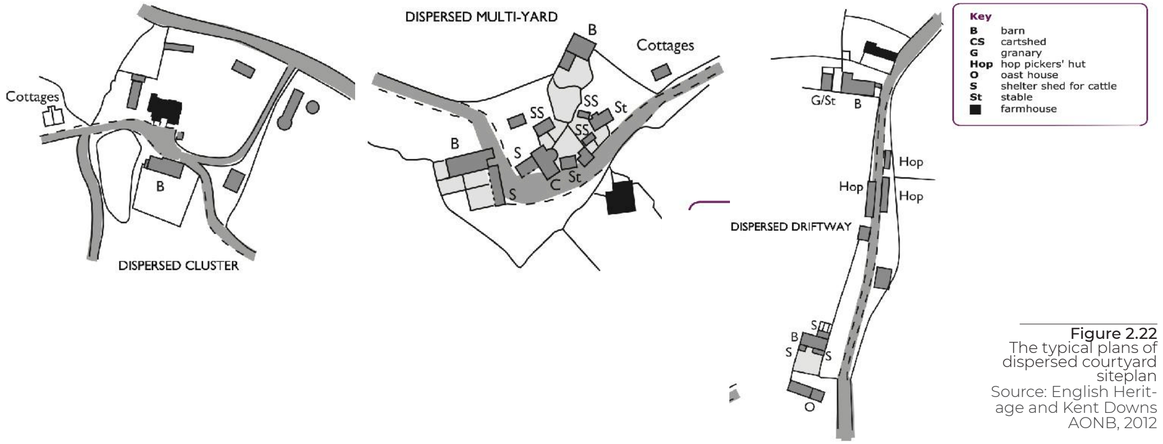


Figure 2.22
The typical plans of dispersed courtyard siteplan
Source: English Heritage and Kent Downs AONB, 2012

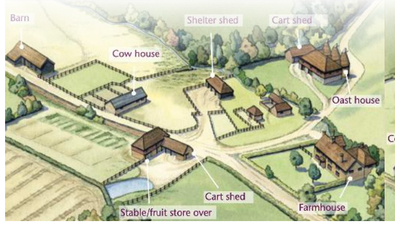


Figure 2.23
Dispersed courtyard "U" plan
Source: English Heritage and Kent Downs AONB, 2012

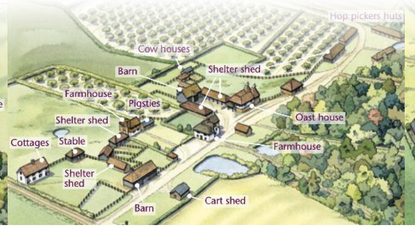


Figure 2.24
Dispersed multi-yard
Source: English Heritage and Kent Downs AONB, 2012

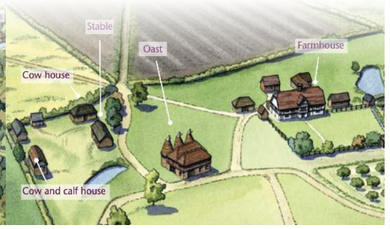


Figure 2.25
Dispersed covered yard as used on some farmsteads from the 1860s
Source: English Heritage and Kent Downs AONB, 2012

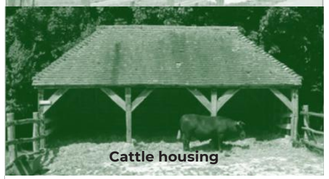
Farmstead buildings

In general, farmstead buildings have several main functions, namely as living areas for farm families, workers, storage and processing of crops, storage of vehicles and agricultural equipment, and livestock. In addition, the garden area is usually developed as a separate area and separated by a fence.

No	Building	Typical Features
1	Barn	The largest building in the farmstead.
		It has an overhanging terrace as a common feature.
		There is usually a livestock enclosure at the side or end of the barn which both have their own access to the outside courtyard, but no direct access between them.
		It can serve as storage for crops in one season and storage for livestock in another.
3	Cart shed	Some of these buildings may have first-floor granaries combined with cart sheds, with access via external steps.
		They have open fronts, sometimes open at both ends, with a few bays enclosed for storing small tools or implements.
		These buildings are usually situated close to stables and roads, allowing easy access to fields.
4	Cattle housing	The cattle housing as the extension of existing barns or built separately in individual yard areas.
		Consists of single-storey and located in the area of livestock building.
		The provision of ventilation, air ducts and ridge ventilation.
		The provision of stalling and feeding arrangements of the animal.
		There is furniture inside the building in the form of shelves for storing animal food.
		There is a door opening at the end or back of the building for access to feed the livestock.
5	Granary	Granaries are used to store grain safely after it has been processed.
		Granaries can be found in various locations, including within the farmhouse, as standalone buildings raised on staddle stones or brick arches, or on upper floors of other buildings like barns or cart sheds.
		Granaries are designed to protect grain from theft, dampness, and rodents, ensuring it remains in good condition for later use.
		The building has ventilated openings (louvers, shutters, sliding vents, or grilles)
		Close boarded walls inside and has a strong load-bearing structure floor construction.
		There is a staircase if the granaries are located on the upper floor.
6	Back kitchen and dairies	Detached buildings located close to the “owner” houses.
		Kitchen is used for brewing, baking, and other purposes.
		The door opening is usually wide.
		The provision of shelves to store the dairy product.
		Utilization of brick or stone flooring to keep the interior cool.
7	Dovecotes	An additional feature on the roof, a hole for pigeons.













Agriculture Post-Harvesting

Introduction

Based on the research conducted, post-harvesting activities are strategic activities that require the role and participation of all actors involved, even the community (Mutiarawati, 2009). This handling is one of the efforts to support national food security. There are several benefits resulting from post-harvesting, namely:

1. There is more food that can be consumed
2. Post-harvesting is relatively cheaper than increasing production, which requires additional inputs and costs money.
3. There is less risk of post-harvesting failure than increased production.
4. There are energy savings compared to increasing production which requires a lot of energy.
5. Improves food nutrition. Good post-harvest handling can prevent food from losing nutrients, leading to improved nutrition for the community.
6. Reducing waste and environmental pollution.

Harvesting Procedure

Harvesting is the final work of crop cultivation, and the beginning of post-harvest work, which involves preparing for storage and marketing. Harvesting can be defined as collecting commodities from the planting field, at the right level of maturity, with minimal damage, done as quickly as possible and at a “low” cost. To get a good harvest, 2 main things need to be considered in harvesting, namely:

1. Determining the right harvest time.
   a. Visual methods: plant changes in leaves, fruit color.
   b. Physical methods: fruit density (soft or hard), ease of picking.
   c. Computational method: calculating the age of the plant from the beginning of planting or from the time of flowering.
   d. Chemical methods: measurement of the analysis of the content of substances or compounds that exist
2. Performing good harvest handling, namely by reducing the possibility of damage that occurs. suppress damage that can occur. In an agricultural business, harvesting methods need to be adapted to the time required (as short as possible) and at a low cost.

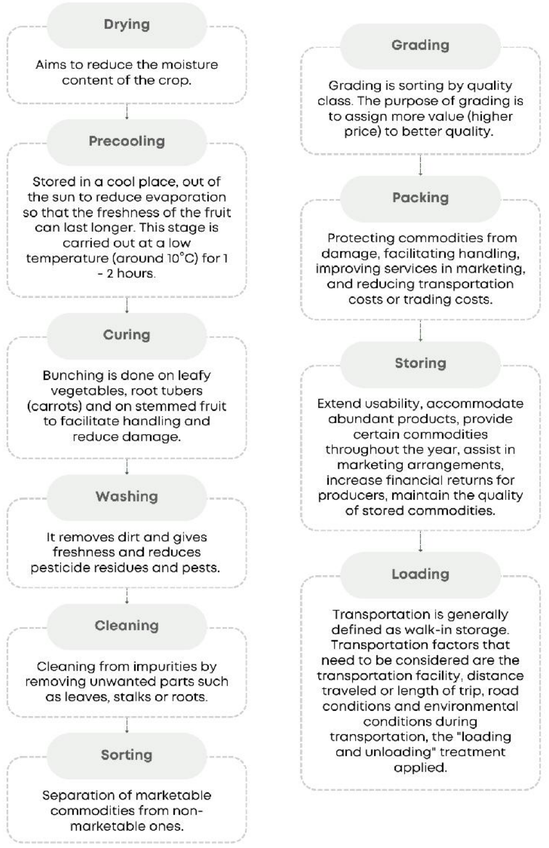


Table 2.1
Farmstead building function and the characteristics
Source: English Heritage and Kent Downs AONB, 2012

Figure 2.26
Typical feature of farmstead building
Source: English Heritage and Kent Downs AONB, 2012

Figure 2.27
The process after harvesting or post-harvesting phase for local-tropical climate
Source: Mutiarawati, 2009

STUDY OF DESIGN APPROACH

Permaculture as an Approach

Definition of Permaculture

Permaculture is the management of farming and animal husbandry in a sustainable improvement of land quality and supports cooperation with local culture and environment (McKenzie & Lemos, n.d). According to Mollison (2002), permaculture is the conscious design and maintenance of productive agricultural ecosystems that have the diversity, stability, and resilience of natural ecosystems. The goal of permaculture is to maintain harmony between the environment and humans.

The word permaculture has two meanings, permanent agriculture and permanent culture. Permanent agriculture is the processing and management of agriculture to improve the quality of land and provide sustainable yields and income. Meanwhile, cultural permanence is a way to preserve, support, and cooperate with the surrounding culture and environment in order to grow together in the same period of time (Imanda et a.l, 2019). Thus, it can be concluded that permaculture is an agricultural management principle that considers the surrounding culture and environment to increase land value and sustainable income.

Permaculture Ethics

Permaculture is practiced based on three ethical values, namely earth care, people care, and fair share.

1. Earth care

The application of permaculture principles is done with methods that minimize negative impacts on the earth and living creatures

2. People care

It emphasizes the basic needs of human beings as individuals that must be met, such as food, shelter, education, work, and human relationships. It then continues to realize and empower the power of community.

3. Fair share

This ethic deals with the concept of sharing living space with all living things on earth, as well as for future generations. The value of this ethic is that the existence of inequality among the world's people requires us to limit our consumption of natural resources.

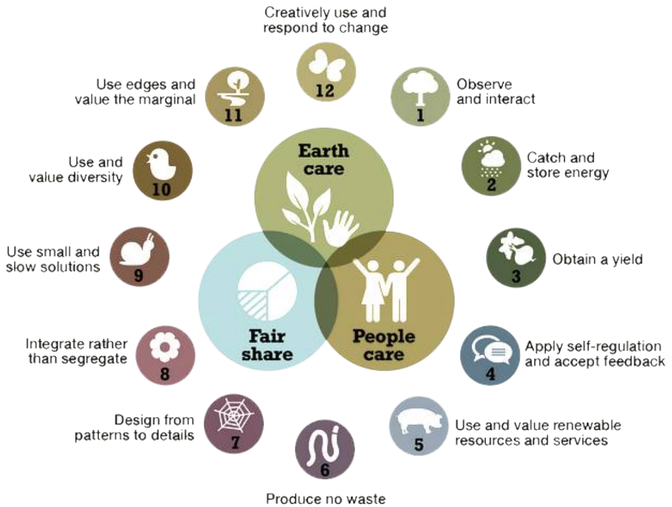


Figure 2.28
Three etchis and twelve pricipals of permaculture
Source: barefootsolution.com

Permaculture Principals

1 Observe and interact
Observation is a key step of permaculture. It is needed to develop an essential and well-functioning permaculture design.

2 Catch and store energy
This principle emphasizes the importance of capturing and storing energy in the permaculture cycle. The energy stored is alternative and sustainable energy, such as wind, sunlight, and motion. The energy can then be processed for primary or backup energy use in the operation cycle.

3 Obtain a yield
In permaculture design, there are elements that can provide a measurable harvest. The harvest can be food, fuel, beauty, peace of mind, fragrance, and so on.

4 Apply self-regulation and accept feedback
This principle emphasizes limiting actions that are inappropriate and violate permaculture manners so that feedback is needed in its application.

5 Use value and renewable energy resources
The permaculture principle aims to utilize renewable resources in its planning.

6 Produce no waste
This principle aims to reduce unused output or waste. This can be done by maximizing waste to be reused or even processed into useful products with higher value.

7 Design from patterns to details
The design process starts with understanding the local pattern as a big picture which is then detailed in the planning of spaces.

8 Integrate rather than segregate
In permaculture design, each element is integrated where the needs of one element are complemented by another to create an interrelated system.

9 Use small and slow solutions
This principle emphasizes the application of permaculture on a local scale rather than a global or national scale. This is because the local scale will be more adaptable to local needs. In addition, gradual changes are easier to observe and understand.

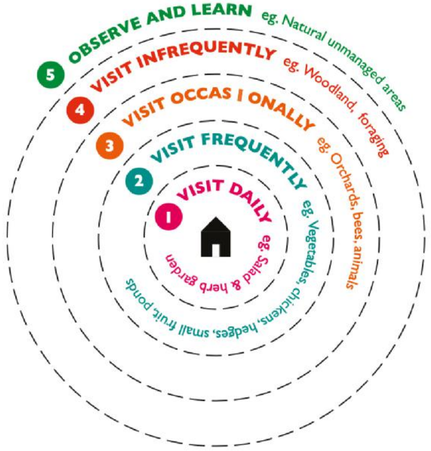
10 Use and value diversity
This principle emphasizes diversity by considering varieties of plants, animals, as well as diverse activities.

11 Use edges and values the marginal
This principle emphasizes that areas located between two major ecosystems are often more productive and species-rich. This will increase the diversity and productivity of the site.

12 Creatively use and respond to change
This principle emphasizes the importance of planning with change in mind. Anticipating negative changes can be done by making a positive impact.

Permaculture Zone





Based on the research conducted, it was found that the function of each permaculture zone is determined based on three design elements, namely vegetation, animals, and buildings. The natural pattern of the environment in a location is the main reference in designing the land and the appropriate design elements. Some of the natural patterns are topography, soils, hydrography, climatic factors and orientation, vegetation, and wildlife (Salleh et al, 2018). According to Mollison (1998), permaculture planning consists of five zone sections, namely

1. Zone 0, home

In the form of a building that serves as the main activity place for users. The structure of the building comes from environmentally friendly materials.

2. Zone 1, kitchen vegetables, herbs, and small fruit trees

This zone is an intensively managed zone. Elements located in this zone include those that require the most attention, such as kitchen gardens, herbs, spices, greenhouses, and others.

3. Zone 2, large fruit trees, perennial herbs, and flowering plants.

This area accommodates some elements that are larger, a little more frequently used, and still require considerable attention, such as vegetables that have a long growing season, small fruit trees, poultry houses, aquaculture ponds, rainwater harvesting, and others.

4. Zone 3, fruit and nut tree, vegetable, and animal production

This zone is a commercial farming or plantation zone where the produce can be sold. Elements located in this zone include all things that rarely require attention, such as crops, large fruit trees, large livestock (cattle, sheep), water storage dams.

5. Zone 4, timber, fibre, and animal broa acre systems.

This zone is the border area between forest and wildlife, but can still be used. This zone functions as an agroforestry/food forest zone where the main use is for wild food gathering, timber production. Some of the elements that comprise this zone are timber crops for harvesting, shade grown commodity crops (coffee, cacao), cultivation of wild mushrooms, endemic plants, and others.

6. Zone 5, wild or natural environments

This zone is a natural zone that is not controlled and free from human intervention. This zone is a place where nature is still in its pure form so that it can be used as observation material to find out about natural cycles.

Figure 2.29
Permaculture zoning based on the function
Source: santacruzpermaculture.com

Figure 2.30
Permaculture zoning based on the intensity
Source: beulahacresagroforest.com

The relationship between design elements and permaculture zone

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Location or size	Near to the building or 1/4 acre	1 acre	4 to 20 acre	Any size	Any size
Land use intensity	High intensity, frequently visited	Semi-intensely cultivated	Occasionally visited	Minimal care	Unmanaged
Accessibility	Very good	Good	Good	Poor	Very poor
Design element	Kitchen garden, small trees, rainwater tank	Food production	Large fruit trees, livestock with forage system	Food forest, livestock with self forage system	Timber trees, inspiration, meditation
Energy efficiency	Low energy usage	Low energy usage	Intermediate energy usage	High energy usage	High energy usage

Table 2.2
Character of permaculture zones and its relationship with design elements
Source: Salleh et al., 2018

Permaculture design and regional values were significantly correlated. In order to construct a permaculture system that can be incorporated into the surrounding rural community, ecosystem-based design must take local knowledge into account, in keeping with the ethical values and design principles of permaculture. This is based on the requirement that permaculture design consider the way of life and cultural practices of rural people, as specific to this project, rather than concentrating just on the ecological or natural layout (Salleh et al., 2018).

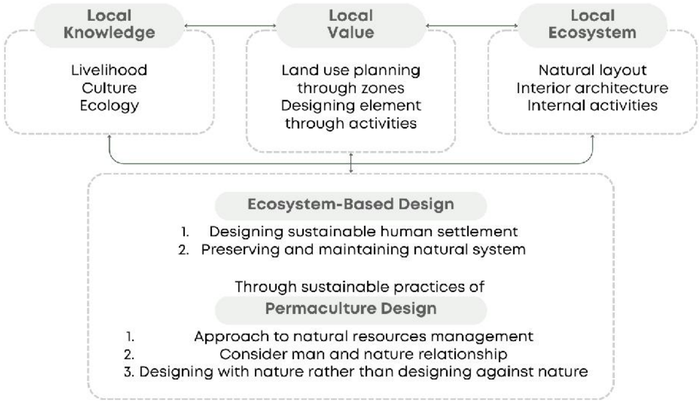


Figure 2.31
Relationship between permaculture and local knowledge, value and ecosystem in planning and designing house compound for ecosystem-based design project.
Source: Salleh et al., 2018

Permaculture zoning map

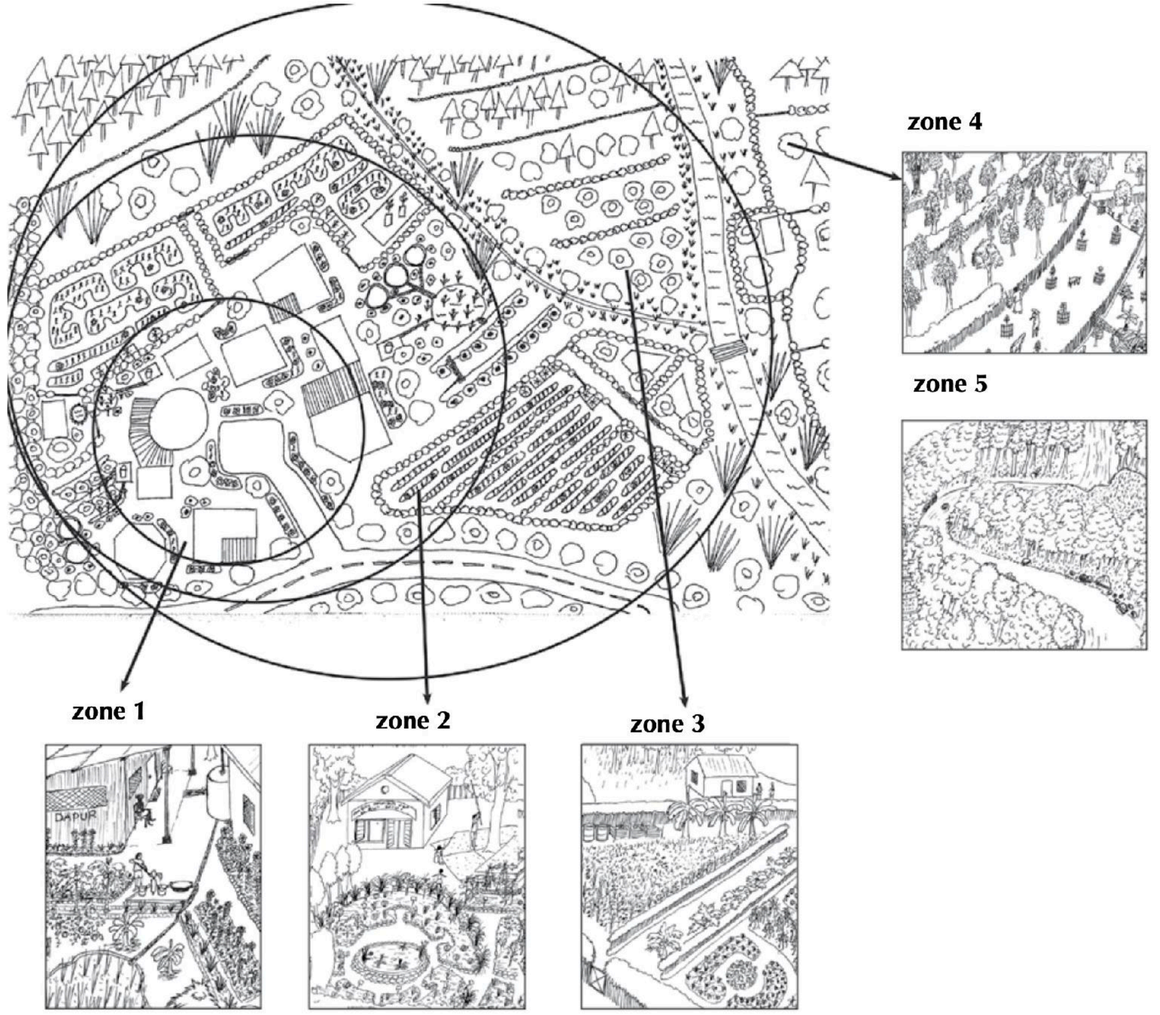


Figure 2.32
Permaculture zoning map scheme
Source: McKenzie & Lemos, n.d

The Concept of Guilds

The multiple crop design or polyculture method is based on interactions between species rather than their composition. Permaculture design should combine mutually beneficial species communities, using the concept of species guilds and cooperative interactions between species. Polyculture is a way of planting by utilizing existing land to plant various types of plants that are suitable for planting more than one type of plant on one land and at the same time (Akhmad, 2021).

A guild, is a grouping of several plant species centered around a central point and harmoniously arranged (Mollison, 2002). The arrangement of plant groupings has a mutually beneficial relationship in terms of plant health, plant management, and avoiding environmental harm. Some of the reasons for the importance of planning guilds in permaculture concepts are:

1 To benefit as selected species by

1. Reducing root competition.
2. Pest control.
   - by giving anti-feedants (bitter or unappealing browsing or chemical deterrents)
   - by eliminating root parasites or predators
   - by providing a home for predators, such as robber-flies and predatory wasps, which are hosted by nearly all small-flowered plants.
3. Creating open soil surface conditionsor mulch.
4. Providing free nutrients.
   - Woody or herbaceous legumes nourish related trees, encourage soil microbes or fungus, and fix nitrogen or other necessary nutrients through root associations. Some vegetation may be chopped to provide rich mulch between agricultural rows or beneath trees.
5. Providing physical shelter from frost, sunburn, or wind drying effects.
   - There are a variety of plants that can withstand strong winds at the same height or even higher. These plants can act as canopy cover, block wind, and provide mulch.

2 To assist for the gathering

- One type is kitchen plants. Grouping these types of kitchen plants can make it easier for residents to harvest for their daily needs.

3 Specific animal associates of a guild

1. Ground foragers to remove any fruit that has fallen and is home to fruit flies or other insect larvae. When fruit falls and begins to decay, foragers can be let loose in the garden, where they can deposit manures and consume rejected fruit.
2. Insectivores by sprinkling a small number of herbaceous and blooming shrubs. For insectivorous birds, all of them give insects and nectar as food.
3. Two huge lizards and a flock of ducks can regulate mollusk populations.
4. Dogs kept as guard dogs in orchards and fed there provide a deterrent against foxes preying on the fowls that browse in the orchard.
5. Kites flown above a large grain crop as light model planes prevent flocks of birds that might otherwise prey on the crop.

Guild planting scheme

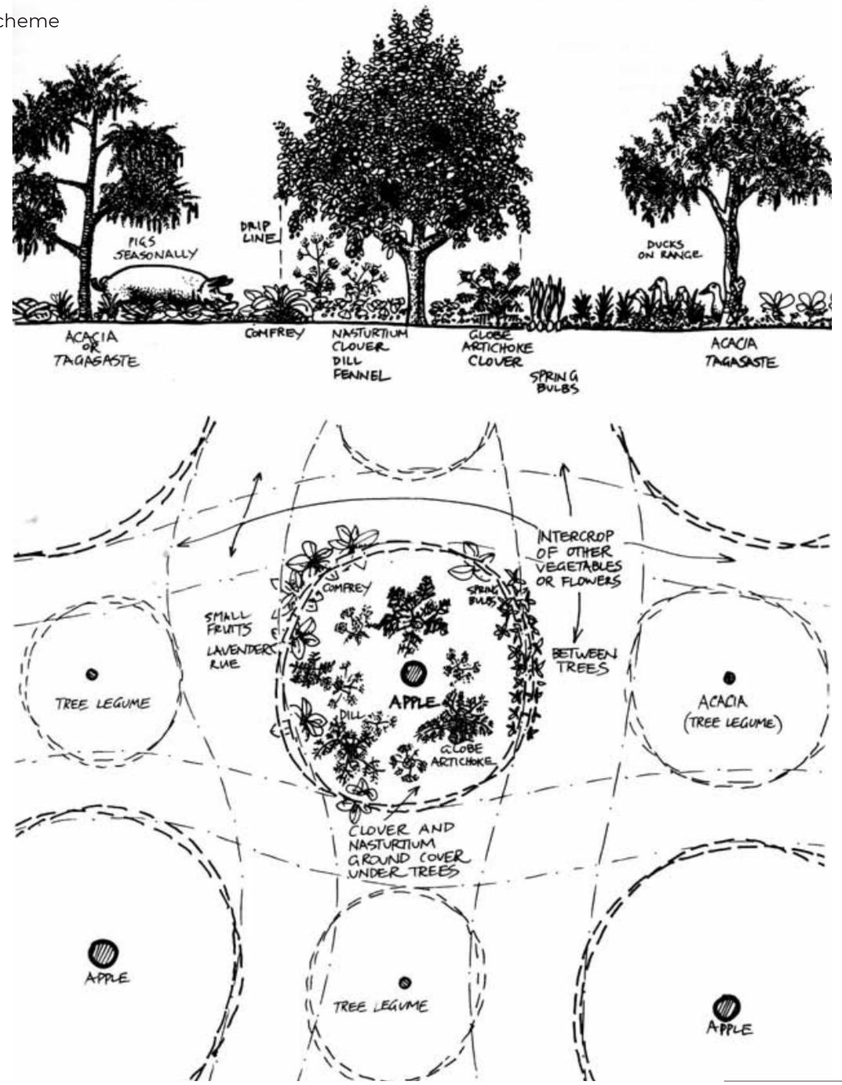


Figure 2.33
A guild assembly for an idealised apple orchard
Source: Mollison, 2002

Companion Planting

Growing a group of complementary plants next to one another allows one plant to take advantage of the traits of the other (McKay, 2022). This practice is known as companion planting. Pollination, pest management, space optimisation, creating home for beneficial insects, and raising crop yield are some of these advantages.

