The Application of Adaptive Concept Form of Tissue Culture Laboratory Building in Black Orchid Research and Development Center in Samarinda

To cite this article: R Fajarini et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 462 012031

View the article online for updates and enhancements.
The Application of Adaptive Concept Form of Tissue Culture Laboratory Building in Black Orchid Research and Development Center in Samarinda

R Fajarini¹, I Ratniarsih¹ and Sukarnen¹

¹Department of Architecture, FTSP, Institut Teknologi Adhi Tama Surabaya, Surabaya, Indonesia

rizkifjrini@gmail.com

Abstract. Black Orchid is an endangered species in East Kalimantan in the last five years. If it’s not conserved, this endemic species will extinct. The research and development center aims to research and develop black orchids so that the population is maintained. In this research and development, the main facilities are tissue culture laboratory and greenhouse with adaptive as the concept form. The adaptive concept was applied to create a form of building that can adapt to the environment, without having to reject the use of modern materials and technology. The shape of the structure based on the shape of regional architecture of East Kalimantan which adapts to the local cultural values to create harmony with the surrounding environment. The characteristic of the building has many openings, and in the front facade, there are typical of Dayak carvings with philosophy as protection of the building.

1. Introduction

1.1 Background

Black orchids’ population is currently decreasing, and even their presence in nature threatened with extinction due to excessive harvesting because black orchids are in high demand by the public. Another reason that causes a decline in the black orchid population is the growing habitat that damaged by logging and land conversion and the flowering period is very short (withering), and flowers are relatively difficult to cross. Design of Tissue Culture Laboratory Facilities at the Center for Black Orchid Research and Development provides solutions for orchids vegetative development so that the population maintained and balanced. The research facility was designed to adapt to the surrounding environment and culture so that the design can give a cultural image of East Kalimantan and able to adapt to the environment.

Figure 1. Black Orchid (Coelogyne pandurata)
1.2 Problems
Based on a review of the existing background it is seen that there is a problem in the application of the form, namely how to design an area consisting of black orchid research buildings that are oriented to the surrounding, nature, and culture.

1.3 Benefits
The design of the Tissue Culture Laboratory expected to become a building that provides research facilities for black orchids' ecosystem balance and to develop endangered species from extinction.

2. Literature Review
Adaptive based on KBBI 2008 is easy to adjust (self) to the situation. Meanwhile adaptive research [1], Ching [2-7], concerned with buildings that designed to adapt to their environments, their inhabitants and objects as well as those buildings that are entirely driven by internal data. The term is trying to merge what people imply when they talk about flexible, interactive, responsive or indeed media architecture, the large variety of recent publications demonstrates the mounting interest in this emerging.

Lamin (long house), is Dayak traditional house, have been known as one of unique architecture in east Borneo, especially in Kutai Kartanegara county. Lamin (long house), as a living houses not only physical formation but also as community system, so lamin as communal living houses [8].

3. Research Methods
The research method used is using descriptive research which aims to see, know and interact directly with the black orchid's living environment. With this research can give information and knowledge that is very important in the fundamental aspects of the Planning and Design of the Black Orchid Research and Development Center in North Samarinda, East Kalimantan [9-10].

Figure 2. Research Stage Diagram

4. Comparative Study
Case Study Form 1: Pampang Cultural Village, Samarinda
Pampang Culture Village is a tourist attraction of Kota Samarinda with traditional East Kalimantan building forms. The main characteristic of this building is the stairs made of tree wood. Surrounding the Lamin House there are many Blontang statues which depict gods as guardians of the house or village. Right at the corner of the roof is usually given a dragon headdress as a symbol of grandeur, nobility, and heroism.

Case Study Form 2: Office of the Governor of East Kalimantan, Samarinda

The Governor's Office is located in Samarinda City with a building that combines modern architecture with traditional architecture. Traditional forms are found on the gable roof and dragon carvings on the roof corner. While the material on the roof is metal roof with the main material of the building is concrete and steel.

5. Program and Design Concept

5.1 Form Design Program
In the design of the Tissue Culture Laboratory there is a form design program, namely; using colors and building materials that are environmentally friendly, designing roofs, bodies, and building legs that aligned to create unity in the building. Laboratory buildings designed with organic formations so the building can blend with the surrounding environment.

5.2 Map of Site Location and Boundary of Site
The building located on Jalan Rimbawan Dalam, the site is a form of terrains with an area of about 1.6 hectares. This site was chosen as the site of the Black Orchid Research and Development Center because of the land was designated as conservation forest for rare plants from the Samarinda Botanical Garden.
5.3 Building Boundaries
The boundaries area of the Tissue Culture Laboratory are the North Side is the side entrance on the site, the southern side of the border is a pond and garden. The East Side is a Pest and Disease Laboratory, a greenhouse and a parking area, while for the West side of the building is a greenhouse and an administration and management building.

5.4 Design Concept
In the design of Tissue Culture Laboratory building the concept used is an adaptive concept that aims to create a form of building that can adapt to the environment, without having to reject the use of modern materials and technology. The shape of the building adapts to the local cultural values to create harmony with the surrounding environment.

6. Design Transformation
6.1 Transformation of Building Forms of Tissue Culture Laboratory
Transformation form is adaptive. An adaptive form can adjust to the environment without changing the surrounding's condition. The adaptive form also adapts to the buildings that are around and oriented to the original architecture of East Kalimantan.

