The Dependency project, The Design of Beekeeping Network in the Community for Bee Conservation.

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Abstract

The objective of this research is to study the habitat of bees and the environment in Bang Krachao community, a natural conservation area in the capital, by trying to create a model of coexistence based on people and bees that benefit the community by increasing careers' opportunities and income for the villagers in the urban community. Including the conservation and restoration of bees at the same time as the Bees Dependency project. The coexistence model is a prototype architecture and environment designed for beekeeping to solve the problem of limited area of villagers in each household which is an important network link between Bees and nature that spread throughout the area.

Keywords: *Architecture, Bee, Network, Conservation, Ecosystem economy, Urban community*

1. Introduction

1.1 Background

Bees are one of the highest ecological importance in nature as the pollinators. Bees can increase agricultural productivity. Bees also help pollinating many types of economic crops. Bees are the insect that promotes economic income. (Jitjamsri, 2006) Nowadays in many areas around the world, the population of bees has decreased rapidly. A phenomenon known as the "colony Collapse Disorder" (CCD) is a result of widespread use of chemicals, pesticides and chemical fertilizers in agricultural areas, which causes the bees to die. Another important thing is that, the forest area has been shrunk and transformed into a large agricultural area to grow a single type of crop. As the bees gradually disappear in the ecosystem, there is no intermediary for pollinating the plants, resulting in not properly producing agricultural products including flowers and plants in the forest. So, bees can be the indicator of the abundance of the forest. (Figure 1)

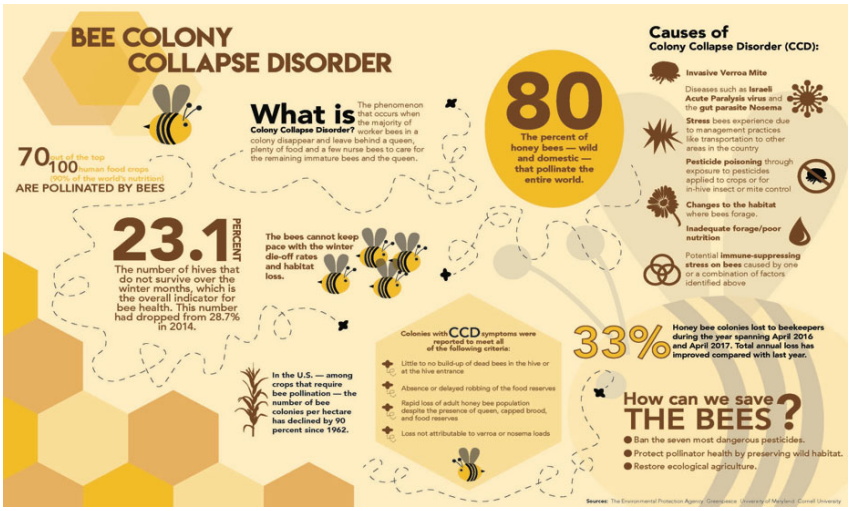

Figure 1 Bee Colony Collapse Disorder

Scientists estimate that in the next thirty years bees are likely to become extinct from the world. Many European countries are being taken to prevent the use of pesticides and various chemicals that affect the extinction of bees. The International Non-Governmental Organization (NGO) launched the Save the Bees campaign to inform the world about the dangers of using chemicals in agriculture for bees. Which these problems are only a small point that lead to a larger extent, which have a profound effect on nature and humans. “remove the bee from the earth and at the same stroke you remove at least one hundred thousand plants that will not survive.” (Einstein, 1941)

Figure 2 Bang Krachao

Bang Krachao is a part of the bend of the Chao Phraya River, which is shaped like a pig's stomach and covers area of 6 sub-districts in Phra Pradaeng District of Samut Prakan Province, the total area is over 19,200,000 sq.m. Bang Krachao area is designated as a conservation area and green area. There are abundant natural resources and biodiversity consisting of various plant species, approximately, more than 600 species of animals. At present, Bang Krachao does not have any farmers or villagers who have beekeeping careers. The study therefore recognizes the potential of the site, both the environment and the primary factor for bee s conservation. There are also many types of plants and flowers that are sufficiently used for food for the bees, and there are water sources that surround the area which is important for the bees' habitats, in which the bees can fly within a radius of 2 kilometers throughout Bang Krachao. Villagers in each household can be part of collaborating with the Bee Rehabilitation Center by using a model to be a habitat for bees to produce income to the village. Also, there is a career promotion for the villagers that take care of bees, in which the villagers sell the produce to the bee rehabilitation center, which was set up to be a place to learn and research about bees and the field bee that is provided for the villagers to breed. The Bee Conservation Center is an important network that forms the BEE NES network in Bang Krachao. In 2006, Time Asia Magazine honored the Bang Krachao as one of the best urban lungs in Asia (The Best Urban Oasis of Asia 2006). (Phankuut, 2016) (Figure 2)

1.2 Conceptual Framework

The relationship between the villagers and the living environment, which may be person to person, person to group, group to group, network to network, become a subnet under a large network. Linking to such a network is not just a general gathering but the goal for joint activities (Polsri, 2007). The results lead to sustainability and benefit to both nature and human. By doing occasional network activities or ongoing activities, it is a way to connect people with common interests and develop them together with the same goals and objectives, which is to conserve along with creating a career in the community. Therefore, the network is not just a collection of houses that are members of the organization, but there is a system for the villagers to be able to carry out activities together in order to achieve the goals that the villagers agreed with the

organization or the Bee Conservation Center. The things that connects the villagers and the organizations together is the objectives or interests that need to be achieved together. They are supporting each other.