Figure 2.34
Companion planting list of vegetables vegetation
Source: McKay, 2022

Plant	Good companions	Bad companions
Asparagus	Basil, Marigold, Parsley, Dill, Tomato, Nasturtium	Garlic, Potato, Onions
Beans	Potato, Marigold, Cucumbers, Squash, Summer Savory, Corn	Tomato, Pepper, Chives, Garlic, Onions
Beets	Mint, Garlic, Onions, Leeks, Scallion, Broccoli, Cauliflower, Brussels sprouts, Radish, Kale, Cabbage	Pole beans
Broccoli	Dill, Mint, Rosemary	Strawberry, Mustard, Tomato, Oregano
Cabbage	Onions, Dill, Oregano, Sage, Mint, Chamomille, Nasturtium, Clover, Beets	Strawberry, Tomato, Peppers, Eggplant
Corn	Cucumber, Beans, Melons, Parsley, Squash, Marigold, Pumpkin	Tomato
Cucumber	Radish, Lettuce, Onions, Dill, Nasturtium, Corn, Beans	Potato, Sage
Eggplant	Catnip, Spinach, Peppers, Nasturtium, Marigold, Sunflower, Bush beans, Thyme, Tarragon, Tomato, Potato	Fennel
Lettuce	Radish, Dill, Cucumber, Carrot, Strawberry	Beans, Beets, Cabbage, Parsley
Peppers	Beans, Tomato, Onions, Geranium, Petunia	Fennel
Potato	Eggplant, Beans, Cabbage, Peas, Sage, Corn, Nasturtium, Catnip, Coriander	Cucumber, Tomato, Pumpkin, Spinach, Fennel, Onions, Squash, Fennel, Raspberries
Pumpkin	Melons, Corn, Dill, Radish, Beans, Oregano	Potato
Spinach	Cauliflower, Strawberry, Radish, Eggplant	Potato
Squash	Onion, Corn, Mint, Nasturtium, Dill, Peas, Beans, Radish	Potato
Tomato	Carrot, Parsley, Basil, Marigold, Garlic,Asparagus, Collards	Corn, Cabbage, Broccoli, Brussels sprouts, Potato
Turnip	Radish, Cauliflower, Beans, Lettuce, Spinach, Broccoli, Cabbage, Peas, Tomato, Brussels sprouts, Mint	Carrot, Parsley and other root crops
Zucchini	Nasturtium, Corn, Beans	Potato

Keyhole Arrangement

One type of garden that is affordable and can be built with local materials in the area is the keyhole garden. A raised bed with a composting area in the centre gives this garden its characteristic keyhole shape. These raised beds are usually circular with a path leading to the central composting unit. A keyhole garden consists of several layers, such as soil, compost, dry leaves, green waste and a moisture retention layer. As well as providing a place to store the composting material, the central composting unit also serves as a central watering point, allowing the compost to release nutrients into the soil and provide water at all levels (Maiava, 2018, as cited in Allen, 2018)

Based on the research conducted by Raleigh in 2010, the use of keyhole gardens can be used successfully where it use space and labor more efficiently. This type of garden also reaching the initial goal to provide more low cost, naturally grown, healthy produce to the immedate area (Raleigh, 2010). Pahpute in 2017, stated that keyhole gardens provide a viable option for growing produce year-round because of the locally available materials, easy construction and maintenance while capturing rainwater and grey water. The application of keyhole garden also can be used in areas with high variablity of precipitation (Pahpute et al., 2017, as cited in Allen, 2018)

Some of the example above stated that keyhole gardens can make farming more productiove in a variety of climates, and that utilizing these gardens can provide communities with essential fresh product (Allen, 2018).



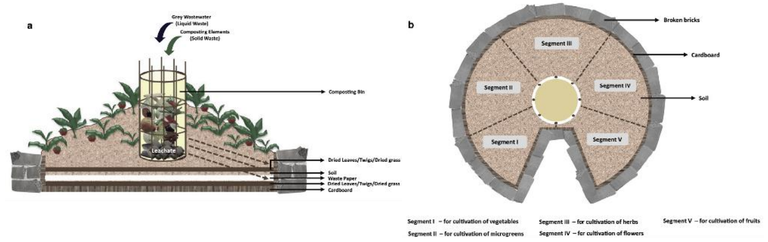


Figure 2.35
Raised beds of keyhole garden
Source: Allen, 2018
Figure 2.36
Cross section of keyhole garden
Source: Mohan et al., 2020
Figure 2.37
Top view of keyhole garden
Source: Mohan et al., 2020

Mandala Garden



One kind of gardening where the plants are arranged in concentric circles is the mandala garden. Ecologically and functionally, this style of garden design has certain benefits as well. This design's circular form makes it an excellent composition for compacted soil, allowing plants to grow in less area while yet retaining water and capturing runoff. The Mandala garden's form also reduces the amount of time needed for watering and facilitates weeding. Psychologically, the idea behind this design is to promote wandering and meditation when person stands in the centre of those encircling gardens, as the design is link art and nature (Leah & Boeckmann, 2024).

Based on the research that has been done, mandala garden enables the transformation of the environment, in addition to the diversified and concentrated production of food and the harmonization and bautification of the landscape (Almeida and Favetta, 2012, in Maciel, 2022).

The practice of mandala garden is to plant several types of vegetation or mixed cropping to improve plant diversity and include natural pest repellents. The idea is suitable with the application of companion planting, where some crops are grown together, they will improve each other's health and yield (Kuria, 2020).



Figure 2.38
A bird's eye view of mandala garden
Source: hosachiguru.com
Figure 2.39
The example of mandala garden layout
Source: Leah & Boeckmann, 2024

Permaculture “Activities”

Planting and Gardening

Planting and gardening activities in the context of permaculture are integral practices that emphasize the creation of sustainable, self-sufficient ecosystems (Mollison & Holmgren, 1978). In order to promote biodiversity, soil health, and resource efficiency, these activities entail the thoughtful placement and nurturing of plants that coexist peacefully with the environment (Ferguson & Lovell, 2014). Gardening in permaculture aims to regenerate the land, improve ecological balance, and promote resilience in both human and natural ecosystems, in addition to producing food (Ferguson & Lovell, 2014).





Organic Waste Processing

Organic waste processing in the context of permaculture is a crucial activity aimed at closing the loop in sustainable systems by converting waste into valuable resources (Mollison & Holmgren, 1978). Composting, vermiculture, and anaerobic digestion are commonly used in this process to convert organic waste, such as food scraps and plant residues, into nutrient-rich compost or biogas (Ferguson & Lovell, 2014). By decreasing waste and improving soil fertility and microbial activity, these techniques support healthy plant development without requiring the use of chemical fertilisers (Rhodes, 2012).

Figure 2.40
Gardening activity
Source: www.thrive.org.uk
Figure 2.41
Composting process
Source: rejogja.republika.co.id



Workshop and Discussion

Workshop and discussion activities in the context of permaculture are essential for knowledge sharing, community building, and skill development (Mollison & Holmgren, 1978). These activities provide participants with hands-on learning experiences, enabling them to apply permaculture principles in practical settings, such as designing sustainable gardens or managing natural resources (Ferguson & Lovell, 2014).

Lodging

Lodging activities in the context of permaculture are designed to align with the principles of sustainability, ecological harmony, and resource efficiency (Holmgren, 2002). These accommodations not only provide a sustainable living experience but also serve as educational models, demonstrating permaculture principles in practice to visitors and residents alike (Rhodes, 2012). Research supports the effectiveness of such lodging arrangements in enhancing the sustainability and resilience of permaculture sites, while also fostering a deeper connection between humans and the environment (Ferguson & Lovell, 2014).

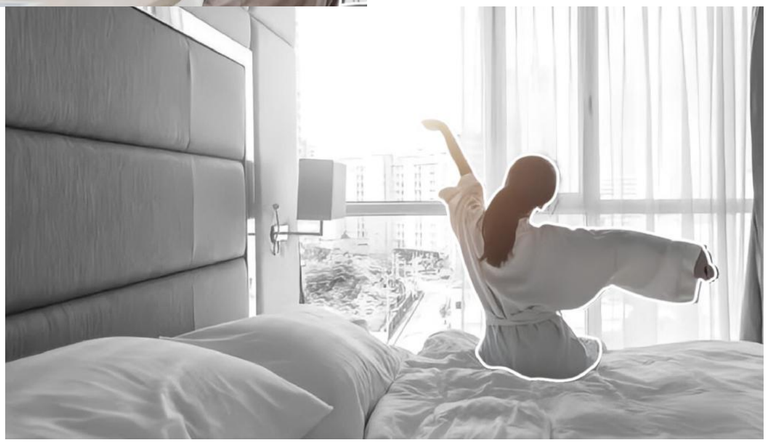


Figure 2.42
Discussion activity

Figure 2.43
Lodging



Stores and Shopping

In the context of permaculture, stuff and grocery shopping activities are redefined to emphasize local, sustainable, and ethical consumption practices (Holmgren, 2002). Permaculture encourages sourcing goods and groceries from local producers and farmers' markets, reducing the carbon footprint associated with transportation and supporting the local economy (Mollison & Holmgren, 1978). The focus is on purchasing organic, seasonal, and minimally processed foods that align with permaculture's principles of ecological health and sustainability (Rhodes, 2012).

Cooking

Cooking activities in the context of permaculture focus on sustainability, resource efficiency, and the use of locally sourced, seasonal ingredients (Holmgren, 2002). Ingredients are often harvested directly from permaculture gardens, ensuring that meals are fresh, nutritious, and aligned with the ecological cycles of the local environment (Ferguson & Lovell, 2014). Cooking in permaculture is not just about feeding people; it's an integral part of a sustainable lifestyle that nurtures both the community and the environment (Holmgren, 2002).



Figure 2.44
Grocery shopping activity

Figure 2.45
Cooking activity

Permaculture Design Strategy

Permaculture design strategy is applied to five aspects of design, namely site planning, form and mass planning, appearance planning, structural planning and utility planning.

1 Site planning

The permaculture design strategy used in planning refers to the permaculture principle where site selection should be related to biological resources, and the selected site has access, potential, and is in accordance with existing regulations.

2 Building form and mass planning

In its planning, the management of the shape and massing of the building uses a permaculture zoning design strategy where the massing is grouped according to the intensity and use of the building.

3 Building appearance

The permaculture design strategy in processing the appearance of the building is to focus on the selection of local materials and emphasize local culture. This is supported by the principle of permaculture of biological resources and scale so that it can support the aesthetic aspects and appearance of the building.

4 Structural planning

Structural processing refers to the structural system to support the strength and durability of the building to the environment and climate response, in addition to being in harmony with nature. The permaculture design strategy is focused on the selection of structural systems and structural materials that are suitable for the design location.

5 Utility planning

Utility management in the design strategy refers to the permaculture principles of energy planning and energy cycles. Utility processing is focused on processing existing energy on the site so that existing energy can be used by buildings independently and independently and minimize wasted energy.

DESIGN STUDY PRELIMINARY

Maativan Farmhouse

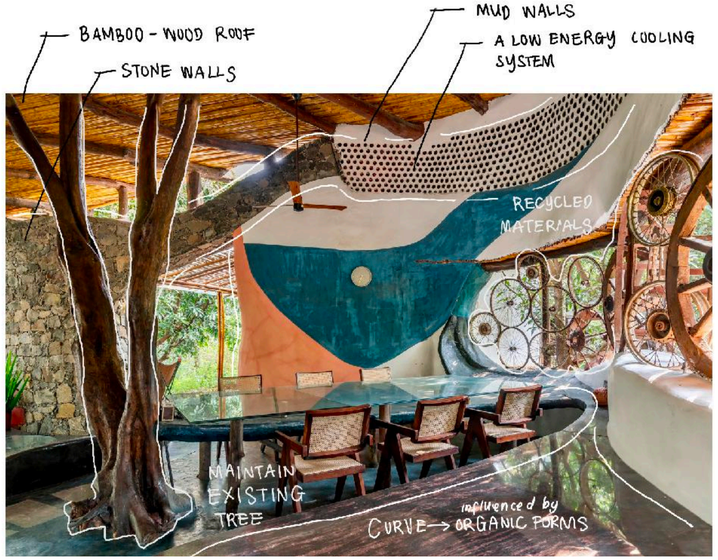
Design Concept Precedent

Mumbai, India

Maativan represents a rustic sanctuary crafted from mud within the embrace of the forest. It achieves this through a blend of materials, biophilic design, passive climatology principles, and construction techniques. Maativan seamlessly incorporates nature into its structure by carefully planning spaces around existing trees and preserving the surrounding vegetation.

Maativan's dedication to sustainability includes utilizing natural materials and traditional methods, steering clear of energy-intensive manufacturing processes. This mindful choice of materials adheres to environmental values and provides efficient insulation, guaranteeing comfort regardless of seasonal changes.

The principle that I learned from this building is how Maativan can embrace the surrounding environment both in terms of cultural background, natural resources as materials, and the environment itself which becomes one part of the building and blurring the division between building and nature.



- *Permaculture-inspired*
- *Biophilic-passive design*
- *Natural building sanctuary*
- *Organic forms*
- *Locally-sourced material*

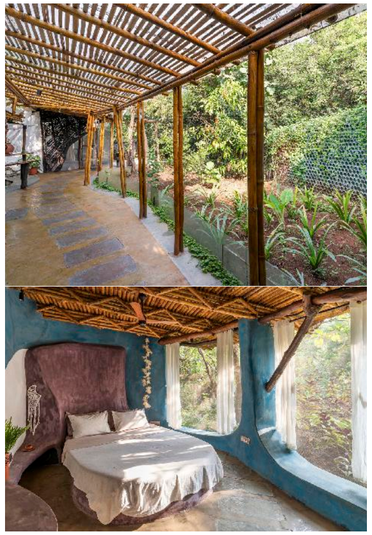


Figure 2.46
Maativan as precedent study
Source: Archdaily, 2023

Figure 2.47
Maativan agricultural farming
Source: Archdaily, 2023

Figure 2.48
Bedroom with garden view
Source: Archdaily, 2023

Bumi Langit Institute

Permaculture Principle Precedent

Imogiri, Bantul, Special Region of Yogyakarta

Founder: Iskandar Waworuntu
Year: 2006

Bumi Langit Institute is a place to facilitate awareness of the role and responsibility of humans with their natural environment. In this place, modern technology becomes a solution in creating a balance of nature. In the plantation, one of the principles used is the intercropping system that supports sustainable agriculture. This is because the variety of crops planted in one area at the same time increases crop efficiency and productivity. The permaculture system implemented in this building is the close loop cycle concept. In its implementation, every activity that runs at Bumi Langit Institute also involves the work of the surrounding community. The local communities involved come from different backgrounds and roles, such as local inhabitants, local farmers, and local traders.

- *Permaculture-inspired*
- *Tumpang sari system*
- *Close-loop cycle*
- *Community collaboration*
- *Post-harvest processing*

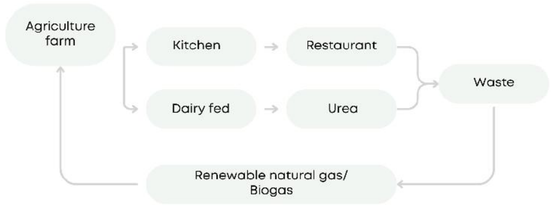




Figure 2.49
Close loop cycle on the agricultural aspect
Source: Author, 2024

Figure 2.50
Bumi Langit agricultural land
Source: bumilangit.org

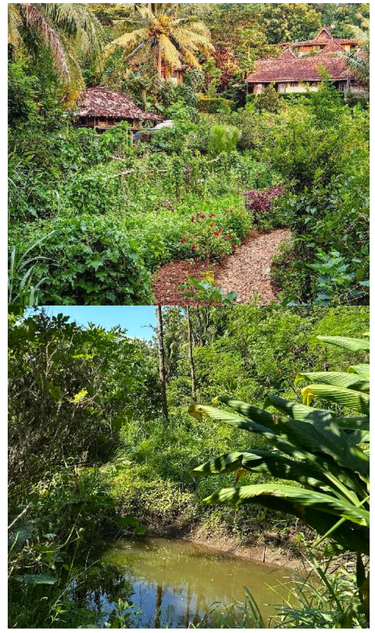


Figure 2.51
Tumpang sari system
Source: bumilangit.org

Figure 2.52
Water retention pond
Source: Author, 2024

Building Typology Precedent

Rumah Atsiri

Plumbon, Tawangmangu, Karanganyar Regency, Cental Java

Architect: Timtiga + Studio-Kita
Area: 23000 ha
Year: 2020

Rumah Atsiri is an educational tourist attraction about the education of making essential oils from volatile plants. Rumah Atsiri Indonesia is the result of the revitalization of the Citronella Factory which was established in 1963. Then, PT Rumah Atsiri Indonesia revitalized the factory building into a recreation area with the concept of natural educational tourism related to essential oils and their utilization. The construction of this building aims to transform the industrial heritage "citronella" into a "home" for the development of essential oil potential in Indonesia. Thus, in its implementation there are three main functions in this building.

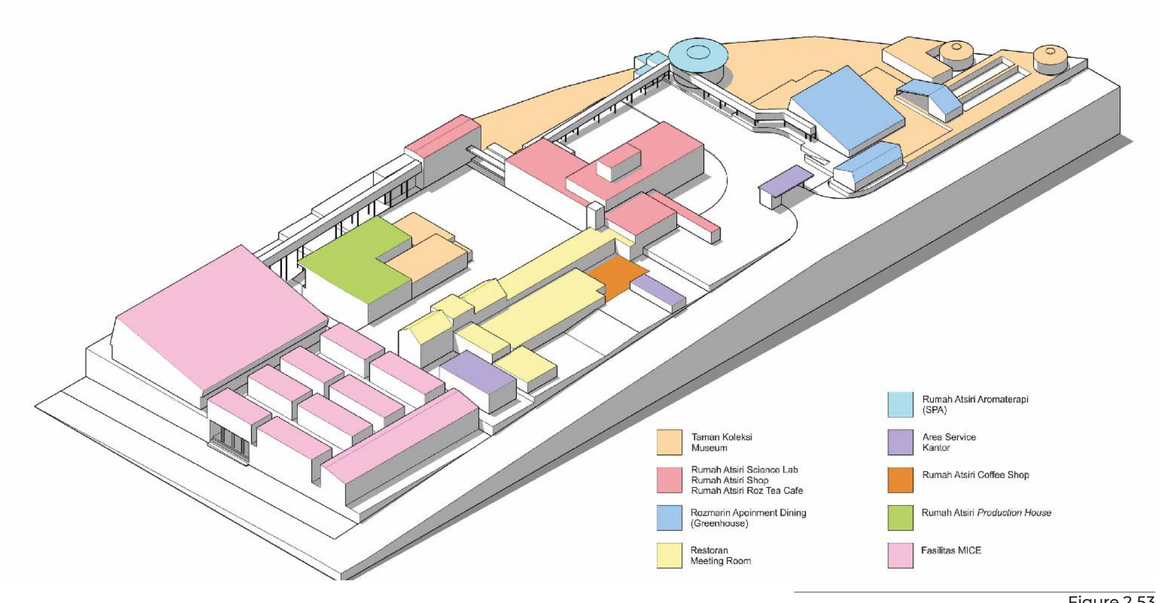


Figure 2.53
Axonometry of Rumah Atsiri' spatial organization
Source: constructionplusasia.com

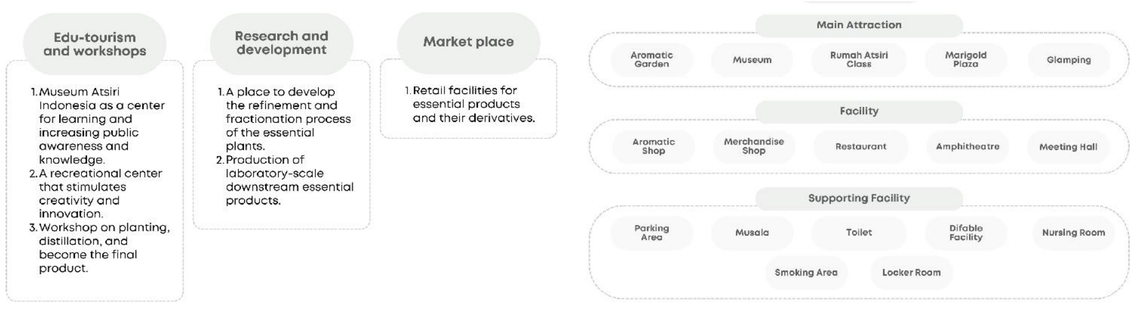




Figure 2.54
Three main function of Rumah Atsiri
Source: Author, 2024

Figure 2.55
Rumah Atsiri building typology
Source: Author, 2024

Figure 2.56
Atsiri garden
Source: kompasiana.com

Figure 2.57
Amphitheatre as gathering place
Source: Archdaily, 2023

Thingamajiggy Coffee Roaster

Chiang Mai, Thailand

Architect: Yangnar Studio
Area: 21 m2
Year: 2023

The site of the building is surrounded by lush paddy fields and elongated hills to the west. Concerning the contextual site, the architectural concept of the building is to allow the environment to shape its identity rather than imposing a rigid architectural. The main building were inspired by the traditional rice barn of Thailand architecture.

One of the materials used in this building is bamboo. Bamboo is often considered an environmentally friendly material. However, it is often the use of bamboo is not followed by an environmentally friendly process by preserving the curved bamboo. Thus, the design of this building utilizes the original straight shape of the bamboo. The bamboos are then connected using rope, a method expertised by the locals.

As such, the building serves the purpose of proving that architecture grows out of the relationship between man and nature. It demonstrates how buildings can seamlessly integrate with their environment to form the essence of space.



- *Outdoor experiences*
- *Sustainable quality material*
- *Local wisdom*
- *Harmonious coexistence*

Figure 2.58
The harmony of nature
Source: archdaily.com





Figure 2.59
The site surrounded by paddy field
Source: archdaily.com

Figure 2.60
The main building inspired by Thailand traditiobal barn
Source: archdaily.com



03

DESIGN PROBLEM SOLVING

FARMSTEAD PROGRAMMING

Based on User

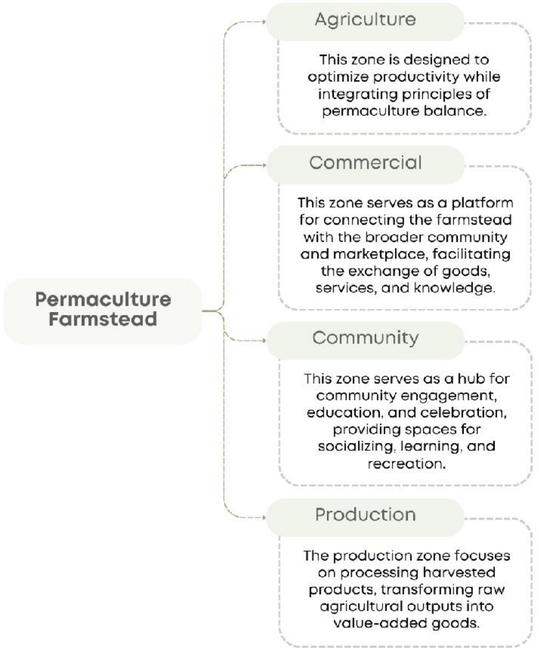
The programming of the permaculture farmstead room is based on the needs of the user. Based on the analysis that has been done with user flow analysis, it can be found that the space needs of each activity flow carried out by each user role.

No	User	Activities	Room Requirement	Properties
1	Farmer	Parking the vehicle	Parking area	Public
		Take and prepare tools for farming	Storage	Semi-public
		Cultivating	Greenhouse	Semi-public
		Watering	Farm area	Public
		Plants maintenance	Farm area	Public
		Having a lunch	Dining area	Public
		Teach a workshop about farming	Workshop area	Semi-public
		Going to toilet	Toilet	Public
		Cleaning themselves from debris and mud	Cleaning room	Public
		Fedding livestock	Cattle	Public
2	Management	Parking the vehicle	Parking area	Public
		Take order, sales and marketing, financial record, etc.	Office	Private
		Farm checking and sweeping	Farm	Public
		Cattle checking and sweeping	Cattle	Public
		Storage checking and sweeping	Storage	Semi-public
		Meeting with stakeholders	Meeting room	Semi-public
		Conduct workshops	Workshop area	Semi-public
		Conduct a big forum meeting	Hall or amphitheatre	Public
3	Community as workers	Parking the vehicle	Parking area	Public
		Sorting, washing, and packing harvested product	Processing area	Private
		Sorting, cleaning, and serving buyers	Farm store	Public
		Checking stock	Storage	Private
		Cooking for food	Open kitchen	Public
		Prepare rooms for lodging	Lodging	Semi-public
		Wash bedsheets and other stuff	Laundry area	Private
3	Community as workers	Prepare lodging needs	Lodging	
		Sorting and manage waste	Waste management	
		Take a break	Resting place	
		Going to toilet	Toilet	
4	Public	Parking the vehicle	Parking area	Public
		Ask initial informations about farmstead	Information center	Public
		Gathering in a big forum	Hall or amphitheatre	Public
		Gathering in a smaller and private forum	Meeting room	Semi-public
		Doing workshops	Workshop area	Semi-public
		Learning about farming practices	Farm area	Public
		Eating lunch	Dining area	Public
		Buy merchandise and stuff farm-themed	Farm store	Public
		Staying for a day or several days	Lodging	Semi-public
		Going to toilet	Toilet	Public
		Watch and join cooking with the chefs	Open kitchen	Public
		Cleaning themselves from debris and mud	Cleaning room	Public

Table 3.1
Farmstead programming based on user
Source: Author, 2024

Based on Spatial Character

Zoning based on spatial character refers to the division of a site or area into distinct zones or regions based on their inherent spatial qualities, characteristics, and functions. This approach to zoning recognizes the unique attributes and potentials of different areas within a site and seeks to optimize their use and management accordingly.



Agriculture

Room	Function	Characteristic
Farming area	Commodities production	Has a large area and easy access
Greenhouse	Vegetation cultivation	Warm temperature, humidity maintained
Biogas	A feature to transform organic waste into energy	Adequate area, ventilation, and drainage
Cow shed	Shelter and management space for cattle	Ample space, ventilation, and good drainage
Chicken pen	A safe, enclosed area for chickens	Adequate ventilation, space for roaming, and protection from predators
Duck pen	A protected area with access to water for ducks	Access to water, waterproof areas, good drainage
Goat pen	A secure and sheltered area for goats	Strong fencing, ample space for browsing, and protection from harsh weather

Commercial

Room	Function	Characteristic
Farmstore	Commodities production	Memiliki area yang luas
Workshop area	Education sharing	Flexible, opennes
Restaurant	From garden to table dining concept	Open space kitchen
Lodging	Stay accomodation for visitor	Private, comfortable

Community

Room	Function	Characteristic
Meeting room	Collaborative gathering	Wide, interactive, natural light
Amphitheatre	Community gathering	Focal point, flexible
Resting place	A place to take a break	Comfortable
Information center	Information about permaculture	Attractive, informative
Library	Reading area	Quiet, adequate lighting and ventilation, sitting area

Production

Room	Function	Characteristic
Office	Management	Orderly, flexible
Toilet	Cleaning, washing	Private, clean
Community production area	Production of goods and services that benefit the community	Communal setting, adequate kitchen space
Production area	Harvested crop processing transformation of crops	Open space, adequate ventilation

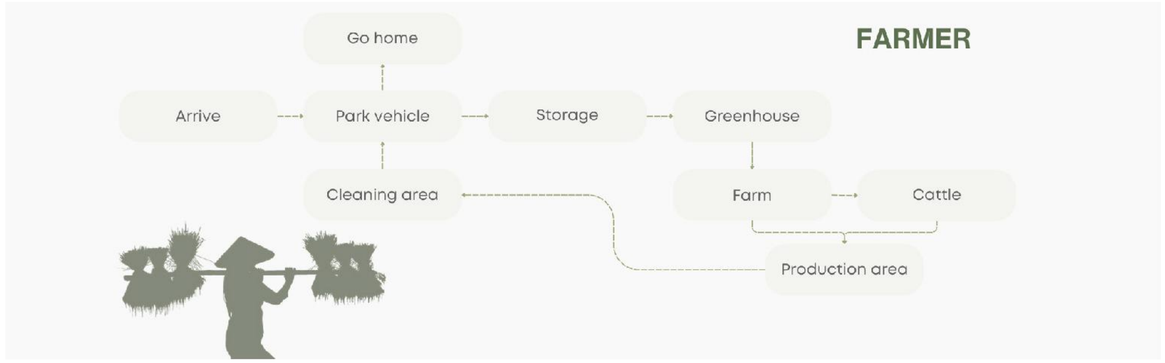
Table 3.2
Farmstead programming based on spatial character
Source: Author, 2024

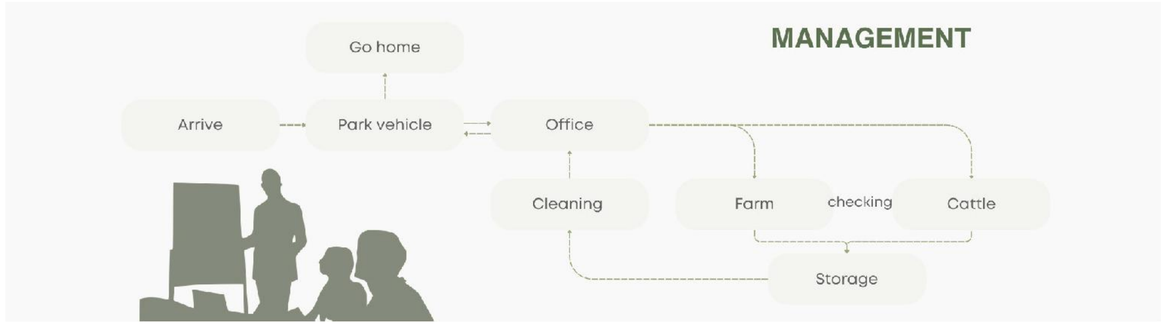
Figure 3.1
Permaculture farmstead zoning
Source: Author, 2024

USER & ACTIVITY FLOW ANALYSIS

Based on User

In designing a permaculture farmstead in Ngoro-Oro, user activity flow analysis is crucial for integrating the needs of four distinct user types—farmers, management, staff, and visitors—into the site layout. This analysis ensures that farmers can efficiently access fields and production areas, while management has suitable spaces for oversight and strategic planning. Staff requirements for daily-operations and maintenance are met with functional workspaces and access to necessary facilities, and visitor areas are designed to provide educational and engaging experiences. Optimizing these flows enhances operational efficiency and user satisfaction, ensuring that each group's activities are seamlessly accommodated within the farmstead.