6.2 Roof Form
The roof shape is a saddle-shaped roof. The roof used shingles as materials because it is easy to get in the area, besides this roof cover lasts about 25 years. With the shingle roof, the room inside the building can feel cool. The sloping roof is very sloping because it was located in the tropics, and facilitates the flow of rainwater, so it does not absorb on the roof of the shingle.
6.3 Building’s Body Form
The building body has many openings so that air circulation can run well. The wall is made of woodplank material to give a natural impression to the building.

6.4 Building’s Legs Form
Legs of buildings consist of columns and stairs made of wood. The stage-shaped staircase the building serves as the main entrance to the building. The bottom of the building is not walled so that air circulation can run smoothly.

6.5 Whole Form Transformation
It undergoes a change of shape with the addition of volume. The development of forms from the addition of square and pyramid volumes is then complemented with other forms such as carving and adding windows, doors and stairs so that the shapes become complex.

The last result of the form is a building with a shingle material that can adapt to the surrounding environment and culture. Wood plank was used for building material on the wall so that the building is
not too massive and can give a natural impression that can adjust to the architecture of East Kalimantan. At the foot of the building, there is a column and stairs of the building that serves as the main entrance to the building.

7. Design Results

7.1 Form Design

With an adaptive concept, the design of the building itself uses the shape of a tropical building that combined with the traditional building form of East Kalimantan, namely Rumah Lamin Panjang. With distinctive characteristics:

- Forms that can adapt to the surrounding environment.
- On every building has many openings that serve to lower the use of air and artificial lighting.

The shape design results in the building of a tissue culture laboratory with a characteristic building shape that elongated and has many openings.

![Figure 12. Front View of Tissue Culture Lab](image)

In the front view, there are typical Dayaks carvings, a shield form with the philosophy of protecting the building as if for the main function as a sunscreen so that the front area of the building will be protected from sunlight.

![Figure 13. Right View of Tissue Culture Lab](image)

On the right side of the lab building, there is a carving shield with a meaning as a protector of the good side of the building. The shape of the building in the form of a rectangle provides effective spaces so that it can accommodate all activities inside the building. In addition, rectangular formations also make it easier to place lighting and ventilation on buildings.

![Figure 14. Left View of Tissue Culture Lab](image) ![Figure 15. Back View of Tissue Culture Lab](image)

On the left side of the building, there is a greenhouse which is a place to grow orchids with attention to the living conditions of orchid plants. The shape of the greenhouse also adapts to the surrounding environment and culture so that it can adjust to the main building.
The shape of the roof at the Research and Development Center is in the form of a saddle that can protect the building and the room inside from heat and rain properly. Because the building is a stilt house, the foot of the building is the columns, stairs, and terraces of the building.

8. Conclusion
After carrying out the discussion, it could be concluded that the concept of adaptive form in the building of the Tissue Culture Laboratory was applied to the material, shape, and appearance of the building. For materials used are materials that are able to adapt to the environment such as shingle roofs that are easily found in East Kalimantan. The form of adaptive concepts is applied to saddle-shaped roofs that are able to adapt to the weather while the building’s appearance adapts the shapes and ornaments of East Kalimantan so that it can adapt to the surrounding culture.

9. References
[1] Adi A. P. Ni kade, Astarini I. A, Astiti and A. Ni Kade. 2014. Aklimatisasi Anggrek Hitam (Coelogyne pandurata Lindl.) Hasil Perbanyakan In Vitro Pada Media Berbeda. ISSN: 2337-7224. Page 9-10.
[2] Ching, Francis D. K. 1996. Arsitektur : Bentuk, Ruang dan Susunannya. (2nd ed.). (Ir. Nurahma Tresani Harwadi, MPM., Trans). Jakarta : Erlangga.
[3] Departemen Pendidikan dan Kebudayaan. 1997. Kamus Besar Bahasa Indonesia. Jakarta: Balai Pustaka. Indonesia
[4] Noviana, Mafazah. 2013. Konsep Arsitektur Berkelanjutan Arsitektur Vernakular Rumah Lamin Suk Dayak Kenyah. Politenik Negeri Samarinda. Samarinda.
[5] Rachima M. Siti., Denny Sudharnoto., dan Agus S. Sadana. 2006. Mengenali Arsitektur Rakyat Dari Perubahan Bentuk Lamin Masyarakat di desa Pampang-Samarinda. Universitas Pancasila. Jakarta
[6] Rapoport, A. 1969. House, Form and Culture. Prentice Hall. New York.
[7] Sedyawati, Edi, EKM. Masinambow, Tjahyono, Gunawan. 1995. Konsep Tata Ruang Suk Dayak Bangsa Dayak Kenyah di Kalimantan Timur. Departemen Pendidikan dan Kebudayaan. Jakarta.
[8] Widayati, Rusfina. 2014. Thesis S2. Konsep Spasial Lamin Adat Suk Dayak Kenyah di Kabupaten Kutai Kartanegara. UGM. Yogyakarta.
[9] Winzeler L. Robert. 2004. The Architecture of Life and Death in Borneo. University of Hawaii. Honolulu.
[10] Yuuwono B. Abito. 2015. Peran, Fungsi, dan Makna Arsitektur Rumah Lamin Dalam Budaya Suk Dayak di Kutai Barat Kalimantan Timur. Fakultas Teknik Universitas Tunas Pembangunan Surakarta. Indonesia.