1.3 Key words

BEE NES refers to the mesh network of prototype models for beekeeping. The villagers bring bees to the houses. The area in Bang Krachao is divided into 3 zones which are spread in the north (N), east (E) and south (S). (Figure 3) The prototype model or called “Ban Pheung Pa Arsai” is a form of beekeeping that is designed using architectural design processes to help solve the issue of beekeeping, where there is a limited area for planting flowers for the food of bees in each household. Each house that participated in the project will be 1 unit of the prototype model. The prototype model will be built into a network of bees or BEE NES of each household that is distributed throughout the island of Bang Krachao for beekeeping. The center is at the Bee Conservation Center to adjust the balance of nature at the heart of the network. This network created a harmonious relationship between nature and the villagers with the organization as a coordinator. Moreover, it is also a part to sustainably improve the quality of life for villagers in accordance with the concept of beekeeping

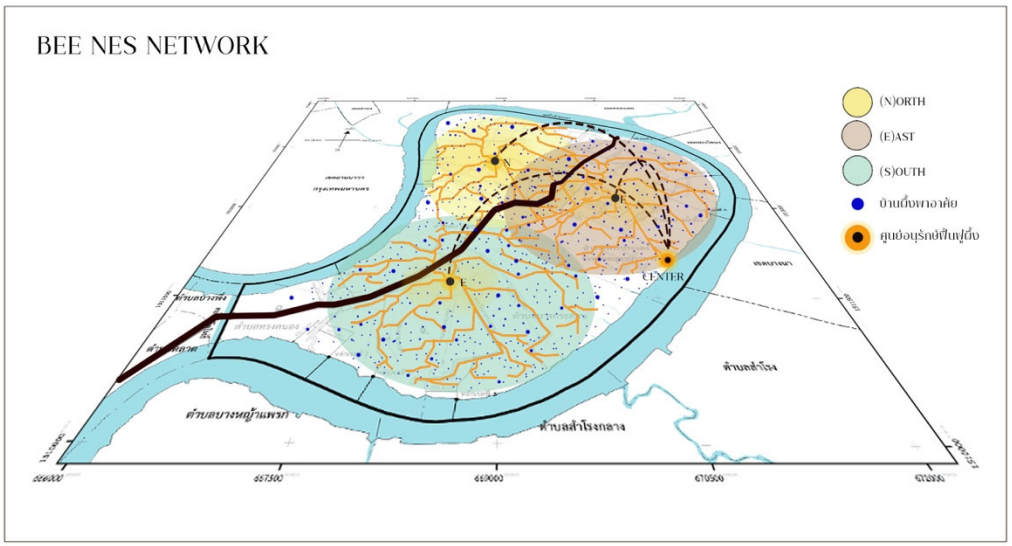

Figure 3 BEE NES Network

2. Objectives

2.1 To study forms of bee conservation using a network of interrelated relationships between villagers and bees in a habitat environment by creating a "model" of co-dependent dependency between people and bees that benefit the villagers in the urban community. The model will increase career’s opportunities and income from the sales of bee products, which is expected to improve the quality of life and sustainable development of the community as a whole. It also creates awareness of the importance of biological resources in the Bang Krachao community, which will lead to the conservation and preservation of the forest in the community to be fertile.

2.2 To study the architectural design concepts for the bees' house, or "Ban Pheung Pa Arsai", which is a connecting point for the BEE NES network by using the modular system structure and 3D vector design.

3. Hypothesis

The physical environment of each area is an important factor in determining the model in creating a "prototype" of the coexistence between humans and bees.

4. Materials and methods

4.1 Methodology

4.1.1 Study the biological aspects of bees and beekeeping including the relationship between bees and forests, and urban communities

4.1.2 Explore Bang Krachao areas by dividing the area into 3 zones and randomly collecting data on the patterns of living of the villagers. To analyze the context in the neighborhoods of the villagers used for the honeycomb settlement

4.1.3 Gather the information from academic documents, textbooks, articles, journals, research reports related to technical, design, and material selection for integration from locally available materials Space allocation and study of flower vegetation

5. Results and Discussion

5.1 The nature of bees

Although bees can exist in all areas of the world where humans live, beekeeping for conservation and expecting the production of honey is not possible in all areas. Not every area has a suitable environment for the life of bees and beekeeping always. These are the crucial factors as follows:

5.1.1 Type and amount of food plants for bees in the area.

The bees will live well and the beekeepers will get to collect more of honey yield from each beehive, depending on the amount of food the bees have in the honeycomb areas. Bees use only two types of food for their livelihood: nectar and flower pollen. The nectar is secreted from the nectar organ of the tree.