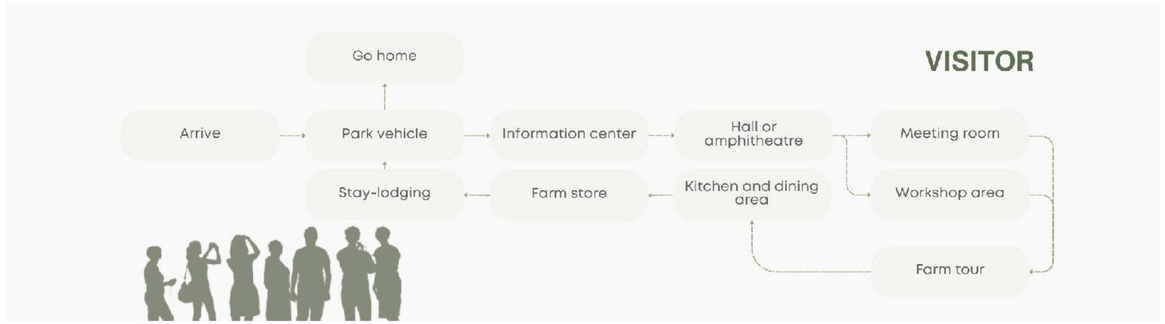




Figure 3.2
User flow activity
Source: Author, 2024

Spatial Programming

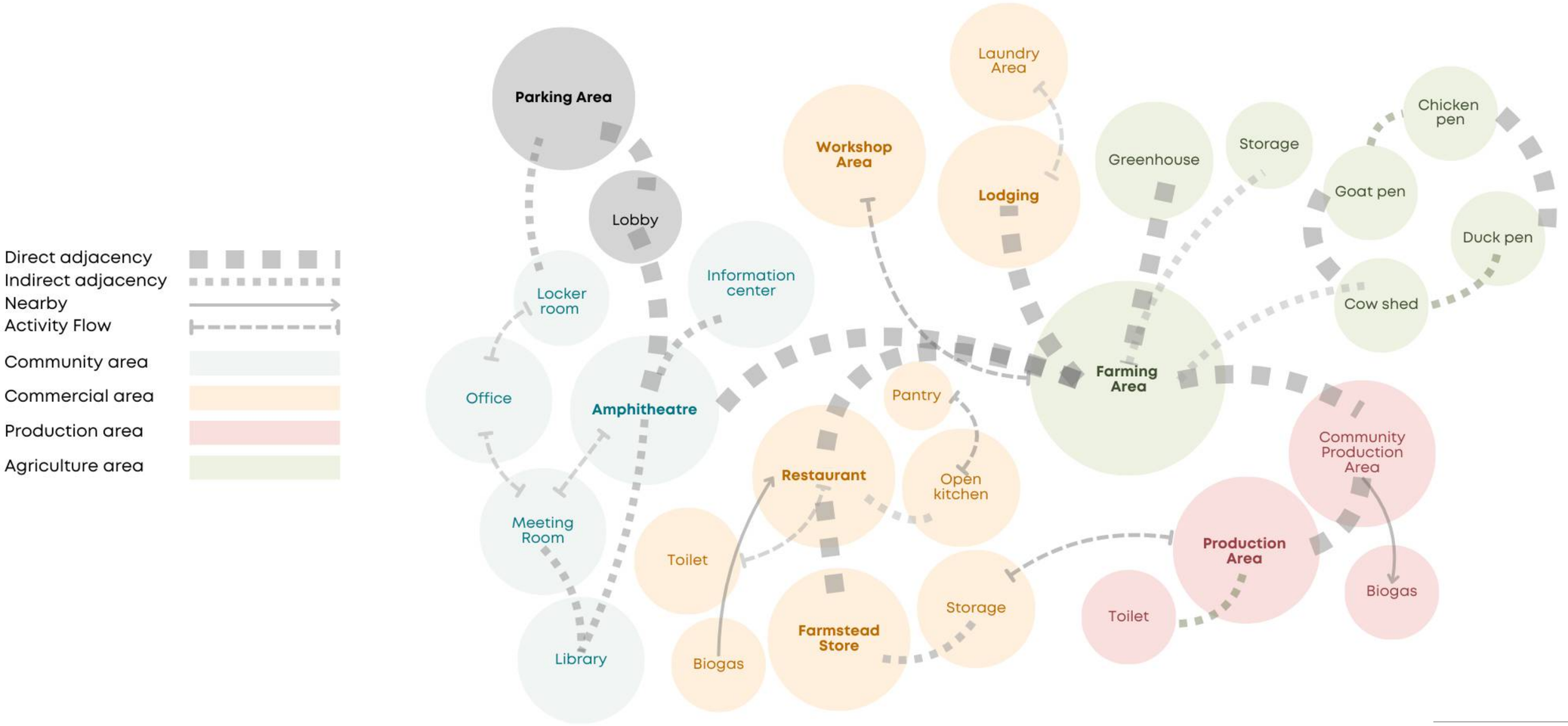


Figure 3.3
Bubble diagram analysis
Source: Author, 2024

DESIGN CONCEPT

Site Planning

Zoning arrangement characteristic

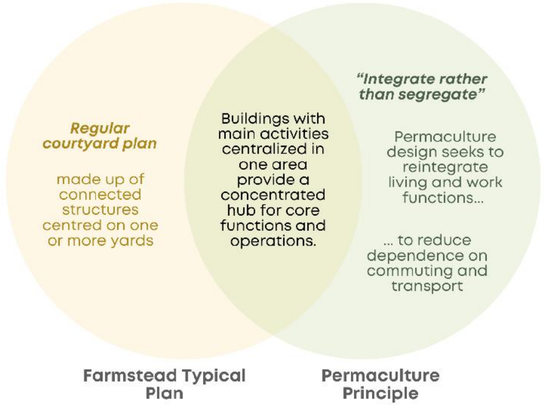


Figure 3.4
Diagram of zoning arrangement characteristics
Source: Author, 2024

Spatial concept and permaculture

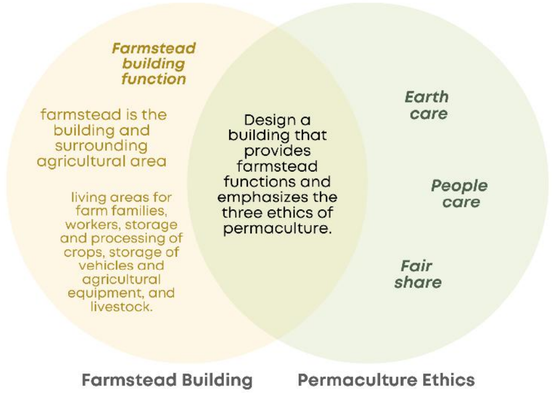


Figure 3.5
Diagram of spatial concept of permaculture
Source: Author, 2024

Conceptual thinking in the spatial division of the room uses a typical plan in farmstead buildings that have developed for hundreds of years. There are three types of plans, namely loose courtyard, regular courtyard, and dispersed courtyard. All three have different characteristics where loose courtyards have areas with building points scattered throughout the site, regular courtyards have characteristics where buildings are centered at one point, while dispersed courtyards are the type where buildings are scattered at random points without any planning.

In the context of this project, the permaculture approach was used as a decision-maker. Permaculture has several ethics and principles that must be fulfilled in its implementation. Within the twelve principles, there is one principle that is interpreted into the architectural elements of the site arrangement, namely Integrate rather than segregate. This principle emphasizes that permaculture design aims to integrate where people live and work. This is in accordance with the description of the farmstead area which functions as a "home" and work area. The application of this concept also plays a role in reducing dependence on transportation or moving activities that are less effective.

The design of this permaculture farmstead pays attention to the room program found in the farmstead generally. In accordance with its function, the farmstead is a building and area around agriculture. On the other hand, the permaculture approach requires a building plan that complies with permaculture ethics, namely earth care, people care, and fair share. This analysis is a flow of how the functions within the farmstead can be achieved while keeping in mind the permaculture ethics in the process.

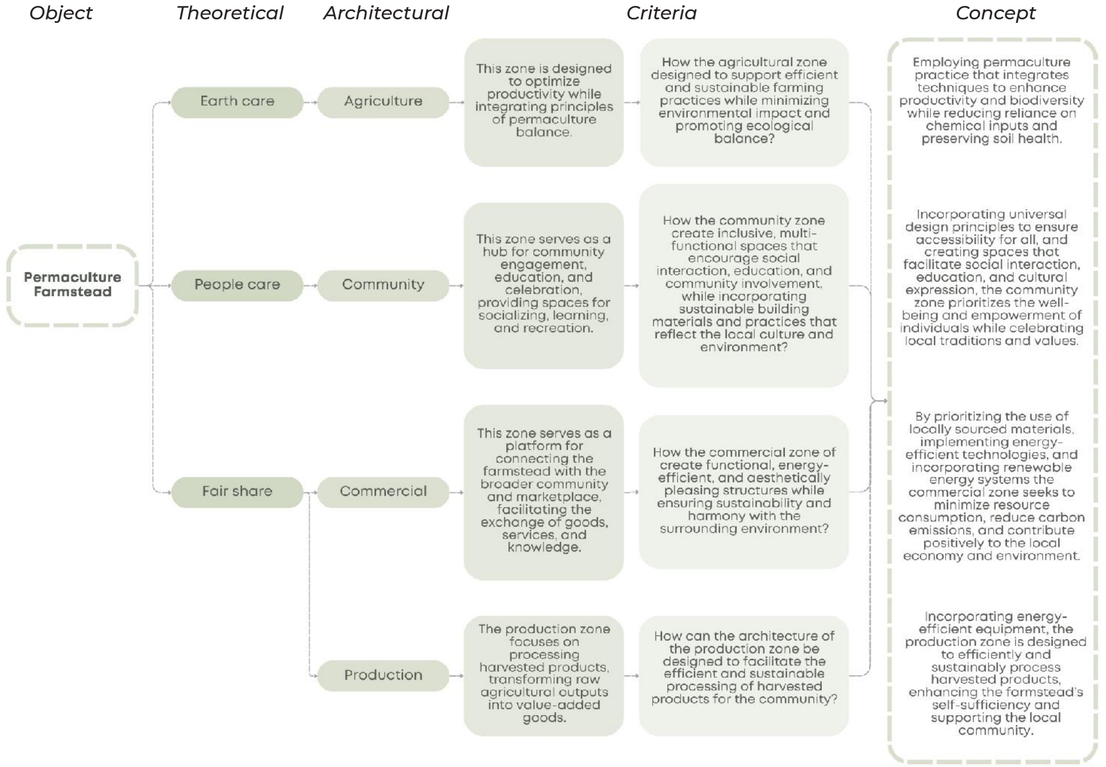


Figure 3.6
Diagram of initial concept
Source: Author, 2024

Design Concept Sketch

Based on Permaculture Principles

Observation deck

'Observe and interact'



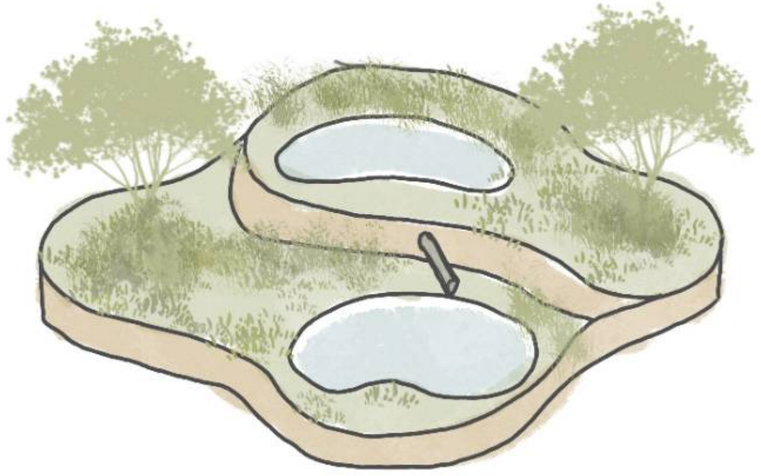
The observation deck is strategically positioned to face the permaculture farming area, allowing users to closely observe and interact with the landscape. Constructed as a bamboo-elevated building, the deck offers a sustainable and aesthetically harmonious structure that blends with the natural environment.

This design not only provides an excellent vantage point for studying the farm's ecosystems but also exemplifies eco-friendly construction practices, reinforcing the permaculture principles of sustainability and thoughtful interaction with the land.

Figure 3.7
Sketch concept of observation deck
Source: Author, 2024

Water retention pond

'Catch and store energy'

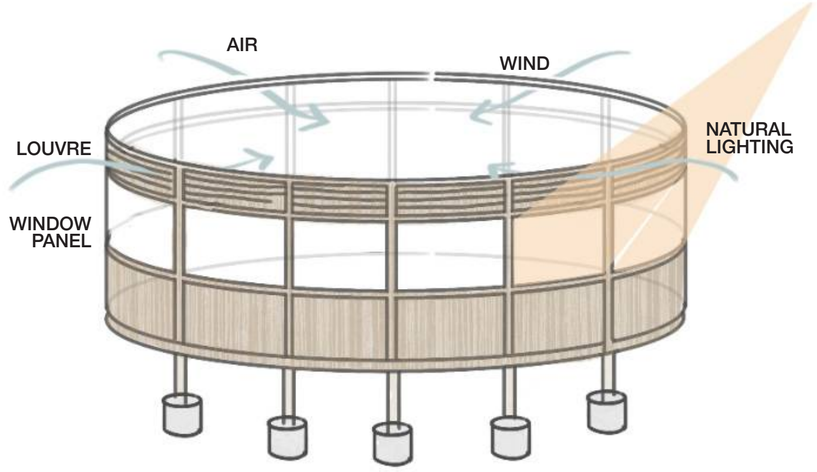


The water retention pond in the Ngoro-Oro permaculture farmstead is designed to follow the natural contour levels of the land, aligning with the permaculture principle of "catch and store energy." By working with the existing topography, the pond efficiently captures and stores rainwater, reducing erosion and maximizing water retention. This design not only supports the farm's irrigation needs but also integrates water ecosystems like aquatic plants and fish, which enhance biodiversity and contribute to the farmstead's overall ecological balance.

Figure 3.8
Concept sketch of water retention pond
Source: Author, 2024

Passive design system

'Catch and store energy'

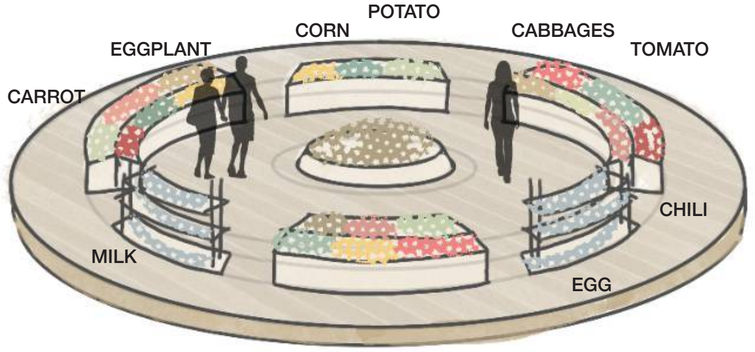


The passive design system aligns with the permaculture principle of "catch and store energy" by optimizing natural resources for building efficiency. Natural lighting is harnessed through strategically placed window panels and louvres, reducing the need for artificial lighting. Airflow and ventilation are managed through louvre panels, allowing wind to cool and refresh indoor spaces without relying on mechanical systems. This design minimizes energy consumption and enhances comfort, making the farmstead more sustainable and resilient.

Figure 3.9
Concept sketch of passive design system
Source: Author, 2024

Farmstore

'Obtain a yield'

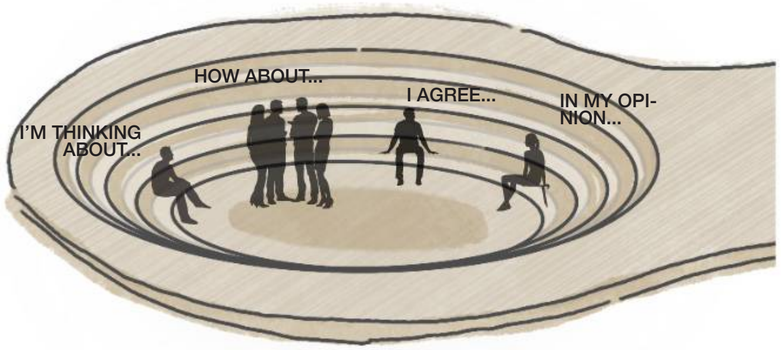


The farmstore in the Ngoro-Oro permaculture farmstead embodies the principle of "obtain a yield" by directly offering products freshly harvested from the garden. This approach maximizes the farm's productivity by converting its yield into valuable goods for sale, thus generating revenue and ensuring that the produce reaches consumers in its freshest form. The connection between the principle and function is clear: by focusing on fresh, garden-sourced products, the farmstore not only enhances the economic return of the farm's yield but also supports the permaculture ethos of sustainable, efficient use of resources and farm outputs.

Figure 3.10
Concept sketch of farmstore
Source: Author, 2024

Community Amphitheatre

'Apply self regulation and accept feedback'

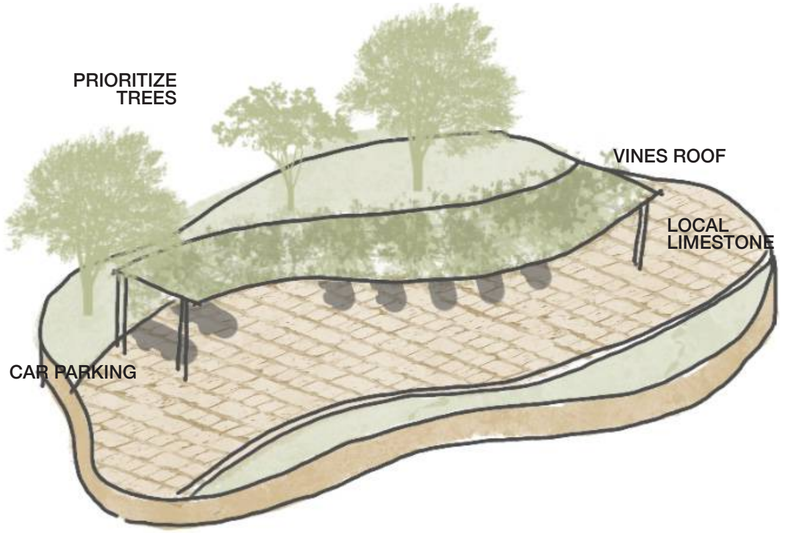


The community amphitheatre in the Ngoro-Oro permaculture farmstead reflects the principle of "apply self-regulation and accept feedback" by serving as a flexible space for community events and gatherings. Its design includes adaptable features that can be modified based on community needs and feedback, ensuring that it remains functional and relevant. By incorporating input from users and allowing for adjustments, the amphitheatre supports continuous improvement and responsiveness, enhancing its role in fostering community engagement and collaboration.

Figure 3.11
Concept sketch of community amphitheatre
Source: Author, 2024

Green Parking Area

'Use and value renewable resources'

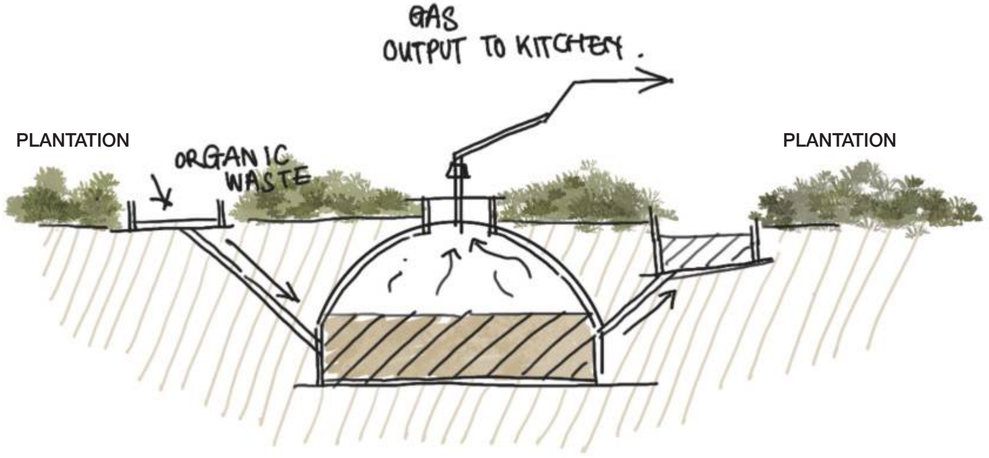


The green parking area in the Ngoro-Oro permaculture farmstead exemplifies the principle of "use and value renewable resources" by featuring a permeable surface made of local limestone from Gunungkidul, a roof constructed from vine plants supported by a bamboo structure, and a shape that prioritizes the placement of trees. This design not only utilizes locally sourced and renewable materials but also enhances sustainability by managing stormwater, reducing heat islands, and integrating natural elements to support ecological balance.

Figure 3.12
Concept sketch of green parking area
Source: Author, 2024

Biogas Features

'Produce no waste'

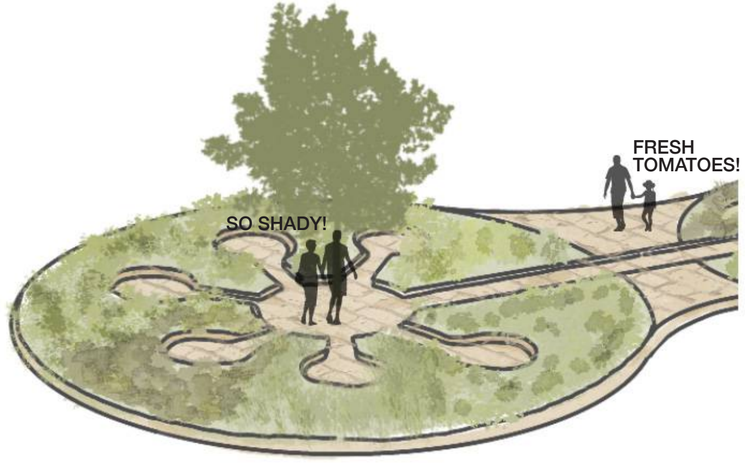


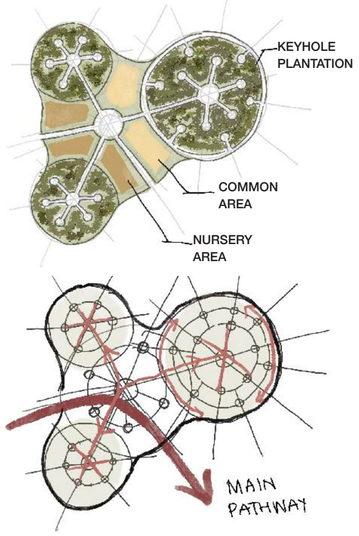
The biogas feature in the Ngoro-Oro permaculture farmstead aligns with the principle of "produce no waste" by converting organic materials into renewable energy. The biogas system processes kitchen scraps and farm residues to produce gas, which will be used as a sustainable fuel source for kitchens within the farmstead. By placing the biogas system in buildings that require a kitchen gas source, the design ensures efficient use of organic waste, reduces reliance on external energy sources, and supports a zero-waste approach.

Figure 3.13
Concept sketch of biogas section
Source: Author, 2024

Keyhole Garden

'Design from patterns to details'



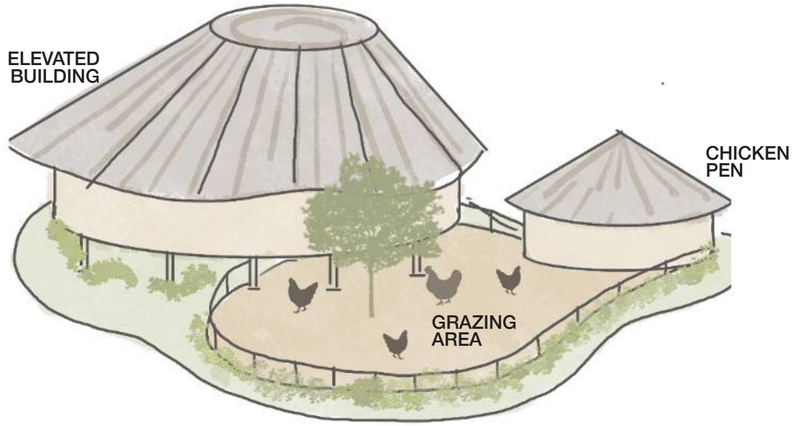


The keyhole garden embodies the principle of "design from patterns to details" by integrating a circular design that maximizes space and resource efficiency. The garden's pattern allows for easy access to all plant areas from a central composting hub, optimizing space utilization and ensuring effective nutrient distribution. This overarching design pattern guides the detailed implementation, enhancing both functionality and productivity while reflecting a holistic approach to sustainable gardening.

Figure 3.14
Concept sketch of keyhole garden
Source: Author, 2024

Elevated Building and Livestock Pen

'Integrate rather than segregate'

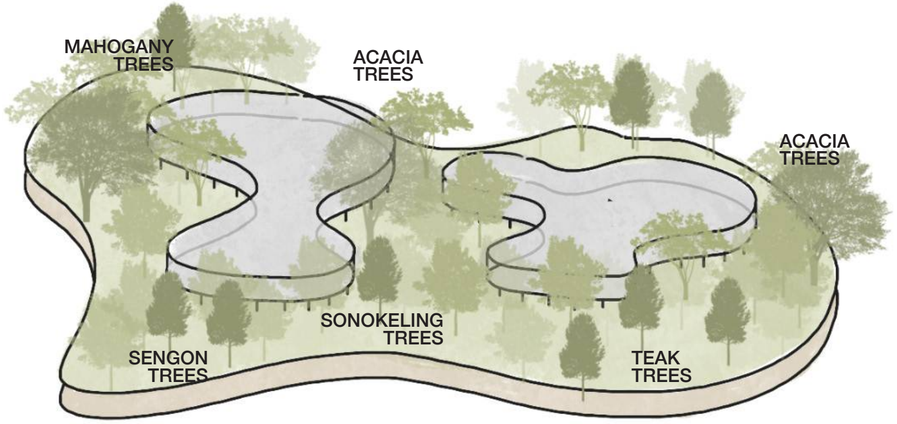


The elevated building and livestock pen in the Ngoro-Oro permaculture farmstead embody the principle of "integrate rather than segregate" by combining multiple functions into a unified design, with the livestock pen placed beneath the building. Allowing chickens to access this space is particularly beneficial as it enhances pest control by letting them forage for insects and weeds, contributes to natural waste management through their droppings, and provides shelter from harsh weather and predators. This integration optimizes space usage, supports natural behaviors, and enhances the overall efficiency and sustainability of the farmstead.

Figure 3.15
Concept sketch of elevated building and livestock pen
Source: Author, 2024

Patterns of Nature

'Use and value diversity'

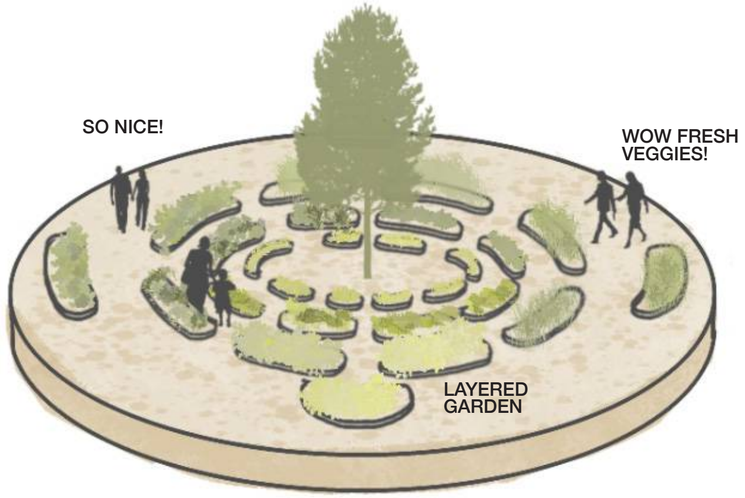


The design concept of analyzing the placement of trees first and then positioning building masses on vacant land aligns with the permaculture principle of "use and value diversity" by preserving natural ecosystems and respecting existing biodiversity. This approach ensures that buildings are sited to avoid disrupting mature ecosystems, maintaining diverse habitats and ecosystem functions. By valuing and integrating natural diversity into the design, it enhances the farmstead's sustainability and ecological resilience while minimizing environmental impact.

Figure 3.16
Concept sketch of patterns of nature
Source: Author, 2024

Mandala Garden

'Use and value the marginal'

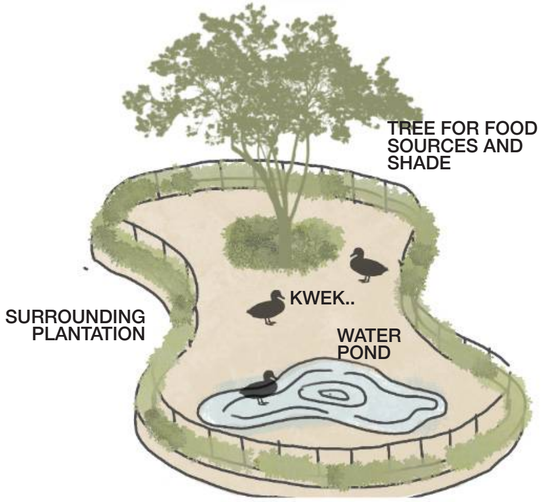


The design concept of a Mandala Garden, a layered garden in Zone 3 of permaculture, aligns with the principle of "use and value the marginal" by effectively utilizing less conventional or marginal spaces for productive purposes. This approach transforms these areas into highly functional gardens, maximizing their potential and contributing to overall farmstead productivity. By incorporating diverse layers and plantings, the Mandala Garden enhances resource use, supports various plant species, and optimizes yields from underused areas, demonstrating the value of integrating marginal spaces into sustainable design.

Figure 3.17
Concept sketch of Mandala Garden
Source: Author, 2024

Duck Pond

'Use and value the marginal'



The design concept of a duck pond aligns with the permaculture principle of "use and value the marginal" by transforming less productive or marginal areas into valuable components of the farmstead. The pond provides habitat for ducks, supports aquatic plants, and contributes to the farm's ecosystem by enhancing biodiversity and managing water resources. By utilizing these marginal spaces, the pond optimizes land use, improves overall farmstead functionality, and integrates ecological benefits into the design.

Figure 3.18
Concept sketch of duck pond
Source: Author, 2024

Design Concept Sketch

Based on Permaculture Ethics

Community Greenhouse

People care ethics



Figure 3.19
Concept sketch of community greenhouse
Source: Author, 2024

Community greenhouses designed with permaculture principles have a close relationship with the People Care ethic, which emphasizes the well-being of people and communities. In the architectural design, the community greenhouse provides a space to grow healthy food locally, which improves food security and community nutrition. It is also an educational center where community members can learn about sustainable agricultural practices and ecology, which enhances their skills and knowledge. In addition, community greenhouses encourage social interaction and collaboration, strengthening social bonds and building support networks among community members. Thus, the community greenhouse serves not only as an agricultural facility, but also as a place to promote community well-being and empowerment, aligning with the People Care ethic in permaculture.

Building and Vegetation Integration

Earth care ethics

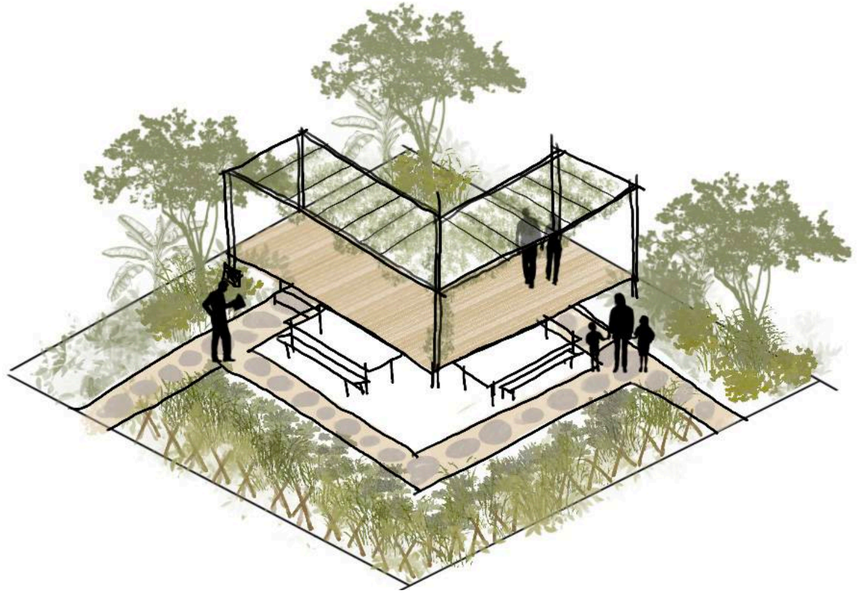


Figure 3.20
Concept sketch of building and vegetation integration
Source: Author, 2024

The integration of buildings and vegetation in architectural design is closely related to the Earth Care ethic in permaculture, which emphasizes the protection and improvement of the earth's ecosystems. This approach combines architectural elements with plants to create a harmonious and sustainable environment, reduce the carbon footprint of buildings, and improve energy efficiency through natural insulation and temperature regulation. Greenery on walls, roofs, and around buildings not only beautifies the space, but also improves air quality, manages rainwater, and provides habitat for wildlife, supporting biodiversity. As such, this integration supports environmental health and human quality of life, in line with the Earth Care permaculture principle that prioritizes ecological balance and sustainability.

Open Kitchen and Dining Area

Fair share ethics

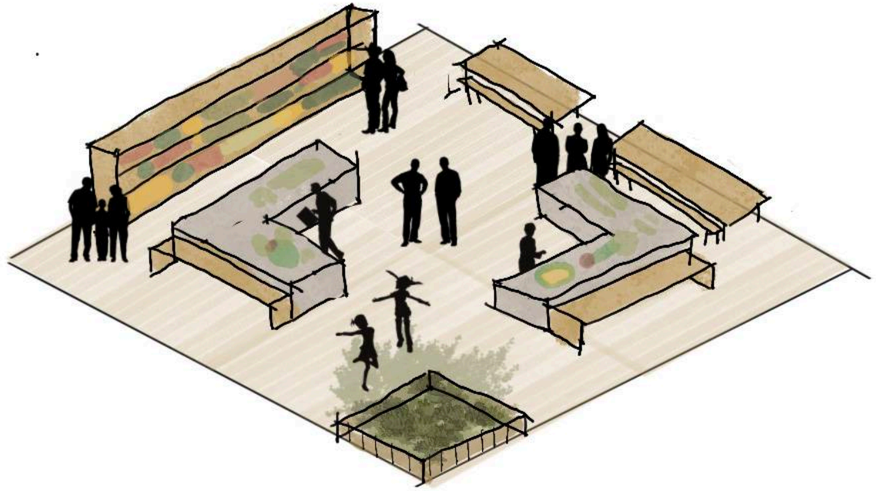


Figure 3.21
Concept sketch of open kitchen and dining area
Source: Author, 2024

Open kitchen in architectural design has a close relationship with permaculture ethics, particularly Fair Share, which emphasizes fair sharing of resources and efficient utilization of space. The open kitchen concept supports social interaction and collaboration, creating a space that invites the community to gather, share meals and participate in culinary activities together. This is in line with the Fair Share principle that encourages fair distribution of resources and proceeds, and minimizes waste by maximizing the use of food ingredients. In addition, open kitchens enable transparency in food preparation, which can raise awareness of sustainable culinary practices and support local culinary ytradition.

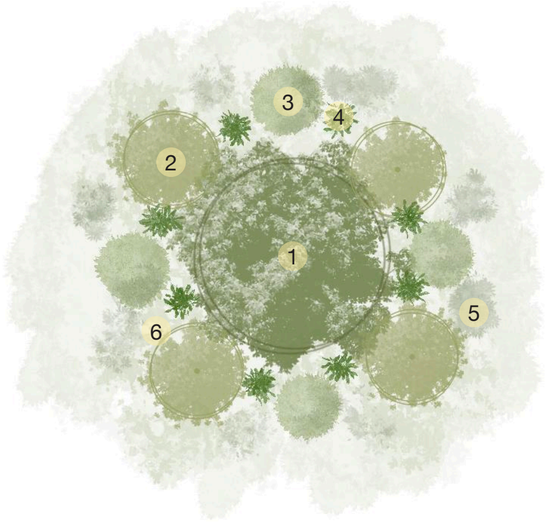
Lodging and garden area

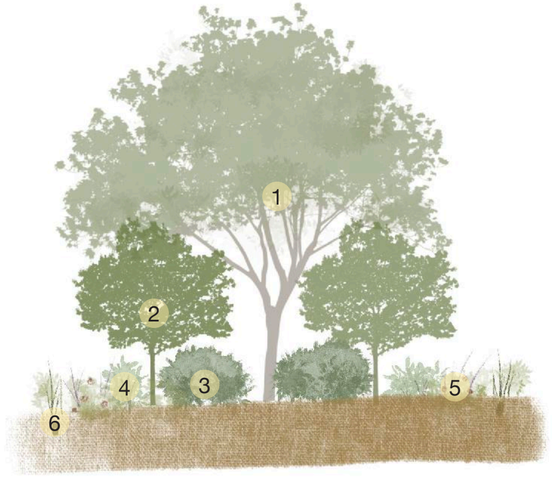
Fair share ethics



Figure 3.22
Concept sketch of lodging and garden area
Source: Author, 2024

Lodging and gardens located in the same area encourages fair sharing of resources and coexistence with nature. This integration allows visitors to experience first-hand the benefits and essence of a sustainable natural environment. Visitors staying in the lodging can participate in gardening activities, harvest fresh vegetables, and learn about organic farming practices, which reinforces a sense of community and responsibility towards the environment. In addition, the presence of a productive garden provides a source of fresh and healthy local food, reducing dependence on external resources and promoting a more sustainable pattern of living. Thus, this integration not only creates an environment that supports human well-being but also reflects the Fair Share principle of permaculture, where the benefits of nature are shared and enjoyed by everyone equally.





1 Canopy
2 Sub-canopy
3 Shrub
4 Herbaceous
5 Ground cover
6 Underground

In permaculture, the concept of polyculture is vital because it mimics natural ecosystems, promoting biodiversity, resilience, and sustainability. By growing multiple species together, polyculture enhances soil health through varied root structures and nutrient cycles, naturally - manages pests through beneficial plant interactions, and improves yield stability by reducing the risk of crop failure. This approach aligns with permaculture's principles of working with nature, optimizing resource use, and creating self-sustaining systems that support both environmental health and human needs.

Figure 3.23
Polyculture farming
Source: Author, 2024

Vegetation Scheme on Polyculture



Canopy	Sub-canopy	Shrub	Herbaceous	Ground cover	Underground
Avocado	Banana	Beluntas	Ginger	Ground nut	Cassava
Durian	Cocoa	Chilli pepper	Turmeric	Cucumber	Potato
Rambutan	Papaya	Eggplant	Galangal	Small pennise-tum grass	Yam
Water apple	Guava	Pineapple	Corn	Ground nut	Potato

Figure 3.24
Polyculture farming scheme
Source: Author, 2024



04
ANALYSIS AND RESPOND



Design Responses

Permaculture-Based Zoning Response

Zone 1

Zone 1 provides for everyday home necessities and is the area next to the living space that needs the most care and attention.

1. Nursery
2. Home and medicinal garden
3. Fruit trees to provide shades
4. Water pump
5. Water tank
6. Waste water pond
7. Composting area

Zone 2

This zone is less intensively managed with spot-mulched orchards, main-crop beds, and ranging domestic animals.

1. Road side garden
2. Community waste management
3. Livestock management
4. Clean water sources

Zone 3

Zone 3 is typically found far from the home since it requires fewer maintenance tasks and attention.

1. Polyculture
2. Home and medicinal garden
3. Tree crops and annual crops

Zone 4

This zone should be designed and managed by the community which requires minimal maintenance and attention.

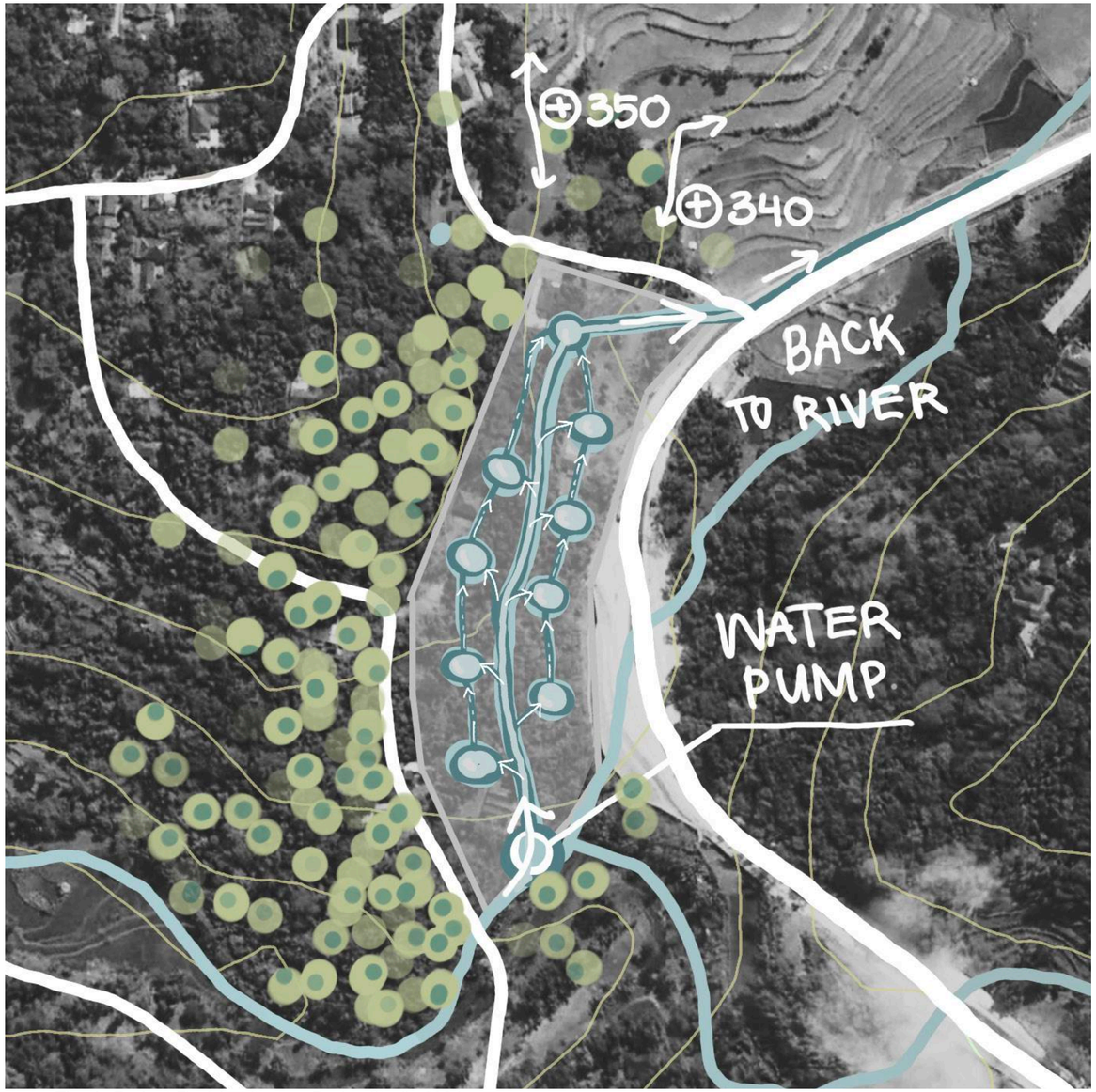
1. Fruit, oil, and nut trees
2. Firewood and timber trees
3. Bamboo
4. Cattle farm

Zone 5

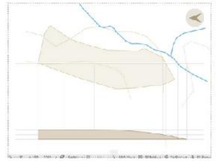
Zone 5 is usually located furthest from residential areas and can be on land which is more difficult to use for cultivation. This zone can provide many functions, such as food and medicines for people, food and habitat for native animals, and protection against hunting and erosion.

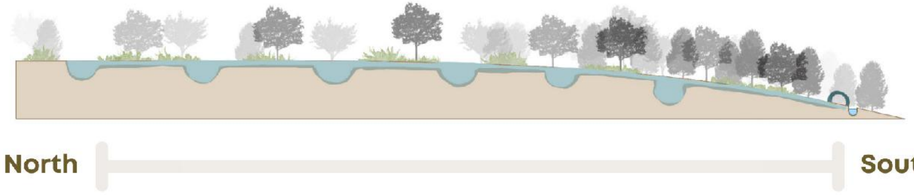
1. Non-timber forest products
2. Low-impact activities

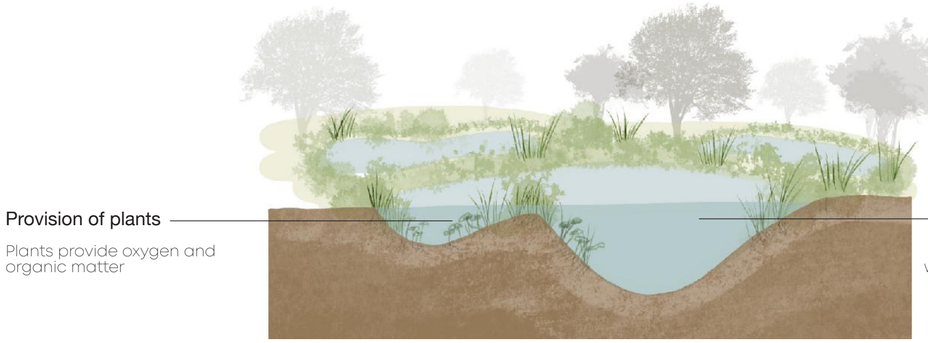
Figure 4.1
Design response on site context
Source: Author, 2024



Water Irrigation Flow Concept


Section Keymap





Earth Care

Water Storage and Conservation

Ponds act as natural reservoirs, storing rainwater and runoff. This stored water can be used during dry periods, reducing dependence on external water sources and mitigating the effects of drought. By capturing and retaining water, ponds help maintain a consistent supply for irrigation, livestock, and other farm needs.

Biodiversity Enhancement

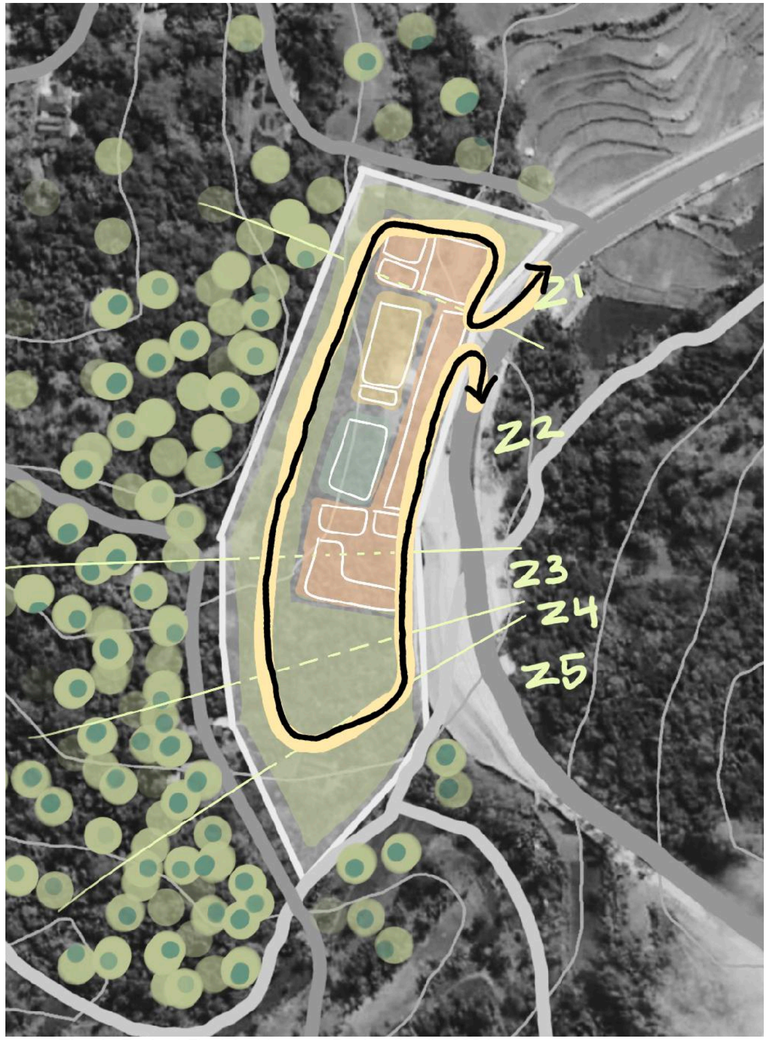
Ponds create diverse habitats for a variety of aquatic and terrestrial species. They support the life cycles of many plants, insects, birds, amphibians, and mammals, promoting biodiversity. Aerobic conditions support organisms such as fish, insects, and aerobic bacteria that require oxygen to thrive. Anaerobic conditions, on the other hand, provide habitat for specialized organisms like certain types of bacteria and invertebrates adapted to low oxygen or oxygen-free environments.

Figure 4.2
Design response on water management
Source: Author, 2024

Figure 4.3
Section of water retention pond
Source: Author, 2024

1st ALTERNATIVE

Zoning Concept



In this concept, the building area is centralized in the middle of the site. The entrance is on the north of the building which will pass through supporting facilities such as the parking area and amphitheater as a gathering area. Next, it will pass through the agricultural area to observe and study until returning to the starting point. At this point, it will pass through the workshop area and farmstead store.

Overall, the agricultural aspect of this building surrounds the building area. This is intended to give the impression of "blurring boundaries" between the inside and outside of the building. In addition, the division of the agricultural zone also follows the permaculture zoning into five sections with each different function.

Legend

- Z1 Zone 1, visit daily
- Z2 Zone 2, visit frequently
- Z3 Zone 3, visit occasionally
- Z4 Zone 4, visit infrequently
- Z5 Zone 5, unmanaged forest
- Commercial Zone
- Community Zone
- Production Zone
- Agriculture Zone

Figure 4.4
Zoning concept on 1st design alternative
Source: Author, 2024

Massing Concept

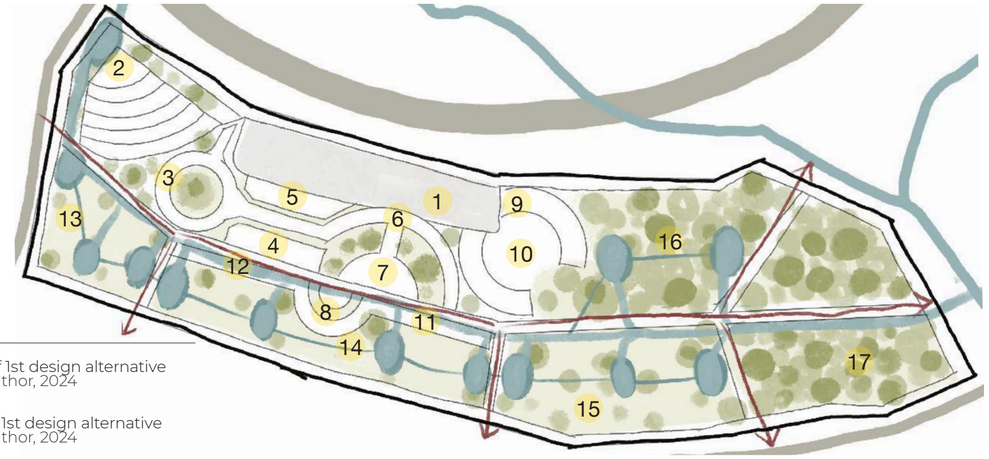


Figure 4.5
Siteplan of 1st design alternative
Source: Author, 2024

Figure 4.6
Section of 1st design alternative
Source: Author, 2024

Section Concept



Legend

1. Parking area
2. Amphitheatre
3. Lobby and information center
4. Management office
5. Meeting room
6. Dining area and open kitchen
7. Farm store
8. Prayer room, lavatory, locker room
9. Crops processing area
10. Courtyard for drying crops
11. Greenhouse
12. Lodging
13. Zone 1, visit daily
14. Zone 2, visit frequently
15. Zone 3, visit occasionally
16. Zone 4, visited infrequently
17. Zone 5, unmanaged forest to observe and learn

In this alternative, the overall site area is divided by an on-site access line. The building and farm areas are located next to each other to show the concept of fair share where humans and nature can coexist. The parking area is located on the roadside for easy vehicle access. The parking area also has direct access to the lobby and information center. The initial building is circular to show acceptance to visitors. Then there is a hallway with offices and meeting areas for the community and management on the right and left sides. The dining area with open kitchen is located circularly centered on the open kitchen so that visitors can see the cooking process. The farm store is located in the center of the open kitchen with a commercial function. The crop production process area is located adjacent to the commercial area to facilitate the movement of goods and in the center there is a courtyard as a place to dry crops. The greenhouse and lodging areas are located close to zones 1 and 2 to foster a feeling of coexistence with nature.

2nd ALTERNATIVE

Zoning Concept



In this spatial concept, the building area and the agricultural area are separated. In the building area, the layout is centralized into one, as well as the agriculture. In this case, access is in the north which will go directly through the parking area, hall, lodging, and towards the farm. After passing through the farm area, it will pass through the workshop area and farmstead store.The agricultural aspect in this section adopts a permaculture approach with five types of zoning according to the function of the zone and its plants.

Legend

- Z1 Zone 1, visit daily
- Z2 Zone 2, visit frequently
- Z3 Zone 3, visit occasionally
- Z4 Zone 4, visit infrequently
- Z5 Zone 5, unmanaged forest
- Commercial Zone
- Community Zone
- Production Zone
- Agriculture Zone

Figure 4.7
Zoning concept on 2nd design alternative
Source: Author, 2024

Massing Concept

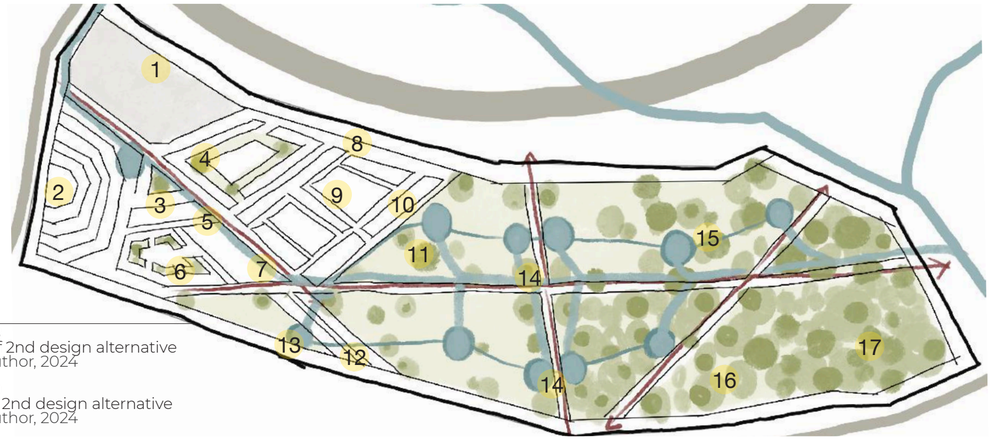
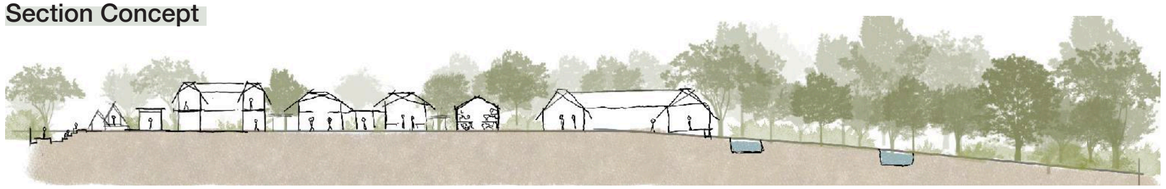


Figure 4.8
Siteplan of 2nd design alternative
Source: Author, 2024

Figure 4.9
Section of 2nd design alternative
Source: Author, 2024

Section Concept



Legend

1. Parking area
2. Amphitheatre
3. Lobby and information center
4. Management office
5. Meeting room
6. Dining area and open kitchen
7. Farm store
8. Prayer room, lavatory, locker room
9. Crops processing area
10. Courtyard for drying crops
11. Greenhouse
12. Lodging
13. Zone 1, visit daily
14. Zone 2, visit frequently
15. Zone 3, visit occasionally
16. Zone 4, visited infrequently
17. Zone 5, unmanaged forest to observe and learn

In this alternative, the site is divided into two, the building area and the farm area. The building area is located in the northern part, while the farm area is in the southern part. The building area is divided into three zones, namely commercial, community, and service zones. Overall, the site area is divided by a line for on-site access. The parking area is located at the front with the lowest contour. The parking area is directly related to the lobby and information center as the visitor reception area. On the side, there is an amphitheater to accommodate a large community. Near the lobby area is a dining area with an open kitchen concept as well as a farm store room that sells farm products. Both buildings are located next to each other to attract visitors. On the other hand, the office area is located at the front to facilitate access for management staff. The lavatory area, prayer room and locker room as service areas are also located in the front area for easy access by the public. In addition, the production process area is located adjacent to the farming area for easy access and transfer of goods. The lodging area is located close to zone 1 to foster the essence of living side by side with nature.

Schematic Design

Siteplan

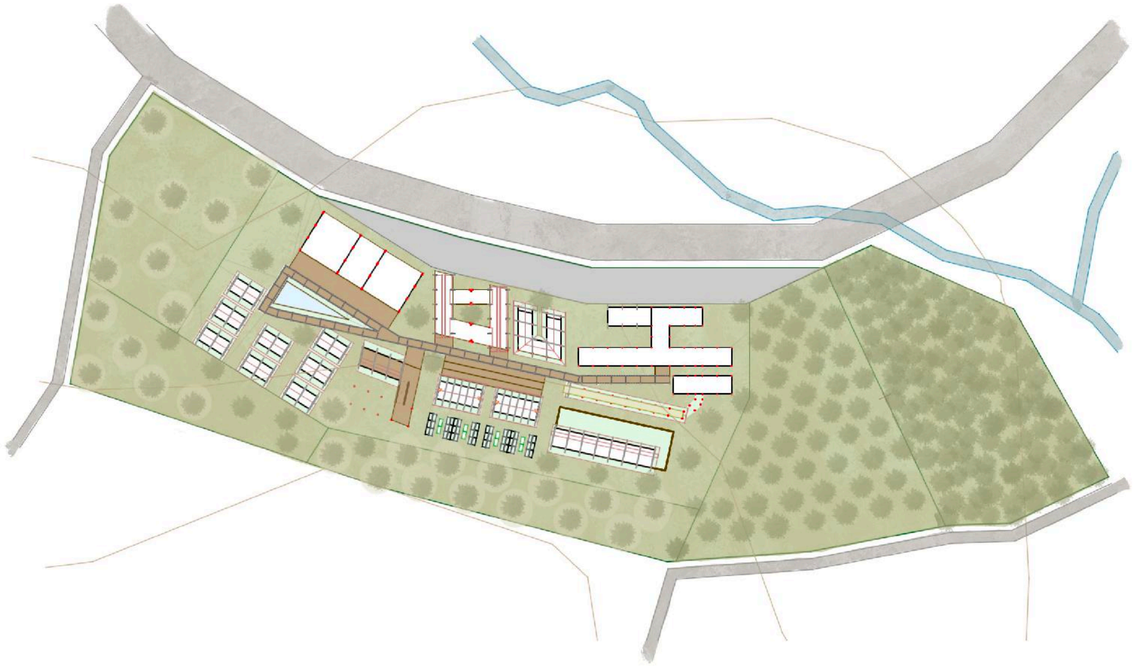


Figure 4.10
Schematic siteplan of 2nd design alternative
Source: Author, 2024

Visualization



Observation deck



Community greenhouse and nursery area



Lobby area



Water retention pond

Figure 4.11
Perspective on observation deck
Source: Author, 2024

Figure 4.12
Perspective on community greenhouse
Source: Author, 2024

Figure 4.13
Perspective on lobby area
Source: Author, 2024

Figure 4.14
Perspective on water retention pond
Source: Author, 2024

3rd ALTERNATIVE

Massing Concept

Tendrils on vines plantation

The shape of this building is inspired by the tendrils on plants. These tendrils are commonly found on vines. One part of this plant, the tendril, is a twisting tool as a form of metamorphosis of one of the main parts of the plant or a form of further growth of the midrib on the leaf (Handayani, 2020).

Lung - lungan ornamentation

The shape of the vine is transformed into a lung - lungan motif, an ornamentation found on Javanese buildings. This ornament has a wavy shape resembling a vine that is symmetrical and centered on a 'bud'. The depiction of these distillations is analogous to the beauty of heavenly plants. Lung - lungan also means that life and sustenance always come continuously.



Tendrils → Lung-lungan ornamentation → Building initial form

Figure 4.15
Transformation of lung-lungan stillation
Source: Author, 2024



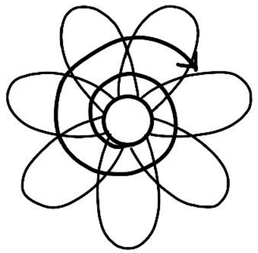


Responding the existing contour
The form of the building following the contour of the site.

Lung-lungan form
The depiction of vegetation in Javanese ornament

Circle as the centre
The circular shape of the building serves as the axis and center of the farmstead building. This building mass will function as a community zone that plays an important role in the development of permaculture.

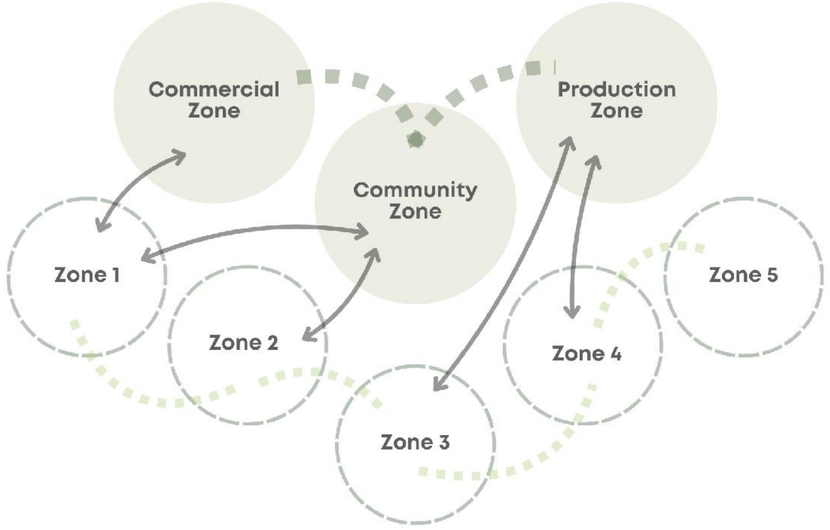
'Spiral' form as the analogous of permaculture key domains or 'Permaculture Flower'



The 'Permaculture Flower' shows the key domains that require transformation to create a sustainable culture. The spiral path beginning with ethics and principles suggests a knitting together of these domains, initially at the personal and the local level, and then proceeding to the collective and global level.

Figure 4.16
Massing flow of 3rd design alternative
Source: Author, 2024

Zoning Concept



COMMERCIAL ZONE

Open kitchen and dining area
The food processed in the kitchen comes from the crops harvested in Zones 1 and 2.

Lodge
Visitors staying at the lodge can harvest their own kitchen plants and herbs.

ZONE 1
The types of plants planted in this zone are kitchen plants and herbal plants that can be used daily.

ZONE 2
In this zone, most of the crops planted are food crops as food supplies for the community.

COMMUNITY ZONE

Community greenhouse and nursery
Greenhouses are usually used to cultivate horticultural plants, such as vegetables, fruits, or decorative plants.

PRODUCTION ZONE

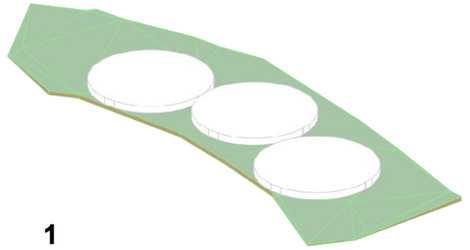
Post-harvesting process
The crops from Zone 2 and Zone 3 are directly processed and processed into finished goods or properly packaged before being sold.

ZONE 3
The types of plants in this zone are seasonal fruit plants, nut trees, or other plants that can be processed.

ZONE 4
Some of the elements that comprise this zone are timber crops for harvesting, shade grown commodity crops (coffee, cacao), cultivation of wild mushrooms, endemic plants, and others.

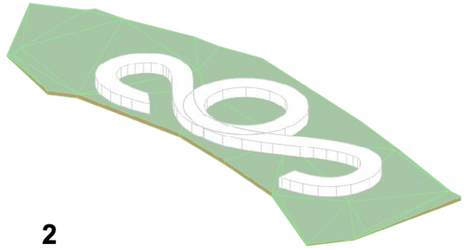
Figure 4.17
Zoning diagram of 3rd design alternative
Source: Author, 2024

Design Transformation



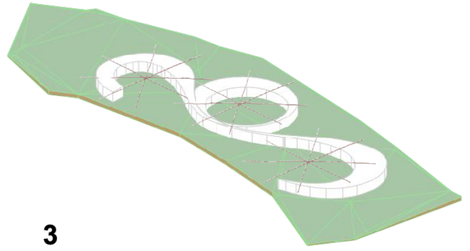
1

Three main building masses based on the zoning function



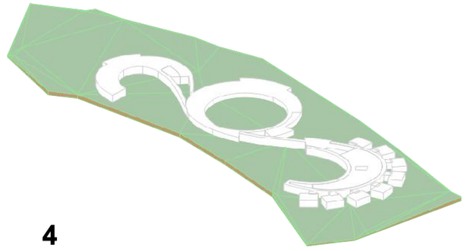
2

Stylization of the lung-lungan shape as the flow of the building



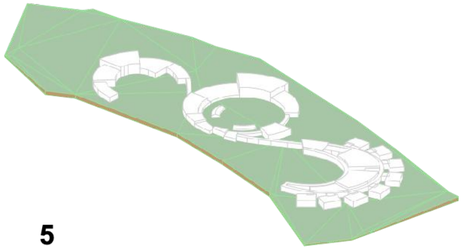
3

Division of rooms based on lines centered on the center point of the circle of each mass by considering space requirements.



4

Space division in the building.



5

Adjustment of building height based on site context.

Figure 4.18
Design transformation of 3rd design alternative
Source: Author, 2024

Schematic Design

Siteplan

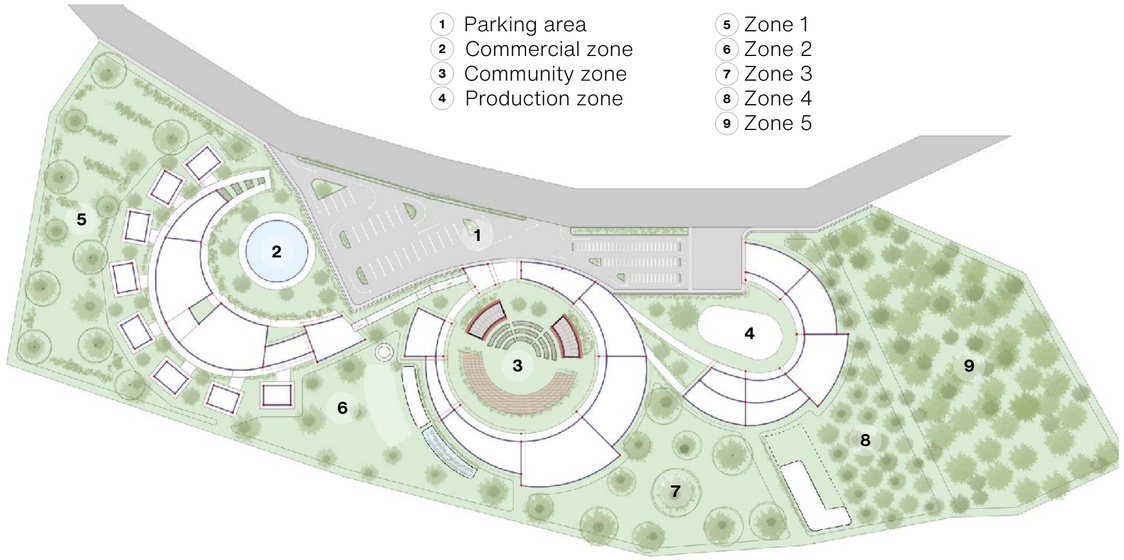


Figure 4.19
Schematic siteplan of 3rd design alternative
Source: Author, 2024

Visualization by AI



Top view



Parking area



Perspective on commercial zone



Perspective on community and production zone

Figure 4.20
Bird's eye view of building
Source: Author, 2024

Figure 4.21
Perspective on parking area
Source: Author, 2024

Figure 4.22
Perspective on commercial zone
Source: Author, 2024

Figure 4.23
Perspective on community and production zone
Source: Author, 2024

4th ALTERNATIVE

Design Strategy

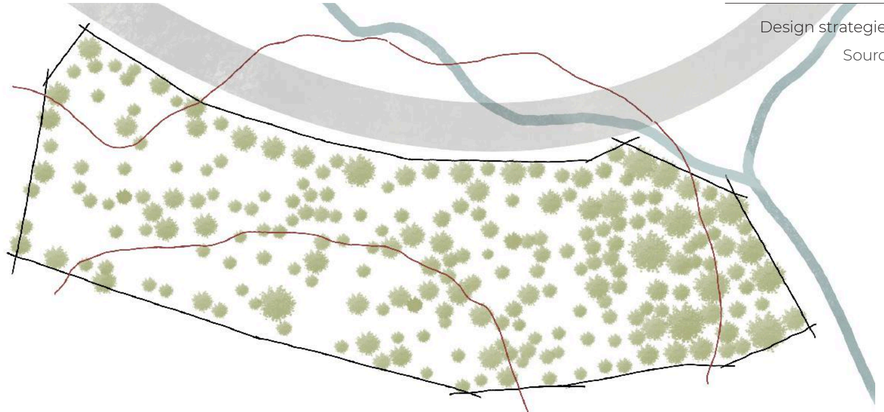
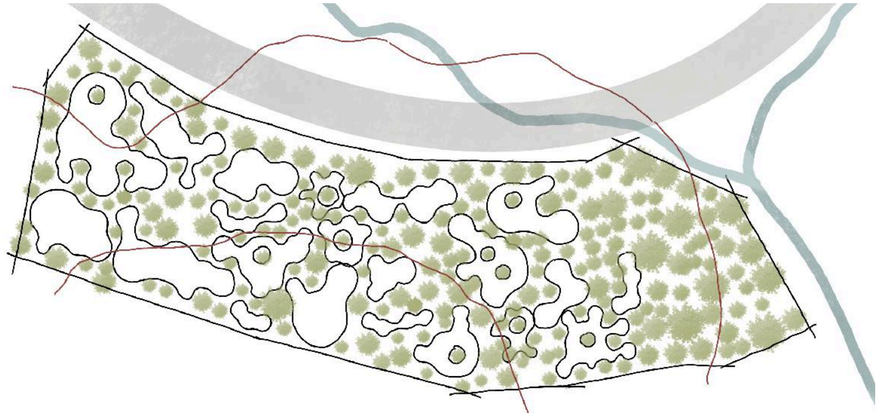
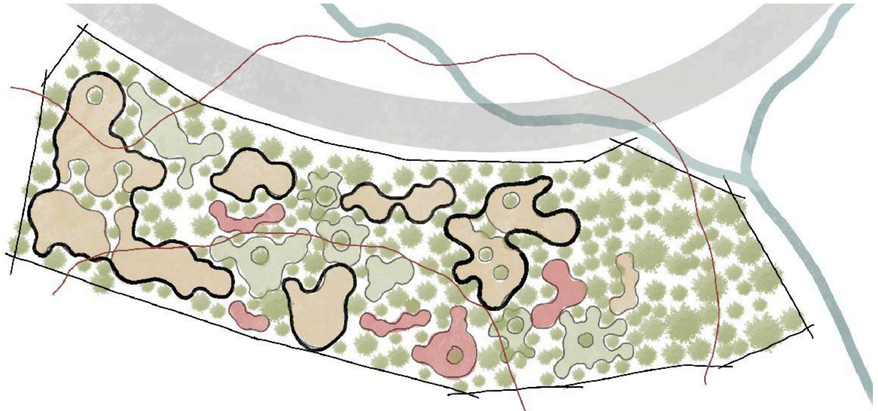


Figure 4.24
Design strategies of 4th design alternative
Source: Author, 2024

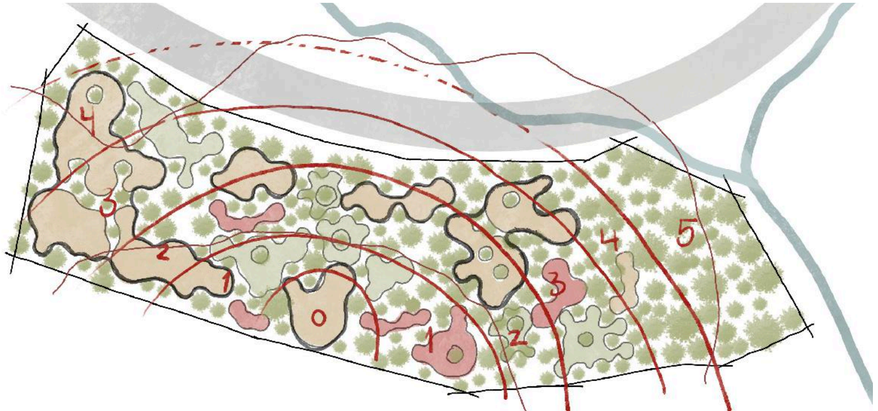
1 The analysis is carried out by mapping the placement of trees on the site. This is done as an initial decision in the design of buildings located among the trees.



2 Then, an analysis of the land area free from trees or vacant land is conducted as the location point for the building. This creates a "pattern of nature" formed by the existing trees.



3 Zoning is carried out based on the flow of the site and the function of the buildings based on the proximity between buildings.



4 The determination of permaculture zones is centered on Zone 0 as the main building or "community" zone. The permaculture zones then expand based on the needs and types of vegetation, following the existing contour pattern, where Zone 0 is located at the highest point on the site.

Massing Concept

Integrated livestock of cow and garden
food sources of cow and vegetation.

Integrated livestock of goat and garden
food sources of goat and vegetation.

Open space for parking area
permeable pavement of limestone.

Integrated livestock of chicken and layered garden
food sources of chicken and vegetables.

Mandala-permaculture garden
kitchen and herbs plantation types.



Observation building for Zone 5
Zone 5 is an unmanaged forest for the natural ecosystem observation purposes.

Production zone
production and storage area for harvested crops from the garden.

Community zone as Zone 0
information center of permaculture, cultivation area, mandala permaculture garden scheme.

Elevated building and duck pen area
elevated semi-permanen building from bamboo structure with duck pen underneath.

Commercial zone
restaurant, farmstore, lodgement, workshop area.

Figure 4.25
Axonometry view of 4th design aternative
Source: Author, 2024

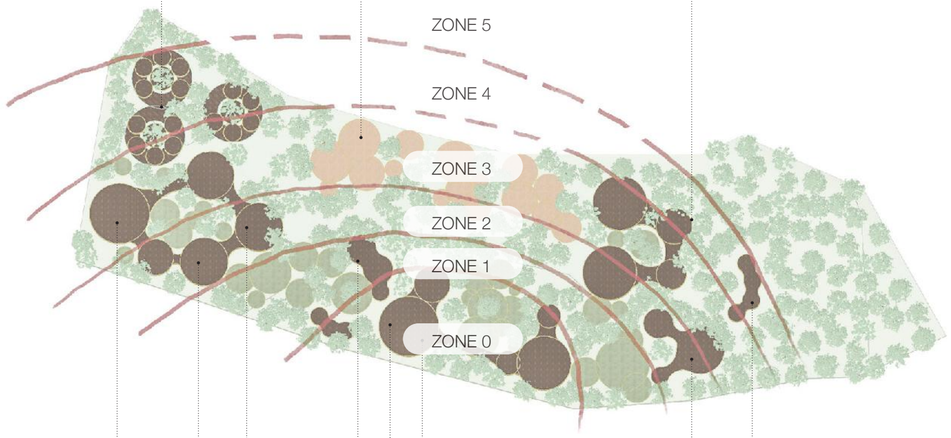
Design Exploration

1st Design Exploration

Lodging
an eco-friendly accommodation integrating natural energy sources and food production to create a self-sufficient and environmentally harmonious living space

Open space for vehicle parking
incorporates permeable surfaces, native vegetation, and efficient water management to minimize environmental impact while providing functional parking

Production zone
a production and storage area for harvested crops from the garden



Farmstore
a space integrated within the farm where locally produced, sustainable goods are sold directly to the community

Open kitchen restaurant
a dining space featuring an open-plan kitchen that emphasizes community interaction while utilizing locally sourced, organically grown ingredients

Workshop area
a designated space where tools, materials, and skills are shared and taught,provide indoor and outdoor activities of permaculture gardening

Zone 0
the center of activity of the people involved in the permaculture system and is the focal point of the entire design

Community zone
information center of permaculture, keyhole garden scheme, common areas, library, meeting hall

Community greenhouse and nursery area
a shared, sustainably managed space where community members collaboratively grow plants to support local food production, biodiversity, and education

Observation area for Zone 5
a designated space for passive interaction with nature, allowing for the study and understanding of natural ecosystems to inform and inspire sustainable design practices

Cow and goat pen
a cow and goat pen, strategically placed, kept to provide manure for soil fertility, assist in weed control, and contribute to the integrated agricultural system

2nd Design Exploration

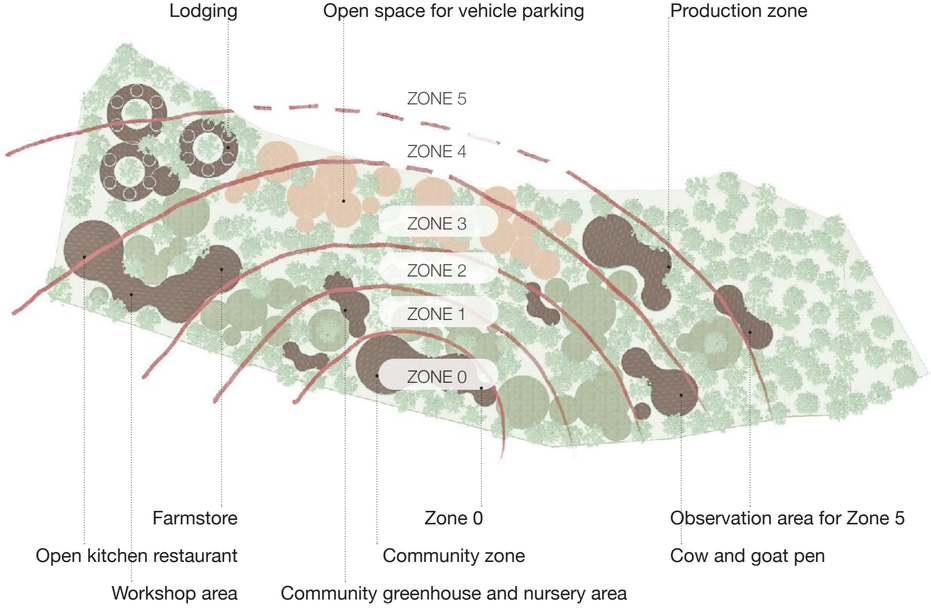
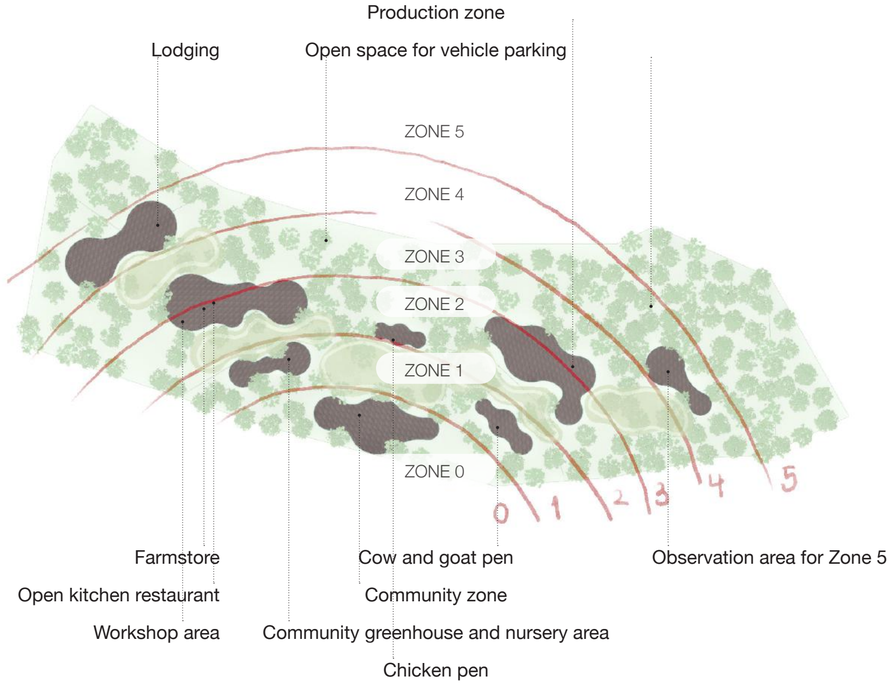


Figure 4.26
Top view of 1st design exploration
Source: Author, 2024

Figure 4.27
Top view of 2nd design exploration
Source: Author, 2024

3rd Design Exploration



4th Design Exploration

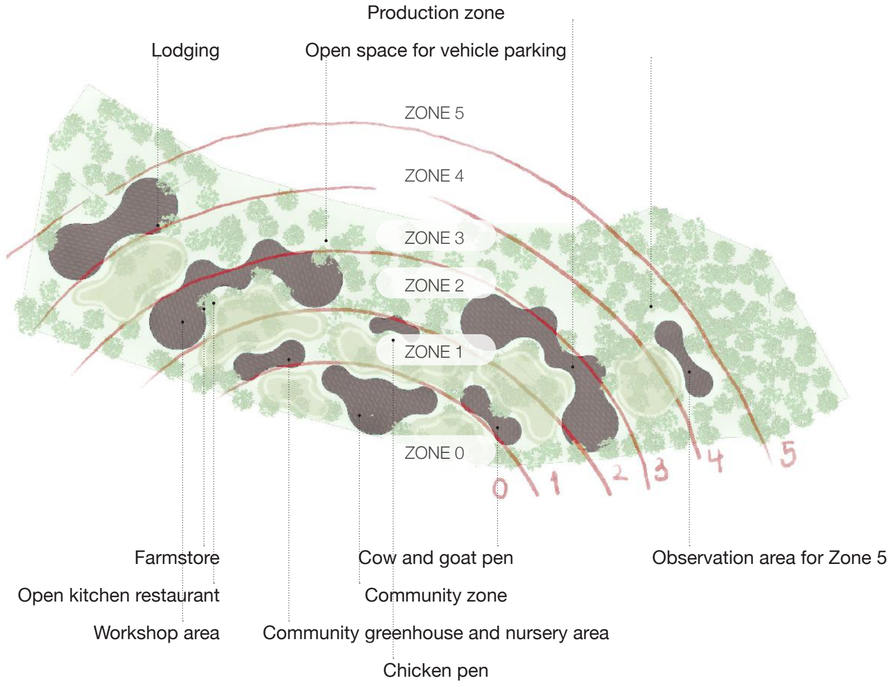


Figure 4.28
Top view of 3rd design exploration
Source: Author, 2024

Figure 4.29
Top view of 4th design exploration
Source: Author, 2024



05

DESIGN DESCRIPTION

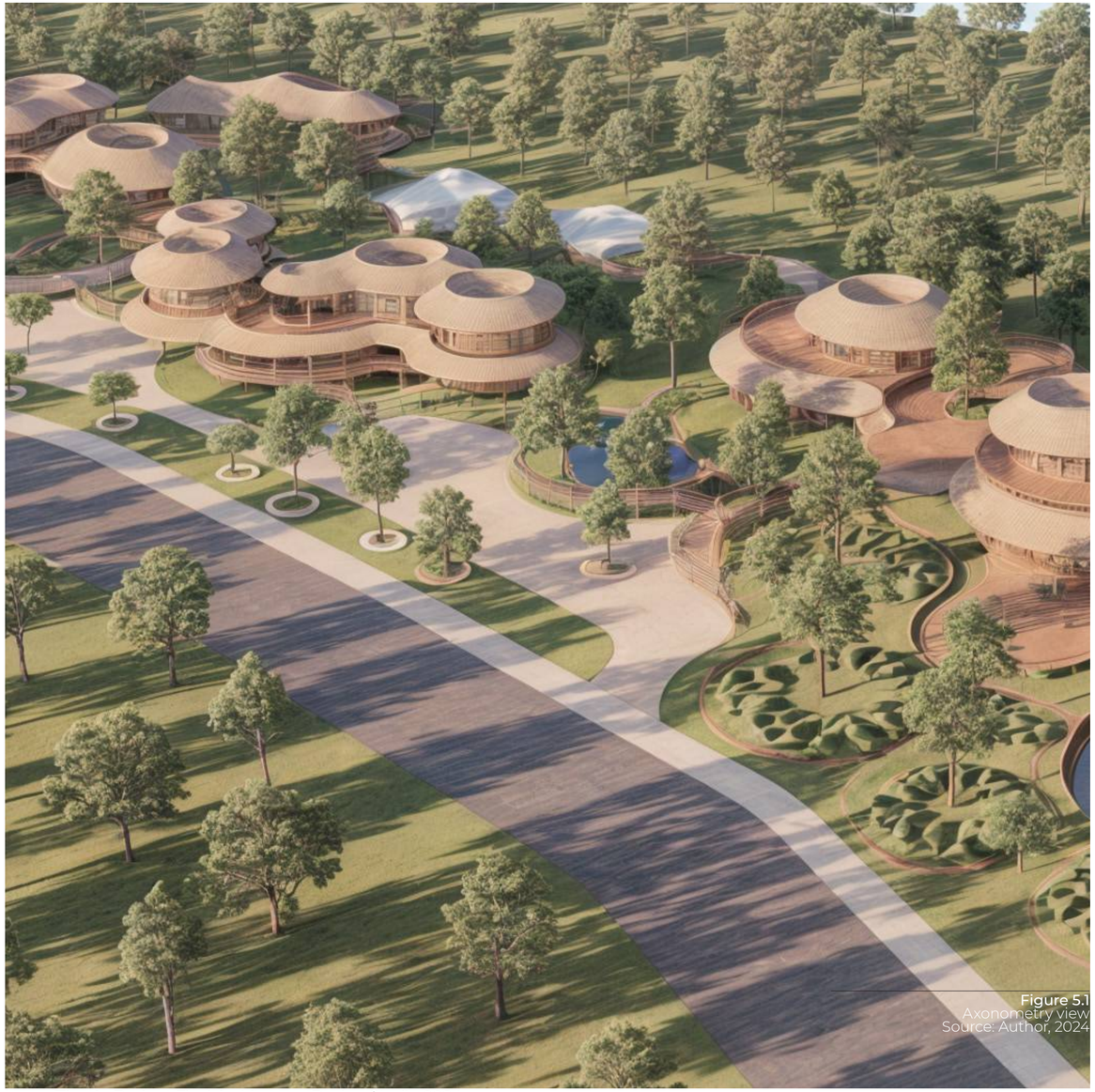


Figure 5.1
Axonometry view
Source: Author, 2024

SPATIAL REQUIREMENTS

Function	Space	Standard	Unit	Capacity	Quantity	Total Area
Commercial	Lodging	4	per person	3	10	120
	Laundry area	2	per person	2	1	4
	Storage	3	per person	4	1	12
	Open kitchen	6	per person	6	1	36
	Dining area	2	per person	100	1	300
	Food storage, pantry	3	per person	4	1	12
	Workshop area	2	per person	30	2	120
	Farm store	2	per person	100	1	200
	Toilet	2	per person	1	4	8
	Total					812
	Circulation (40%)					324,8
	Subtotal					1136,8

Function	Space	Standard	Unit	Capacity	Quantity	Total Area
Community	Amphitheatre	1.5	per person	30	1	45
	Foyer	2	per person	10	2	40
	Information center	4	per person	20	1	80
	Library	3.3	per person	20	1	66
	Common areas	4	per person	20	1	80
	Management office	4	per person	10	1	40
	Meeting room	3	per person	30	1	90
	Toilet	2	per person	1	4	8
	Total					449
	Circulation (40%)					179,6
	Subtotal					628,6

Function	Space	Standard	Unit	Capacity	Quantity	Total Area
Farm	Duck pen	4	per duck	10	40	40
	Chicken pen	4	per bird	10	40	40
	Cow pen	10	per cow	3	30	90
	Goat pen	6	per goat	6	36	216
	Total					386
	Circulation (40%)					154.4
	Subtotal					540.4

Function	Space	Standard	Unit	Capacity	Quantity	Total Area
Production	Community production area	4	per person	5	1	20
	Drying area	3	per person	10	1	30
	Production area	3	per person	4	2	24
	Toilet	2	per person	1	4	8
	Management office	4	per person	6	1	24
	Total					106
	Circulation (40%)					42,4
	Subtotal					148,4

Function	Space	Standard	Unit	Capacity	Quantity	Total Area
Parking	Car parking area	11.52	per unit	1	10	230.4
	Motorcycle parking area	1.5	per unit	1	30	41.5
	Bicycle parking area	1.02	per unit	1	20	20.4
	Total					292.3
	Circulation (40%)					116.92
	Subtotal					409.22

Table 5.1
Spatial requirements
Source: Author, 2024

DESIGN RESULT

Siteplan

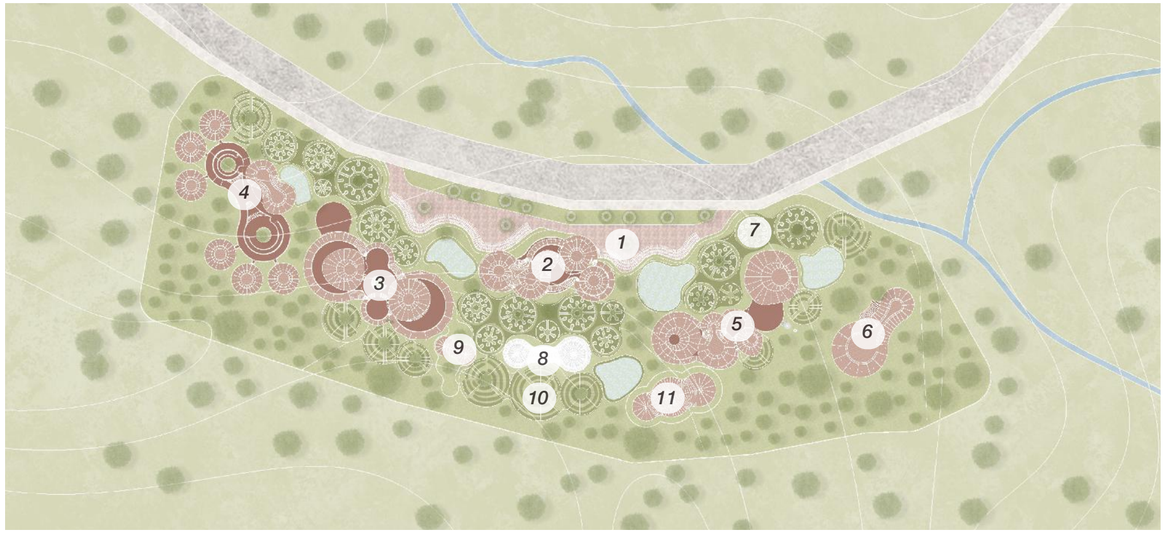


Figure 5.2
Siteplan
Source: Author, 2024

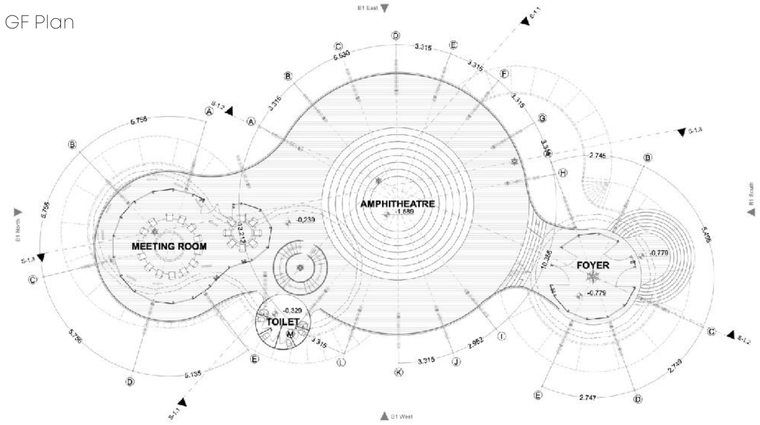
Legend

1. Parking area
2. Community building zone
3. Commercial building zone
4. Lodging area
5. Production building zone
6. Observation area
7. Keyhole garden
8. Greenhouse
9. Chicken and duck pen
10. Mandala garden
11. Goat and cow shed

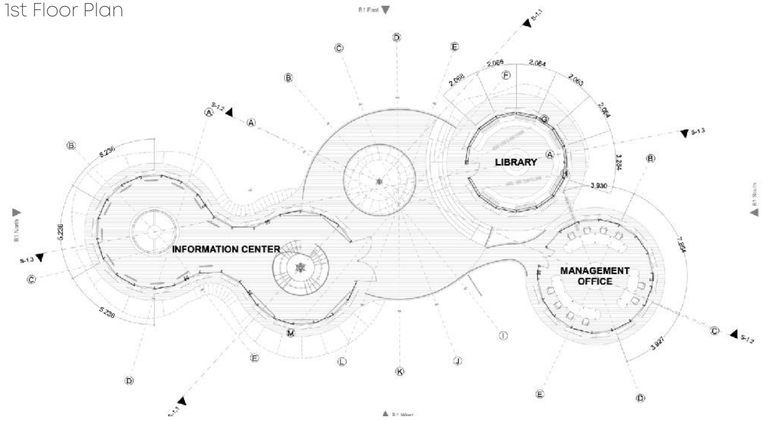
Community Zone

Floorplan

GF Plan



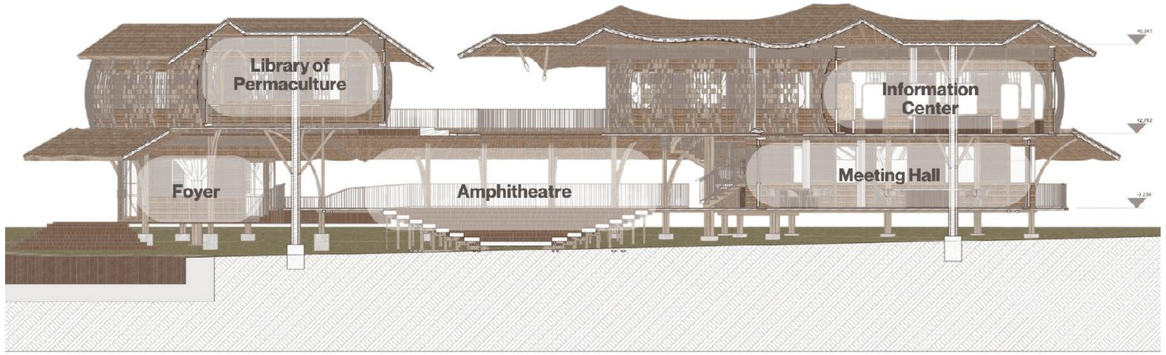
1st Floor Plan



The community zone is thoughtfully designed across two floors, with the first floor dedicated to public spaces that foster community interaction, including an amphitheater for events, a meeting room for group activities, a welcoming foyer, and public restrooms. The second floor features semi-public areas, such as an information center and a library, offering a balance of openness and privacy for focused activities. Additionally, the zone includes a private management office, ensuring efficient administrative functions. This strategic layout considers the varying needs of users, blending public access with necessary privacy.

Figure 5.3
Community area floor plan
Source: Author, 2024

Section



The section drawing above illustrates how room locations have been strategically integrated based on varying levels of privacy required for each space. Public areas, such as communal spaces, are positioned closer to the entrance, while semi-public areas, like library and information center, are situated on the upper levels within the building to ensure seclusion and-tranquility. Additionally, the drawing highlights the use of bamboo as a primary structural element. The bamboo framework not only supports the overall architecture but also enhances the aesthetic appeal by bringing a natural, sustainable element into the design.

Figure 5.4
Community area section
Source: Author, 2024

Figure 5.5
Community area elevation
Source: Author, 2024

Elevation





Community Amphitheatre



The community amphitheatre will host various activities, including workshops, presentations, performances, and community gatherings. The vibe is open and engaging, with a focus on collaboration and learning. The design encourages interaction among participants, fostering a sense of community and shared purpose.

Figure 5.6
Community amphitheatre
Source: Author, 2024

Meeting Room



The meeting room is intended for smaller, more focused discussions, such as planning sessions, team meetings, and educational workshops. The atmosphere is professional yet relaxed, designed to facilitate productive conversations and decision-making in a comfortable setting.

Figure 5.7
Meeting room
Source: Author, 2024

Library of Permaculture



The library of permaculture will serve as a quiet, reflective space where visitors can study, research, and explore permaculture practices through books, digital resources, and interactive displays. The vibe is peaceful and contemplative, encouraging deep learning and connection with the principles of permaculture.

Figure 5.8
Library of permaculture
Source: Author, 2024

Information center



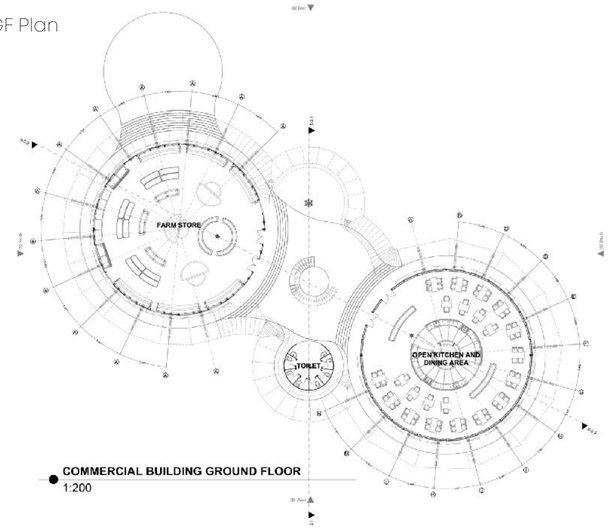
The information center acts as the hub for visitors, providing them with essential information about the farmstead, upcoming events, and educational resources. The vibe is welcoming and informative, designed to engage visitors and help them navigate the farmstead with ease while gaining a deeper understanding of its mission and activities.

Figure 5.9
Information center
Source: Author, 2024

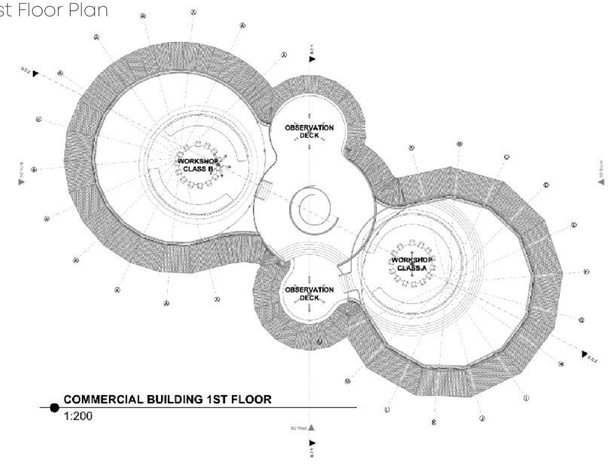
Commercial Zone

Floorplan

GF Plan



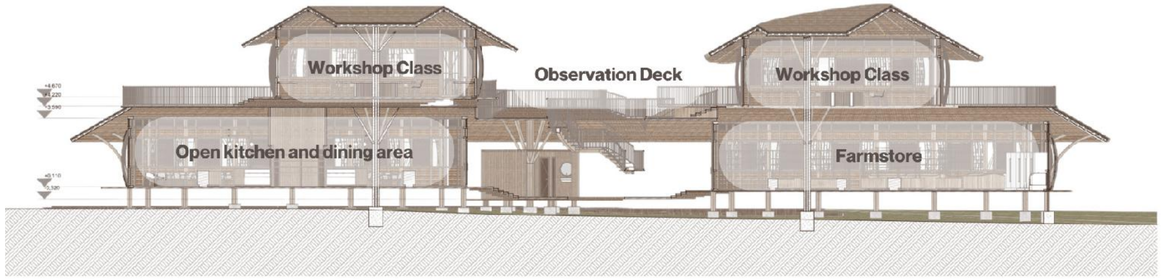
1st Floor Plan



The design of the commercial zone is centered on boosting the local economy and empowering the community. Within this building, a farmstore is established to sell crops that have been locally processed and packaged, providing a direct market for farm products. Adjacent to this is an open kitchen and dining area, where the community prepares and serves traditional dishes to visitors, offering an authentic culinary experience that promotes cultural heritage. Additionally, the building hosts workshop classes led by community members, facilitating the transfer of knowledge and skills in various areas such as cooking, crafts, and sustainable practices. This multifaceted approach not only supports local economic growth but also strengthens community bonds and preserves cultural traditions.

Figure 5.10
Commercial area floor plan
Source: Author, 2024

Section



The section drawing above illustrates how room locations have been strategically integrated based on varying levels of privacy required for each space. Public areas, such as open kitchen, dining area, and farmstore, are positioned at the lower level, while semi-public areas, like workshop class, are situated on the upper levels within the building.

Additionally, the drawing highlights the use of bamboo as a primary structural element. The bamboo framework not only supports the overall architecture but also enhances the aesthetic appeal by bringing a natural, sustainable element into the design.

Figure 5.11
Commercial area section
Source: Author, 2024

Figure 5.12
Commercial area elevation
Source: Author, 2024

Elevation





Farmstore



The farmstore offers fresh produce directly from the garden, creating a lively and vibrant atmosphere where visitors can purchase seasonal fruits, vegetables, herbs, and other farm products. The vibe is rustic and welcoming, emphasizing the freshness and quality of the produce, and connecting customers with the farm's sustainable practices.

Figure 5.13
Farmstore
Source: Author, 2024

Open kitchen and dining area



The open kitchen and dining areas are designed for cooking demonstrations, farm-to-table meals, and communal dining experiences. The vibe is warm, interactive, and social, with a focus on celebrating local, organic ingredients and fostering a strong connection between the food and its source.

Figure 5.14
Open kitchen and dining area
Source: Author, 2024

Workshop class



The workshop space is dedicated to hands-on learning, where visitors can participate in cooking classes, food preservation techniques, and other skill-building activities related to sustainable living. The vibe is creative and educational, encouraging experimentation and collaboration among participants while deepening their understanding of sustainable practices.

Figure 5.15
Woskshop class
Source: Author, 2024

Observation deck

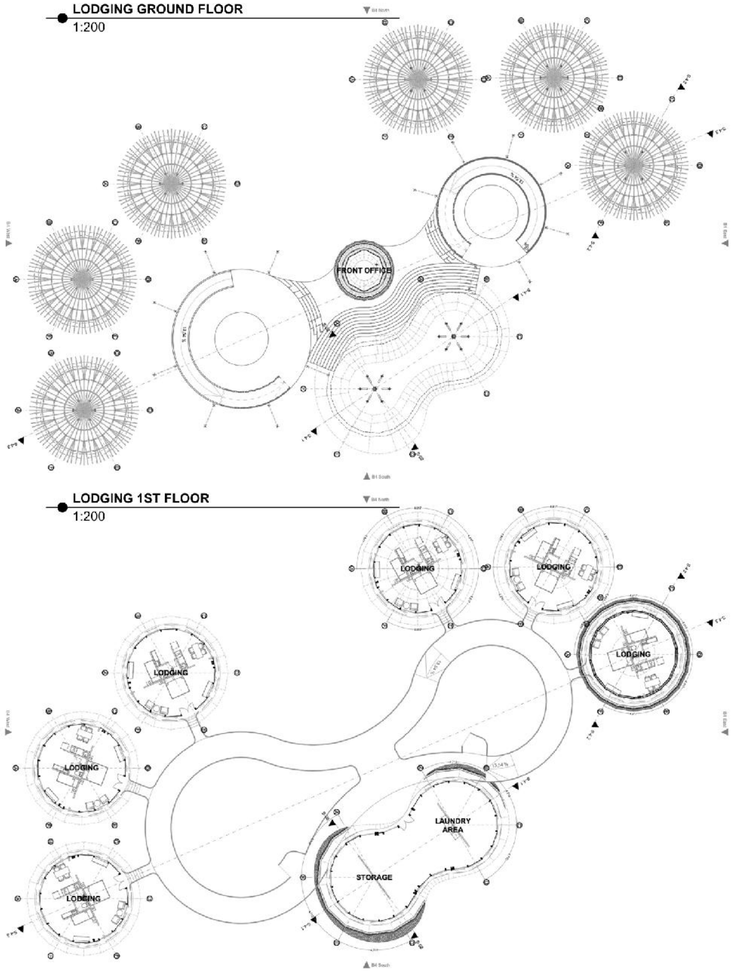


The observation deck is designed to offer visitors a panoramic view of the permaculture farming area, allowing them to observe the farm's activities and the landscape's natural beauty. The vibe is serene and contemplative, providing a space for reflection and a deeper appreciation of the harmonious integration of nature and sustainable farming practices.

Figure 5.16
Observation deck
Source: Author, 2024

Lodging

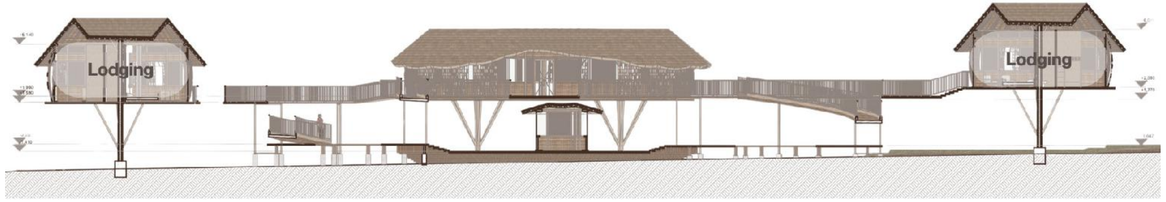
Floorplan



The plan drawing of the lodging area features six elevated lodging buildings and one service room. The elevated design allows for unobstructed views and preserves the natural landscape beneath. Each lodging building is arranged to ensure privacy and comfort, with pathways connecting them to common areas and amenities. The service room is centrally located to provide efficient support, including maintenance and guest services. The layout highlights how the elevated structures optimize the use of space and integrate seamlessly with the environment, enhancing both functionality and aesthetic appeal.

Figure 5.17
Lodging area floor plan
Source: Author, 2024

Section



The section drawing of the lodging area shows six elevated lodging buildings and one service room. The elevated construction enhances views and minimizes environmental impact by preserving the landscape below. Each lodging building offers comfortable accommodations, while the service room provides essential support services. This layout improves operational efficiency and guest experience while maintaining environmental sustainability.

Figure 5.18
Lodging area section
Source: Author, 2024

Figure 5.19
Lodging area elevation
Source: Author, 2024

Elevation





Lodging Interior



The lodging rooms offer a cozy and comfortable space for guests to relax after a day of exploring the farmstead. Designed with natural materials and a minimalist aesthetic, the rooms provide a peaceful retreat that connects guests with the surrounding environment. The vibe is calm and restful, with an emphasis on simplicity and comfort.

Figure 5.20
Lodging Interior
Source: Author, 2024

Exterior Perspective



The exterior of the lodging building features elevated pathway that overlook the surrounding forest, creating a seamless connection between the spaces and nature. The vibe is tranquil and immersive, allowing guests to wake up to the sounds and sights of the forest, fostering a deep sense of relaxation and connection with nature.

Figure 5.21
Exterior perspective
Source: Author, 2024

Pathway



The elevated pathway connects the lodging building with other areas of the farmstead, providing guests with a unique perspective as they move through the landscape. Suspended above the ground, the pathway allows for unobstructed views of the natural surroundings and ensures minimal disruption to the ecosystem. The vibe is exploratory and serene, inviting guests to experience the farmstead from a different angle.

Figure 5.22
Lodging pathway
Source: Author, 2024

Welcoming Area



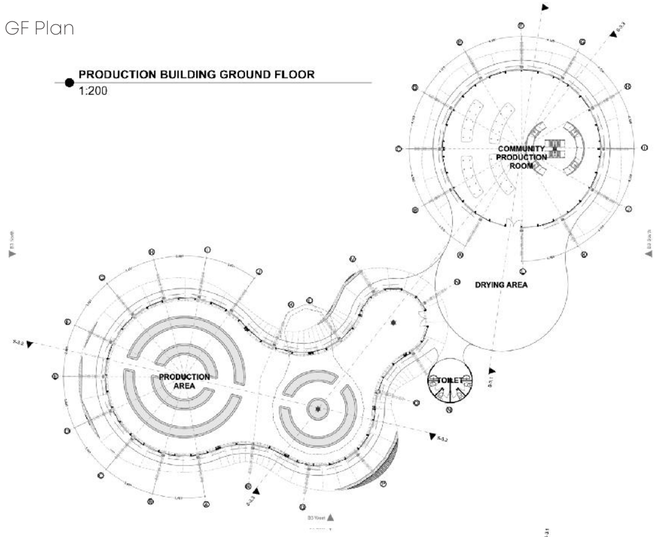
The welcoming area on the ground floor of the lodging building serves as the first point of contact for guests. Designed with warm, natural materials and an open layout, it creates an inviting atmosphere where guests can check in, gather information before heading to their rooms. The vibe is friendly and welcoming, setting the tone for a comfortable and enjoyable stay.

Figure 5.23
Lodging welcoming area
Source: Author, 2024

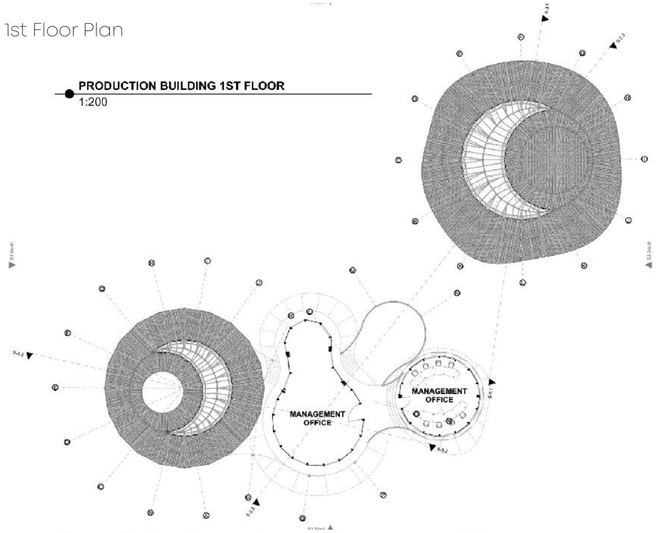
Production Zone

Floorplan

GF Plan



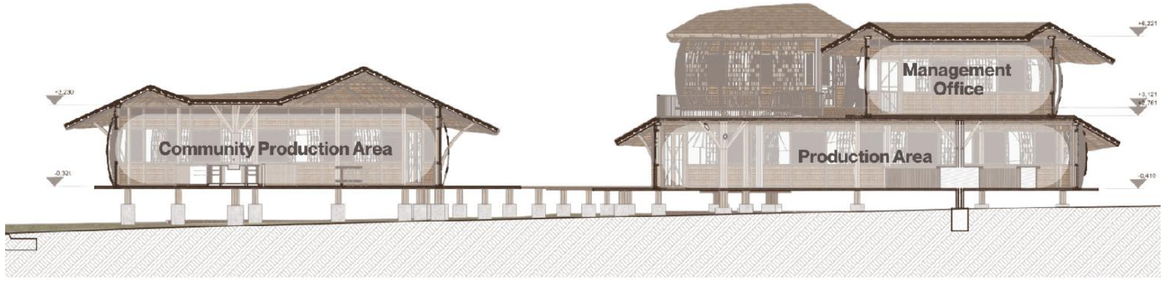
1st Floor Plan



The design of the production building is focused on enhancing the value of harvested crops by transforming them into higher-value products. The ground floor features two key areas: a community production room and a dedicated production area. The community production room serves as a vital space for the MSME (Micro, Small, and Medium Enterprises) community to gather, collaborate, and create traditional food products, fostering local entrepreneurship and preserving culinary heritage. The adjacent production area is dedicated to processing harvested crops, where they undergo washing, packaging, and other value-adding processes to increase their market appeal and selling price. On the first floor, a management office oversees the entire production process, ensuring efficient operation and quality control. This thoughtful design not only supports the local economy but also encourages community involvement and sustainable practices.

Figure 5.24
Production area floor plan
Source: Author, 2024

Section



The section drawing of the production area shows three main spaces: the community production room, the crop processing room, and the management office. The community production room supports micro businesses with shared facilities for product development. The crop processing room is designed for turning harvested crops into value-added products, equipped with necessary machinery. The management office oversees these operations, ensuring coordination and efficiency. The layout demonstrates how these spaces are organized to streamline production and administrative functions.

Figure 5.25
Production area section
Source: Author, 2024

Figure 5.26
Production area elevation
Source: Author, 2024

Elevation





Production Area



The production room is dedicated to transforming harvested crops from the farmstead into value-added products, such as preserves, dried goods, or packaged produce. This space is efficiently organized to handle various stages of food processing, ensuring that raw materials are utilized to their fullest potential. The vibe is functional and purposeful, with a focus on sustainability and maximizing the economic value of the farm's output while maintaining high-quality standards.

Figure 5.27
Production area
Source: Author, 2024

Community Production Area

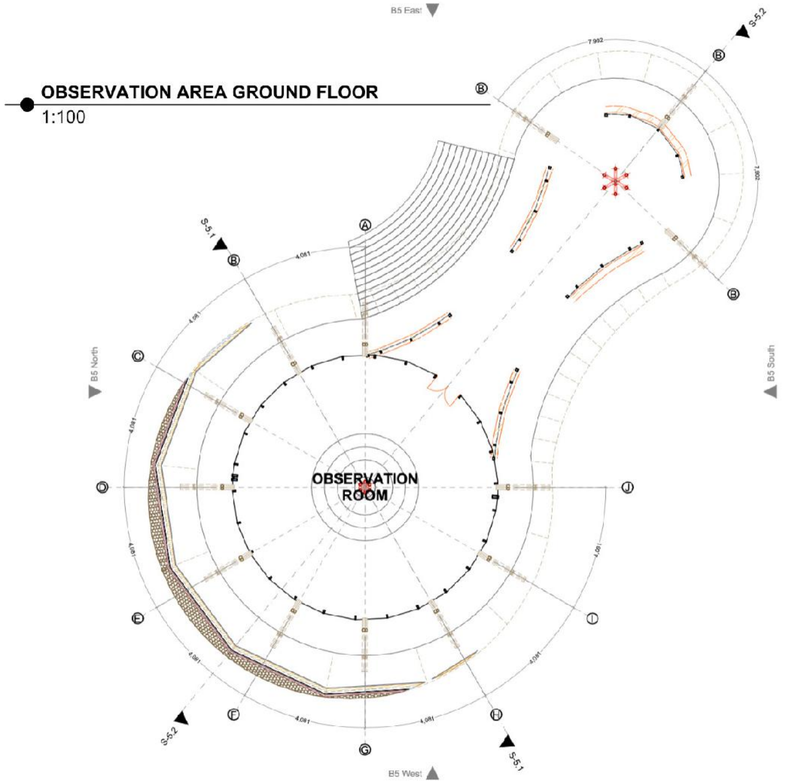


he community production room is designed as a collaborative space where local micro businesses can produce and develop their products. Equipped with essential tools and resources, this room fosters entrepreneurship and community empowerment by providing a shared environment for small-scale producers. The vibe is industrious and supportive, encouraging innovation and cooperation among community members, and contributing to the local economy.

Figure 5.28
Community production area
Source: Author, 2024

Observation Area

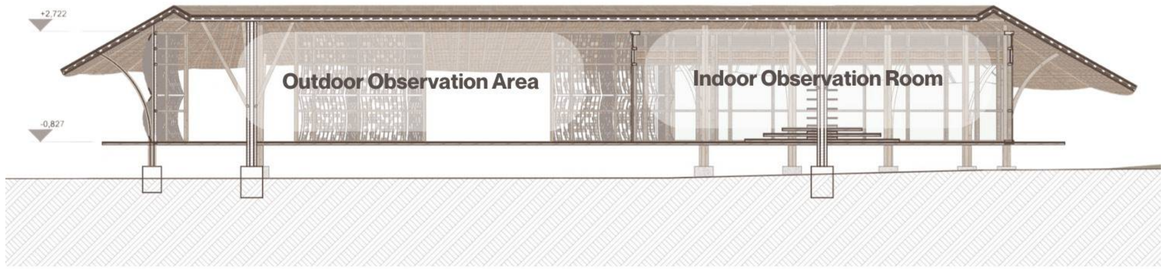
Floorplan



The plan drawing of the observation area illustrates a dual-purpose design with distinct indoor and outdoor observation spaces. The plan shows how these areas are integrated to provide a seamless transition between sheltered and open-air viewing, enhancing the visitor's experience of the farmstead.

Figure 5.29
Observation area floorplan
Source: Author, 2024

Section



The section drawing of the observation area features two distinct spaces: the indoor and outdoor observation areas. The indoor area is designed with large windows to offer sheltered, panoramic views of the permaculture landscape, allowing for comfortable observation and educational engagement regardless of weather conditions. In contrast, the outdoor observation area provides an open-air, elevated vantage point for visitors to directly experience the natural surroundings, enhancing their connection with the environment through sensory engagement.

Figure 5.30
Observation area section
Source: Author, 2024

Figure 5.31
Observation area elevation
Source: Author, 2024

Elevation





Indoor Observation Area



The outdoor observation area offers an open-air experience, where visitors can fully immerse themselves in the sights and sounds of the farmstead. Positioned to provide a broad view of the landscape, this area allows for a direct connection with nature, offering a more dynamic and sensory-rich observation experience. The vibe is open and invigorating, encouraging visitors to engage with the environment and appreciate the natural beauty of the farmstead from an elevated perspective.

Figure 5.32
Outdoor observation area
Source: Author, 2024

Outdoor Observation Area

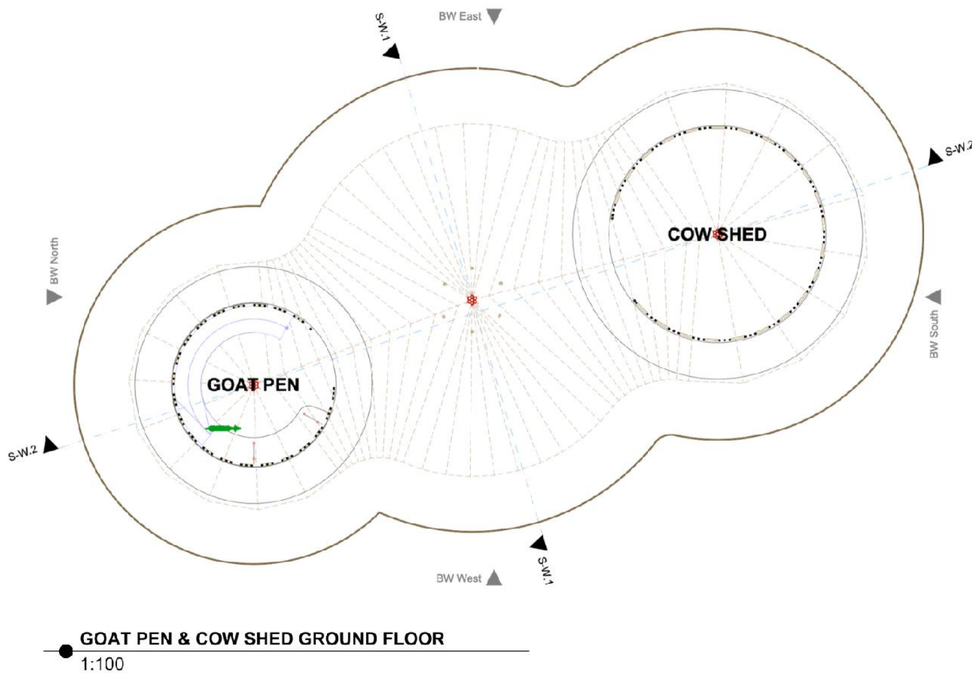


The indoor observation area provides a sheltered space for visitors to observe the permaculture farmstead in comfort, regardless of the weather. It features large windows that frame views of the landscape, allowing guests to study the farming activities and natural surroundings while staying indoors. The vibe is contemplative and serene, offering a quiet place for reflection and learning, with informational displays that enhance the visitor's understanding of the permaculture principles at work.

Figure 5.33
cdSource: Author, 2024

Goat and Cow Shed

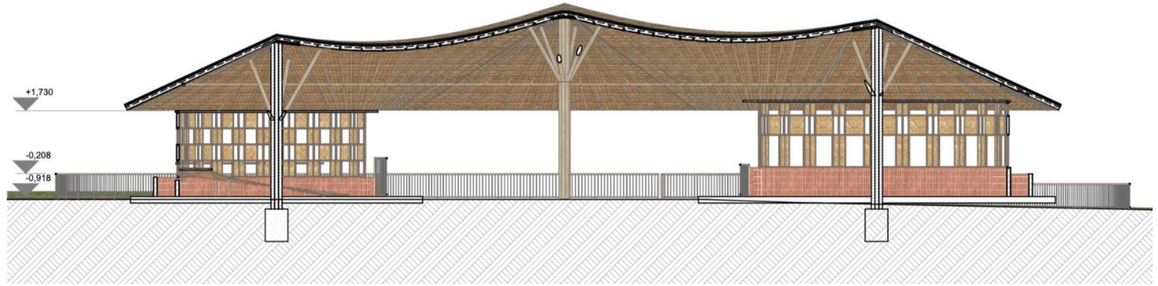
Floorplan



The plan drawing of the goat and cow sheds demonstrates their integration within the permaculture farmstead. The goat shed is designed with adjustable features for feeding and milking, promoting adaptability and ease of management. The cow shed includes dedicated areas for feeding, milking, and waste management, Both sheds are strategically placed to enhance overall farm functionality, aligning with permaculture principles by integrating livestock management with ecological balance and operational efficiency.

Figure 5.34
Goat pen and cow shed floor plan
Source: Author, 2024

Section

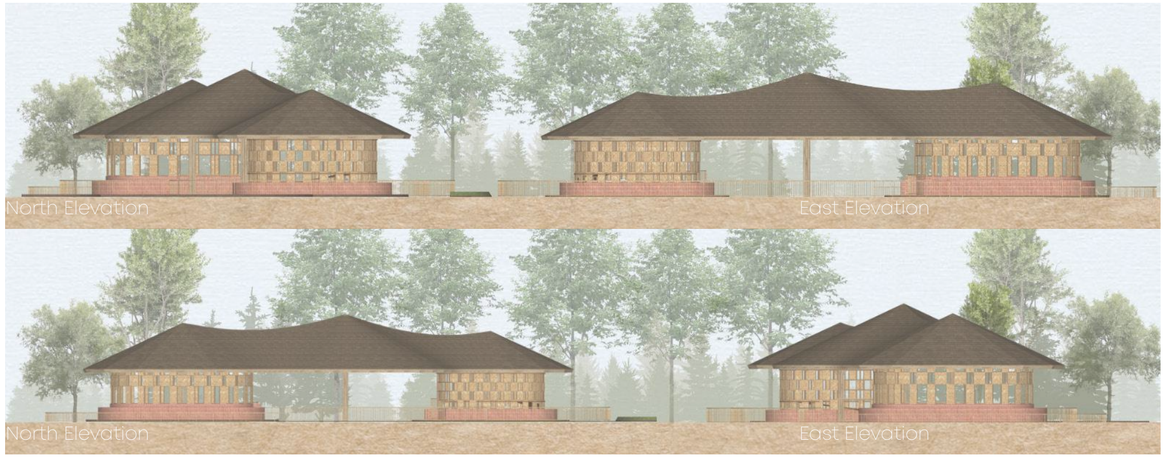


The section drawing of the goat and cow sheds illustrates their design with a focus on sustainability and integration within the permaculture farmstead. The sheds feature tree-like columns made from bamboo, providing both structural support and a natural aesthetic that complements the farmstead's eco-friendly design. The walls are constructed from woven bamboo, which offers adequate ventilation while maintaining durability and protection from the elements. This design enhances airflow and comfort for the animals, aligns with permaculture principles by using renewable materials, and supports the overall ecological balance of the farmstead.

Figure 5.35
Goat pen and cow shed section
Source: Author, 2024

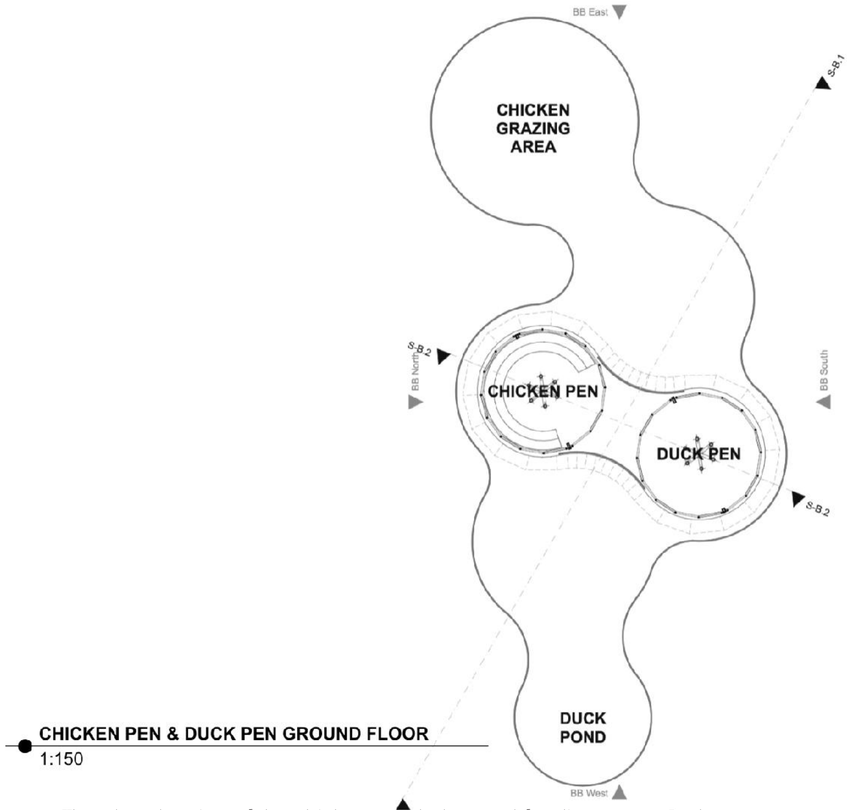
Figure 5.36
Goat pen and cow shed elevation
Source: Author, 2024

Elevation



Chicken and Duck Pen

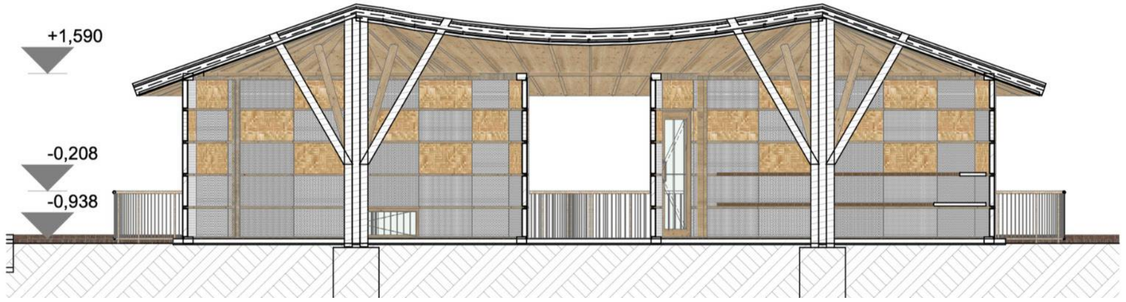
Floorplan



The plan drawing of the chicken and duck pens illustrates their strategic design within the permaculture farmstead. The chicken pen features secure, spacious areas with nesting boxes and perches, promoting natural behaviors and easy management. Adjacent to it, the duck pen includes a pond area for waterfowl activities, integrating water management with shelter and feeding areas. Both pens are designed with access to natural environments, such as shaded areas and foraging spaces, enhancing animal welfare and ecosystem integration.

Figure 5.37
Chicken and duck pen floor plan
Source: Author, 2024

Section

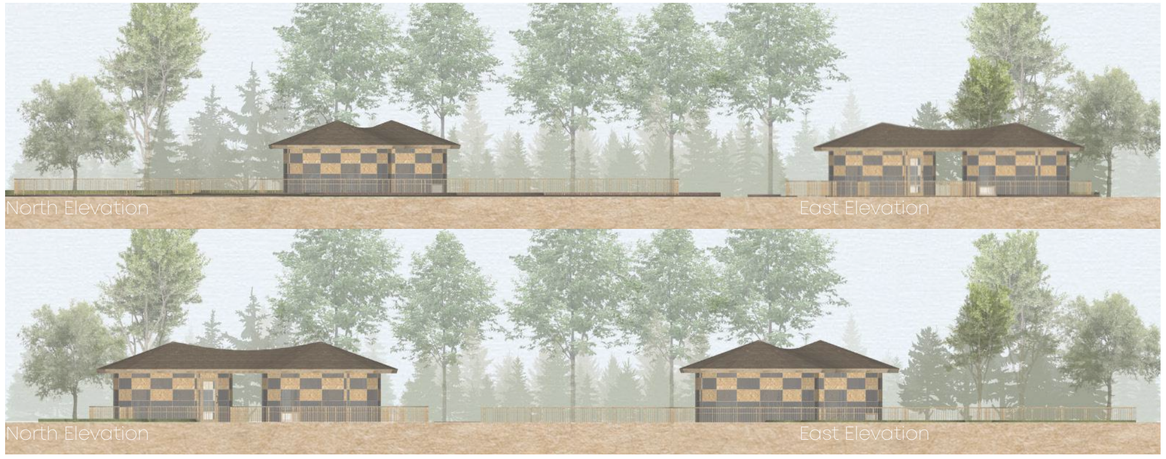


The section drawing of the chicken and duck pens features tree-like columns made from bamboo, providing both structural support and a natural aesthetic that integrates with the permaculture farmstead. The walls are constructed from mesh, offering protection while allowing for natural ventilation and lighting. This design ensures that the pens remain well-ventilated and well-lit, enhancing the health and comfort of the birds. The bamboo columns and mesh walls reflect the permaculture principles of using renewable materials and creating a harmonious environment that supports both the animals and the surrounding ecosystem.

Figure 5.38
Chicken and duck pen section
Source: Author, 2024

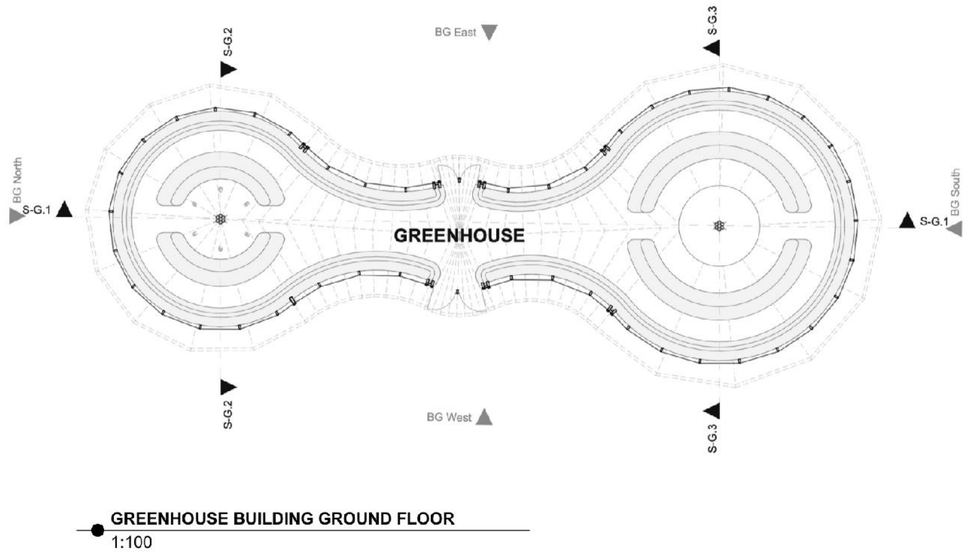
Figure 5.39
Chicken and duck pen elevation
Source: Author, 2024

Elevation



Greenhouse

Floorplan



The plan drawing of the greenhouse in the permaculture farmstead demonstrates its strategic design for optimizing plant growth and resource use. The greenhouse is positioned to maximize solar gain, with its orientation and design allowing for ample natural light and passive solar heating.

Figure 5.40
Greenhouse floor plan
Source: Author, 2024

Section



T he section drawing of the greenhouse showcases its design with tree-like bamboo columns that provide structural support while integrating naturally with the permaculture farmstead. The walls are constructed from transparent solid material, allowing abundant natural light to penetrate and support plant growth, while also protecting the vegetation from external insects and animals. This design ensures optimal light conditions and maintains a controlled environment within the greenhouse.

Figure 5.41
Greenhouse section
Source: Author, 2024

Figure 5.42
Greenhouse elevation
Source: Author, 2024

Elevation



Farming Area



Keyhole Garden

The keyhole garden, visualized in Zone 1, is designed for close proximity to the main living areas, allowing for easy access and frequent maintenance. Its distinctive circular layout features a central composting basket, enabling efficient use of space and resources. This design promotes high-yield cultivation and intensive planting, maximizing productivity in a compact area. The close location ensures that the garden is highly functional for daily use and quick harvesting, supporting a sustainable and easily manageable food source.

Figure 5.43
Keyhole garden
Source: Author, 2024

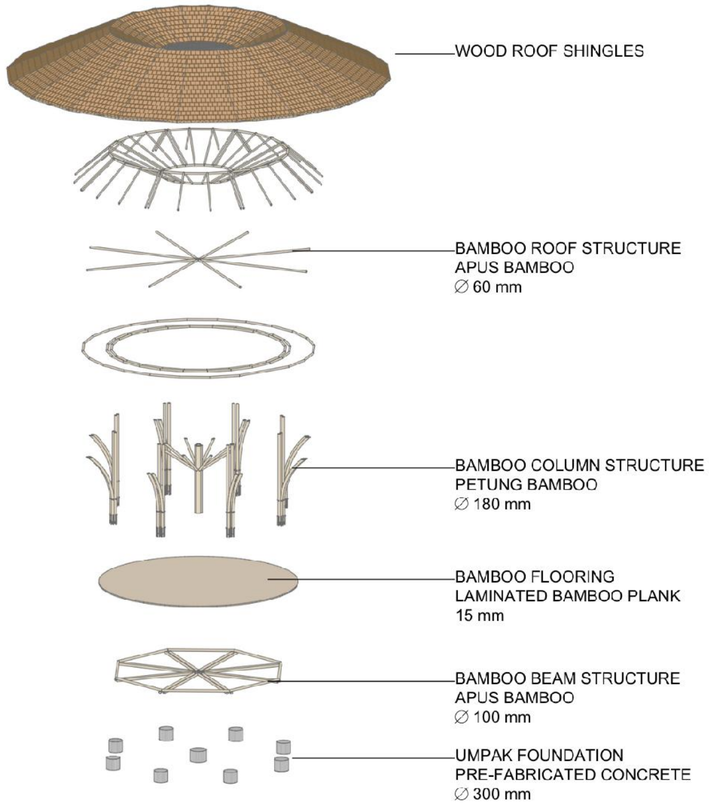


Mandala Garden

The mandala garden, visualized in Zone 3, showcases a larger, radial design with concentric circles that spread outward. Located further from the main living areas, this garden supports a diverse array of plants and crops, making efficient use of the available space. Its expansive layout allows for a more extensive and visually appealing garden, integrating various plant species and enhancing overall biodiversity. The mandala garden emphasizes the principle of using and valuing the marginal by transforming a larger area into a productive and aesthetic feature of the farmstead.

Figure 5.44
Mandala garden
Source: Author, 2024

Structural Axonometry



The structural axonometry drawing highlights a sustainable design utilizing locally-sourced materials. The roof is covered with wood shingles for natural weather resistance, supported by apus bamboo for its strength and flexibility. Tree-like primary columns made from petung and apus bamboo provide stability, while the "V" columns on the periphery, also made from apus bamboo, add architectural interest. The flooring consists of laminated bamboo planks, ensuring durability and cohesion with the bamboo structure. The beams, likewise crafted from apus bamboo, reinforce the structure, all resting on a prefabricated concrete foundation that offers stability and durability.

Figure 5.45
Exploded Axonometry of Structural Scheme
Source: Author, 2024

Building Detail

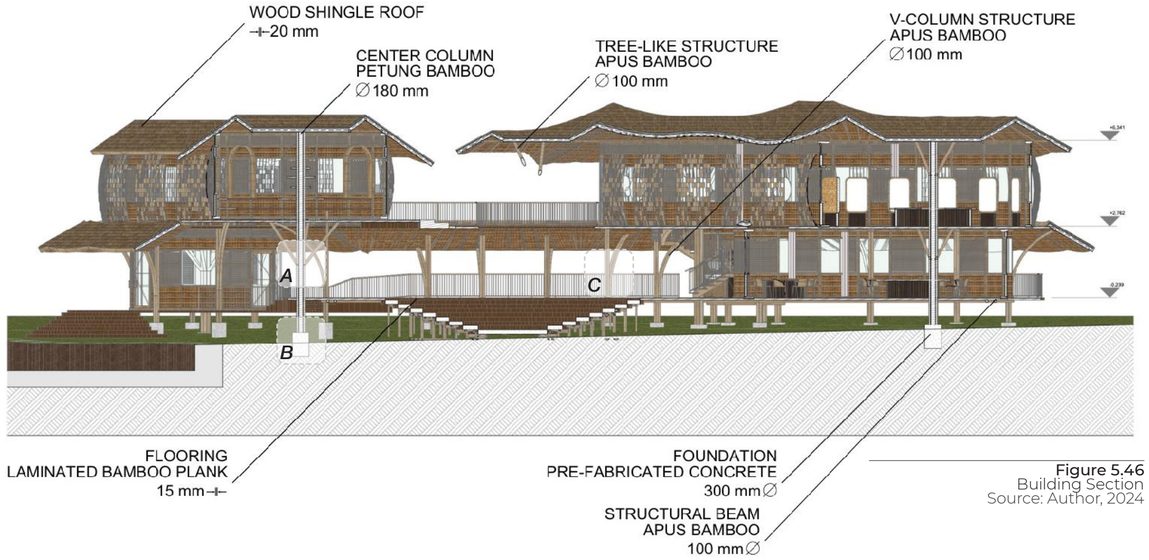


Figure 5.46
Building Section
Source: Author, 2024

A Center Column Detail

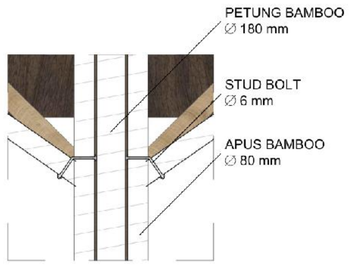


Figure 5.47
Center column detail
Source: Author, 2024

B Foundation Detail

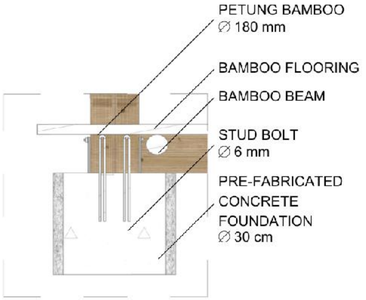


Figure 5.48
Foundation detail
Source: Author, 2024

C 'V' Column Detail

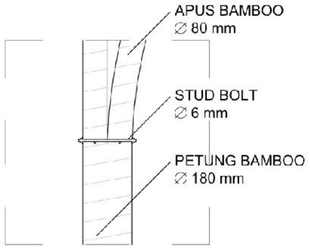


Figure 5.49
'V' column detail
Source: Author, 2024

Utility Scheme

Black Water Management



Figure 5.50
Black water management utility scheme
Source: Author, 2024

Biogas Detail

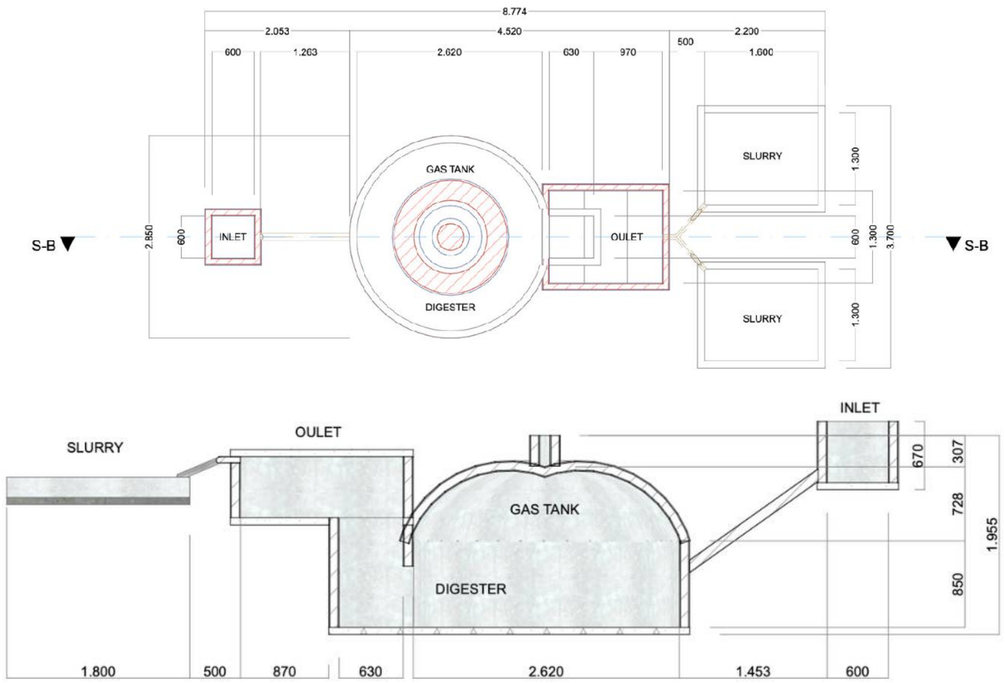
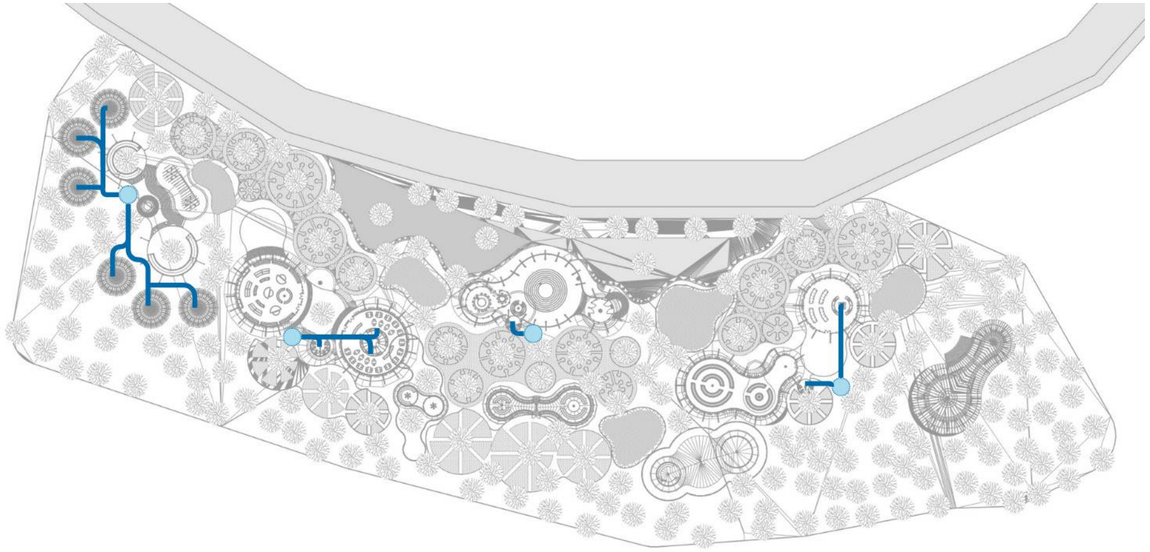


Figure 5.51
Biogas detail
Source: Author, 2024

The biogas feature is an integral part of the permaculture farmstead, designed to convert organic waste into valuable gas that can be used as a sustainable energy source, particularly for kitchen use. The process begins with the collection of organic materials, such as animal manure, kitchen scraps, and crop residues, which are fed into an anaerobic digester. Inside this sealed environment, microorganisms break down the organic matter in the absence of oxygen, producing biogas—a mixture primarily composed of methane and carbon dioxide.

Clean Water Management

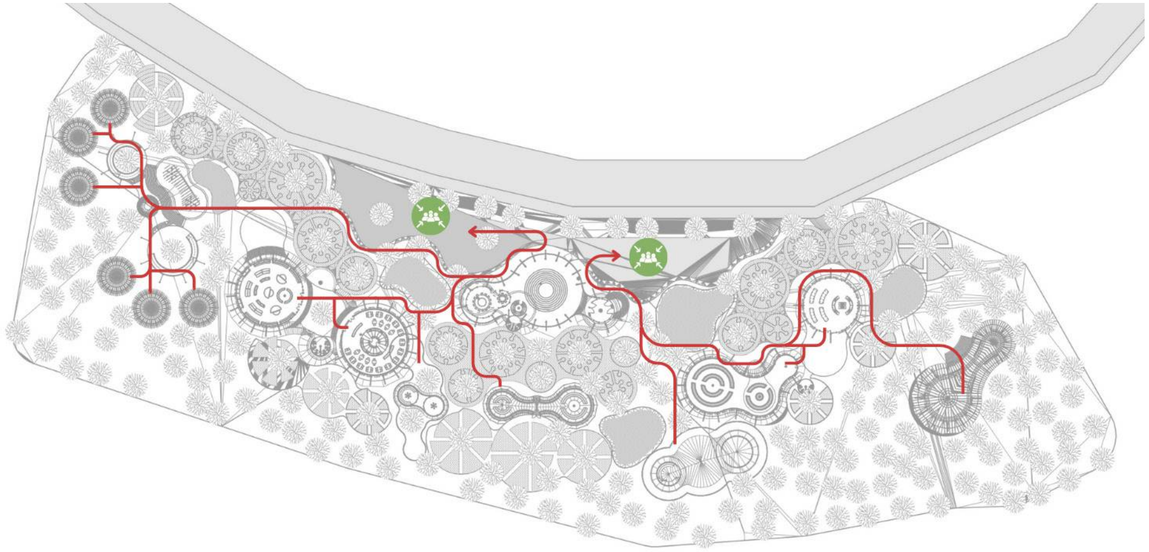


CLEAN WATER SOURCE

CLEAN WATER PIPE

Figure 5.52
Clean water management
Source: Author, 2024

Evacuation Route



ASSEMBLY POINT

EVACUATION ROUTE

Figure 5.53
Emergency evacuation route
Source: Author, 2024

Perspectives



Figure 5.54
Lodging pathway
Source: Author, 2024



Figure 5.55
Parking area
Source: Author, 2024



Figure 5.56
Lodging welcoming area
Source: Author, 2024



Figure 5.57
Water retention pond
Source: Author, 2024



Figure 5.58
Greenhouse
Source: Author, 2024



Figure 5.59
Information center
Source: Author, 2024



Figure 5.60
Chicken and duck pen
Source: Author, 2024



Figure 5.61
Greenhouse and surrounding garden
Source: Author, 2024



06
DESIGN EVALUATION

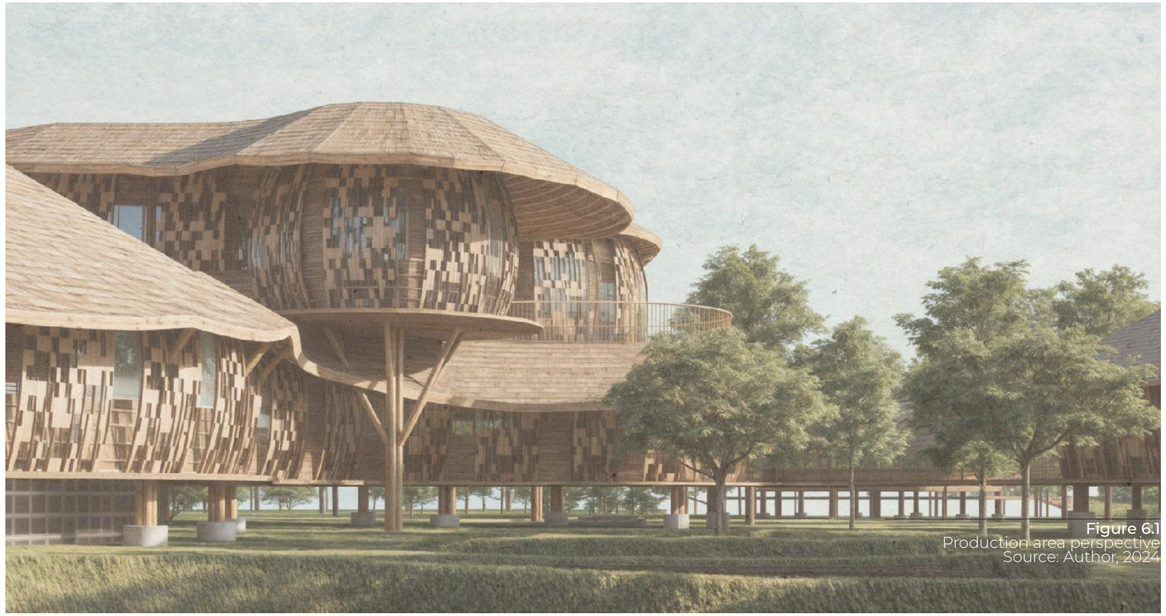


Figure 6.1
Production area perspective
Source: Author, 2024

Conclusion Review

Based on the evaluation results, the examiner and supervisor provided feedback on several aspects of the design, offering valuable insights aimed at enhancing the overall quality and effectiveness of the project. These responses are intended to refine the design, ensuring that it not only meets but exceeds expectations by addressing any weaknesses and optimizing-key features. The feedback emphasizes the need for certain improvements, which, when implemented, will lead to a more robust and well-rounded design. Below are some specific areas that require additional detail and attention to achieve a more optimal outcome.

1. The design needs to prioritize the principles of permaculture and farming over architectural dominance.
2. Significant concerns about the buildability of the design, particularly regarding the choice of bamboo.
3. The section drawing currently lacks the necessary detail to effectively convey the building's structural elements.

1 Prioritize the principles of permaculture and farming over architectural dominance

The design of this building has carefully integrated the ethics and principles of permaculture across all aspects, including the selection of building materials, the organization of room programs, the configuration of the farm area, and the strategic placement of buildings in accordance with permaculture zoning principles. However, based on valuable advice and feedback from the jury, it has become evident that the agricultural and natural areas should be more expansive compared to the building footprint. This adjustment is crucial because the primary objective of the-design is to support agricultural activities and promote sustainable land use. In the initial design, the effort was made to preserve existing forested areas and trees by situating buildings in tree-free zones, thereby minimizing environmental disruption.

Additionally, each designated zone was planned to ensure that ample space was allocated for farming activities. The accompanying site plan illustrates the proportional relationship between the building area and the overall site area. With a total site area of 21,331 m2 (or 2.1 hectares), the calculated building size is xxx m2, resulting in a ratio of x or x percent of the total land area.

Despite these efforts, the designer acknowledges the importance of ensuring that the agricultural and natural spaces remain larger than the building area to align with the core values of permaculture. This realization will serve as a critical point of reflection and improvement in future designs, guiding the designer to prioritize the natural environment and the fundamental purpose of the building, ensuring that the final design output is both contextually appropriate and sustainable.



Figure 6.2
Design masterplan
Source: Author, 2024

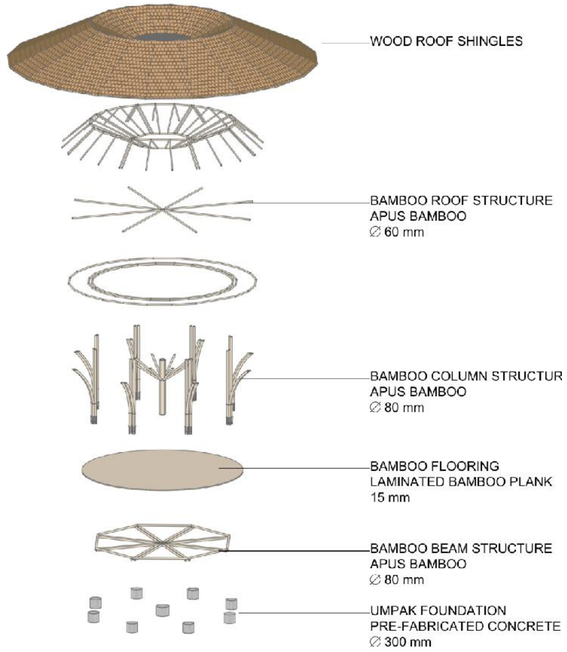
2 Design buildability, the choice of bamboo

The selection of bamboo for the main structural columns in the construction has been identified as a critical concern, particularly regarding the use of Apus bamboo. Apus bamboo, while commonly used in various applications, has been deemed unsuitable for the main columns due to its relatively small diameter of 80 mm, which compromises its strength and ability to adequately support the building's load. This limitation poses a risk to the overall structural stability of the building.

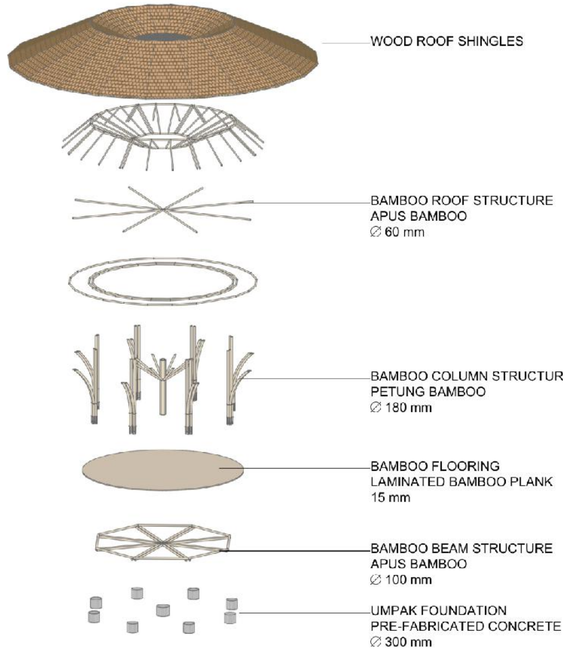
o rectify this issue, Apus bamboo has been replaced with Petung bamboo, a species known for its greater robustness and durability. Petung bamboo, with a much larger diameter of 180 mm, offers significantly improved load-bearing capacity, making it a more appropriate choice for the main columns. This change not only enhances the structural integrity of the building but also aligns with the project's commitment to using sustainable materials while ensuring safety and durability.

Figure 6.3
Revision on exploded axonometry
Source: Author, 2024

Before



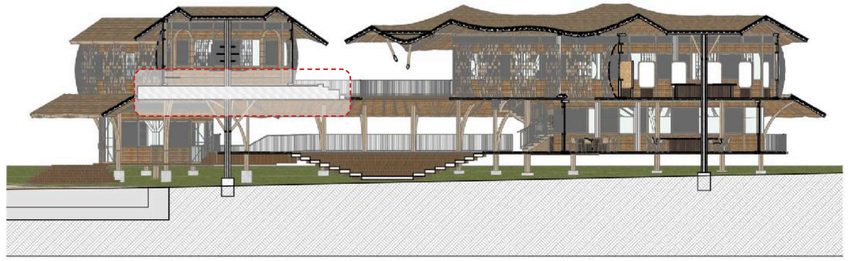
After



3 Detailed drawing with LOD 300

In the initial detailed depiction of the building elements, several errors were identified, particularly concerning the thickness of the flooring and the diameter of the bamboo used as the main column. These inaccuracies could potentially compromise the building's structural integrity and overall design coherence. To address these issues, additional technical drawings have been created. These updated drawings include detailed plans with revised notations and dimensions to accurately reflect the correct specifications. Furthermore, the sections have been enhanced by adding height notations and material descriptions, providing a clearer and more precise understanding of the building's construction details. These improvements ensure that all elements are accurately represented, facilitating a more reliable and effective construction process.

Before



After



Figure 6.4
Revision on building section
Source: Author, 2024

07
ATTACHMENT

Plagiarism Check

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Bismillaahirrahmaanirrahiim

Assalamualaikum Wr. Wb.

Dengan ini, menerangkan Bahwa:

Nama	: Amelia Shafa Kartika
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Pembimbing	: Dr. - Ing. Putu Ayu Pramanasari Agustiananda, S.T., M. A.
Fakultas / Prodi	: Teknik Sipil dan Perencanaan/ Farmasi
Judul Karya Ilmiah	: The Design of Permaculture Farmstead in Ngoro-oro

Karya ilmiah yang bersangkutan di atas telah melalui proses cek plagiasi menggunakan **Turnitin** dengan hasil kemiripan (*similarity*) sebesar **4 (Empat) %.**

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Wassalamualaikum Wr. Wb.

Yogyakarta, 7/29/2024
Direktur

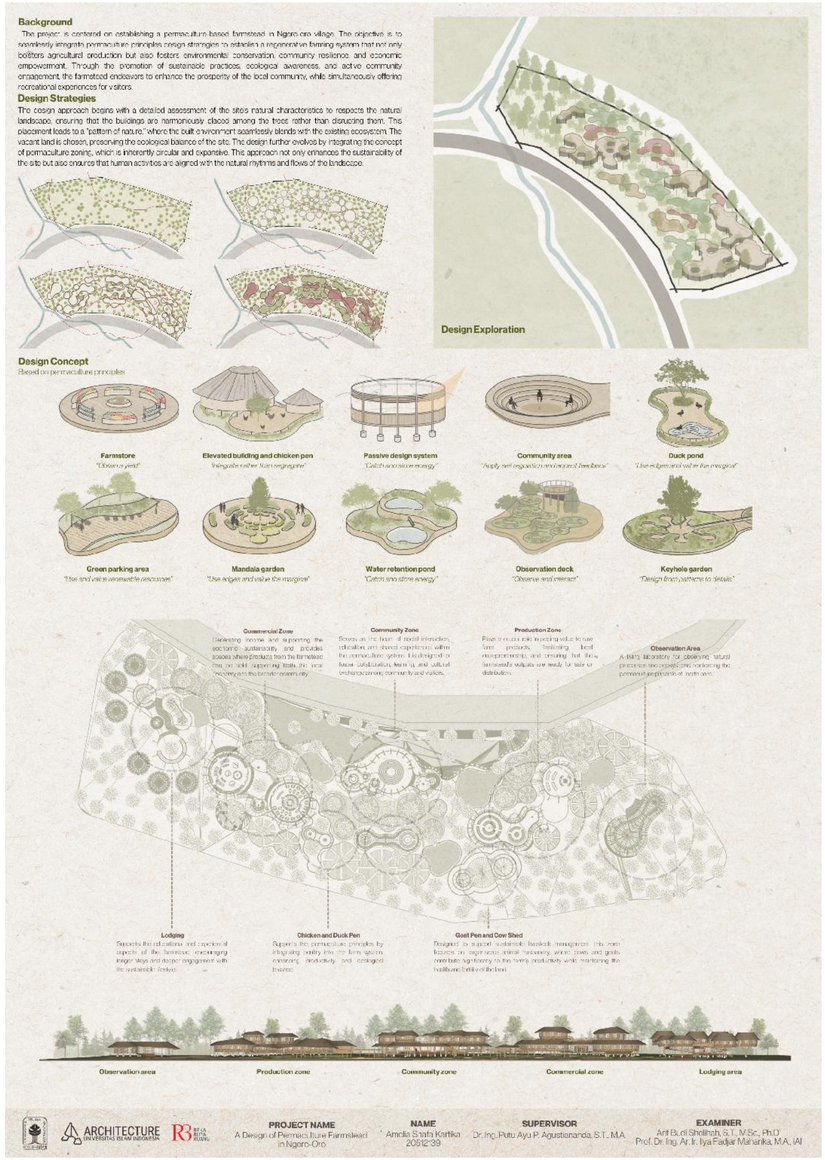
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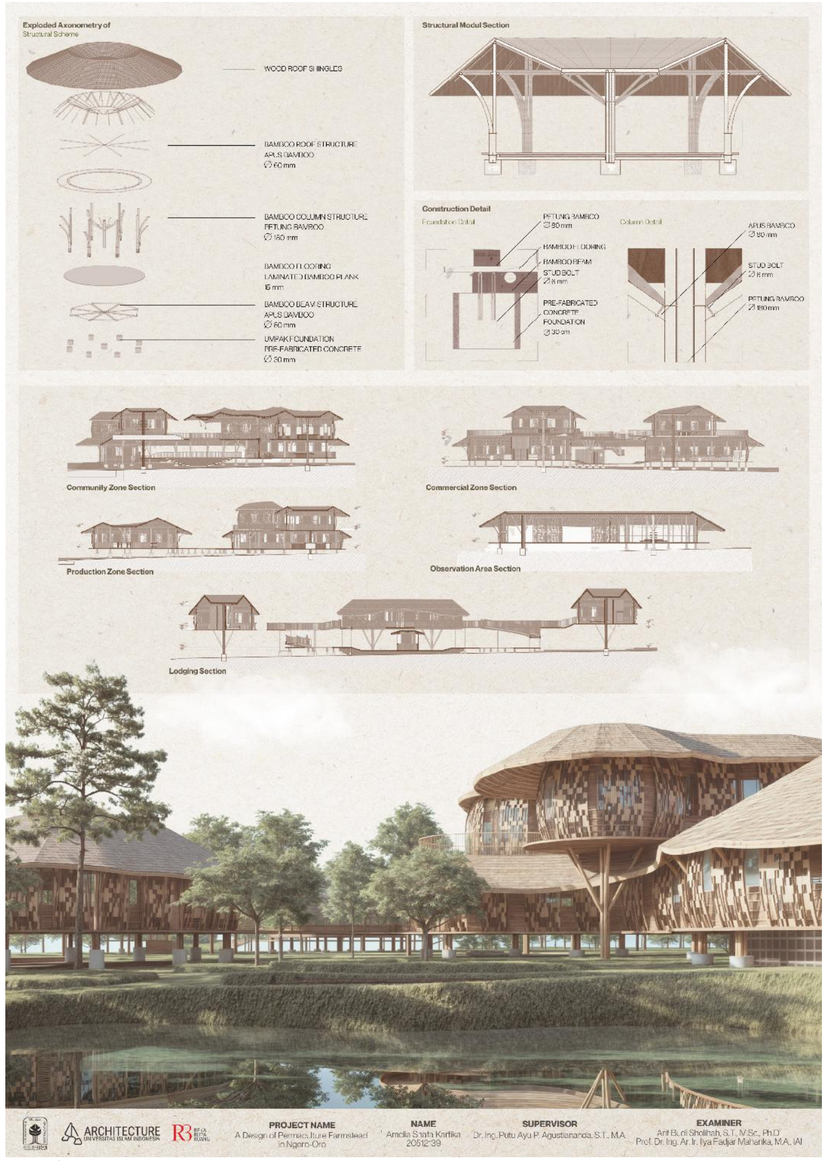
Muhammad Jamil, SIP.

Architectural Presentation Board [APREB]

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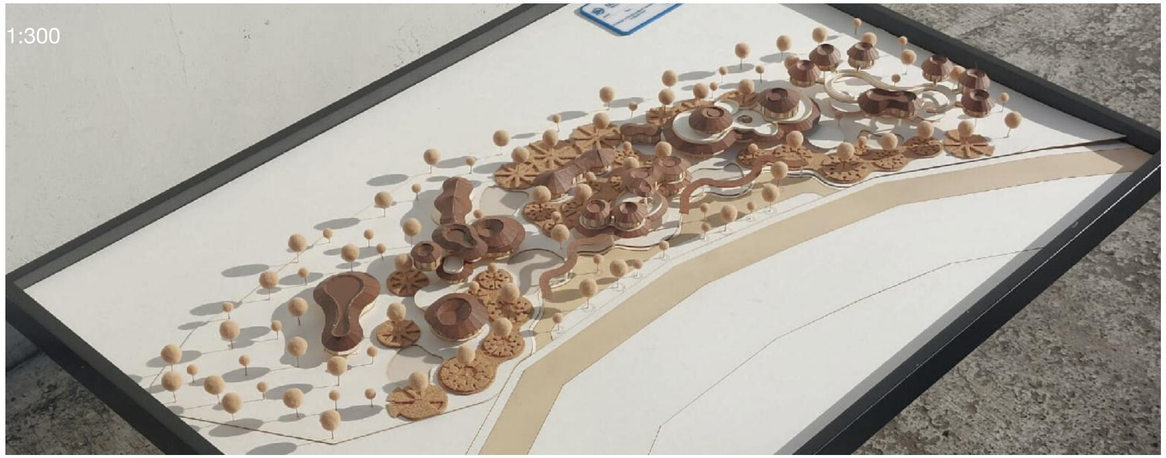


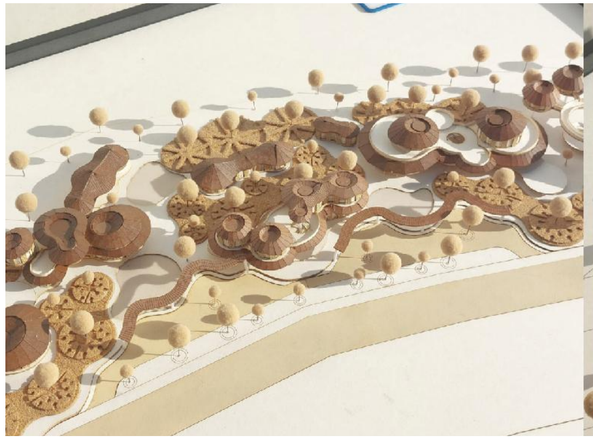



Exploded Axonometry of
Structural Scheme
WOOD ROOF SHINGLES
BAMBOO ROOF STRUCTURE
APUS BAMBOO
∅ 60 mm
BAMBOO COLUMN STRUCTURE
PETUNG BAMBOO
∅ 150 mm
BAMBOO FLOORING
LAMINATED BAMBOO PLANK
15 mm
BAMBOO BEAM STRUCTURE
APUS BAMBOO
∅ 80 mm
UMPAK FOUNDATION
PRE-FABRICATED CONCRETE
∅ 30 mm
Structural Modul Section
Construction Detail
Foundation Detail
PETUNG BAMBOO
∅ 80 mm
BAMBOO FLOORING
BAMBOO BEAM
STUD BOLT
∅ 8 mm
PRE-FABRICATED
CONCRETE
FOUNDATION
∅ 30 cm
Column Detail
APUS BAMBOO
∅ 80 mm
STUD BOLT
∅ 8 mm
PETUNG BAMBOO
∅ 150 mm
Community Zone Section
Commercial Zone Section
Production Zone Section
Observation Area Section
Lodging Section
ARCHITECTURE
PROJECT NAME
A Design of Permaculture Farmstead in Ngoro-Oro
NAME
Amelia Sraita Kartika
20512-39
SUPERVISOR
Dr. Ing. Putu Ayu P. Agustinanda, S.T., M.A.
EXAMINER
Arif Budi Sholihah, S.T., M.Sc., Ph.D
Prof. Dr. Ing. Ar. Ir. Ilya Fadjar Maharika, M.A., IAI

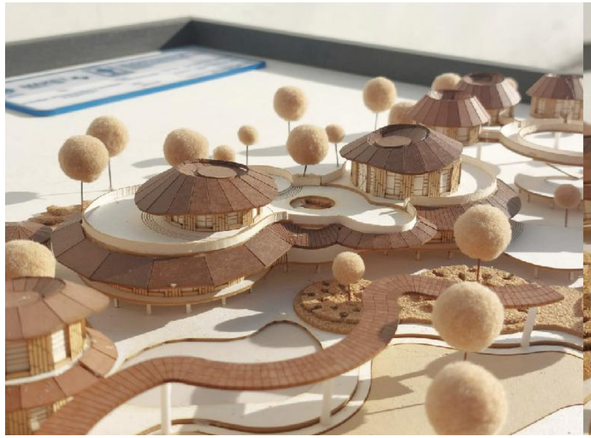

Keyhole Garden, Zone 1 of Permaculture
Farmstore
Greenhouse
Observation Area
Library of Permaculture
Community Production Area
Lodging
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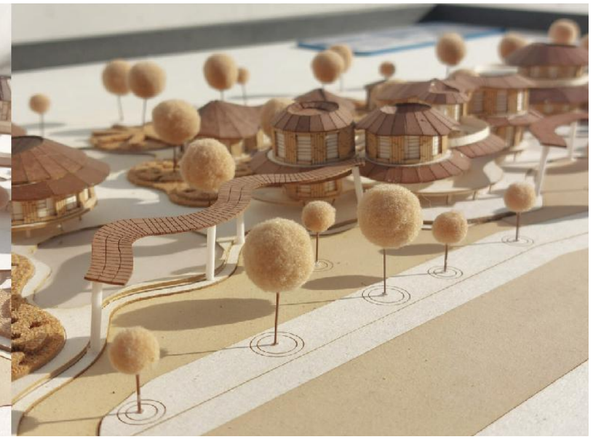
3D Model















Technical Drawing



Scan to access technical drawing

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