5.1.2 The climate of the honeycomb location and nearby areas. Honeycomb location is also known as an apiary, aside from being near the food source, the location should be an open, dry courtyard. The surface of the soil is smooth, not damp, receives enough sunlight, especially in the morning and evening.

5.1.3 The natural enemies that affect the bee population.

The beekeeping area should be a safe source from any natural enemies that will harm the honeycomb. Natural enemies could disturb the honeycomb or may destroy the entire honeycomb. There are many types of enemies from insects such as ants, hornets, geckos, lizards, skinkers, lizards, amphibians including frogs and toads. There are also falcon and other poultry.

5.2 The nature of Bang Krachao area in terms of the livelihood of the villagers and the area of beekeeping. Most of the area of Bang Krachao Island is surrounded by forest, about 80% of the area, because it is an environmental conservation area. The villagers live in a dependency group. The area of each house is mostly garden and some areas still have forests and big trees, but the area is limited. There is a raised open space under the basement, so one must think about the design of the bee house of each house.

5.3 The methodology of “the Baan Pung Pa Arsai” project

5.3.1 Villagers who have residences in Bang Krachao can contact to be a member of an established bee conservation center.

5.3.2 The center will provide training and knowledge on beekeeping, cultivation and production of bees.

5.3.3 Once the training has been successful, the center will bring the bee house, “the Baan Pung Pa Arsai” and the queen bee to the villagers.

5.3.4 The center will visit and regularly monitor bee population growth statistics for every home in the project.

5.3.5 When the production of honey from the beekeeping of the villagers occurs, Villagers can sell it to the center for processing or Villagers may keep it for themselves in the household.

5.4 The organization of the Bee Conservation Center

The Bee Conservation Center is a key organization established by BEE NES. It is a network of cooperation between the center and the villagers. The villagers will bring bees from the center to nurture and take care of , collect the honey from the farming and get back to the Bee Conservation Center for processing

into bee products under the brand of the center and sold to the general public or tourists who visit the project in Bang Krachao. It is expected to increase the profits in a rotation manner between the organization and the villagers. It also promotes the ecotourism business and encourage the public to be come interested in bees, also give away the knowledge to the researchers and students who study the nature of bees. The project will include entomologists who provide scientific knowledge about bees and insects in the ecology, geneticists who provide knowledge on the flower plants that are the food source for seasonal bees. These all are a part of education purpose for people who are interested in studying of the beekeeping in general. This can also transfer beekeeping technology from villagers in collaboration with the center. To create learning potential and sustainable conservation of natural resources are a key to develop the quality of many lives at once.

5.5 The physical forms of the bee house

The essential thing to keep in mind when designing the bee house is the area of each household. If the area around the neighborhood is unfavorable, and the cultivation of plants and flowers that provide food for bees, may use ivy, which has the ability to produce nectar that can grow vertically by attaching to the wooden structure of the house of bees and the number, to help compensate the area of planting. The design therefore adopted the 3D vector concept by using the X, Y, and Z axes that define the direction of increasing the number of wooden frames used for inserting beekeeping cones. One wooden frame can hold 7 perches. The wood used is 30 cm. X 20 cm. In size per 1 bee frame, using local wood to make the structure as follows.

5.5.1 Using the Z-axis in a straight line suitable for homes with narrow neighborhoods. (Figure 4)

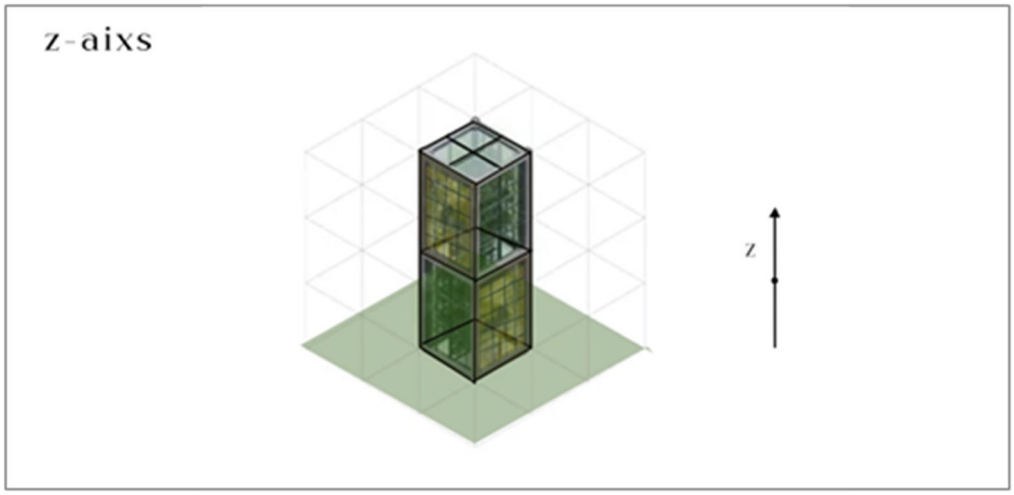

Figure 4 z-aixs

5.5.2 The use of the Y-axis when there is a vector fracture increases the structure, when increasing the number of bees to increase the population of bees more by adhering to the Z-axis structure. (Figure 5)

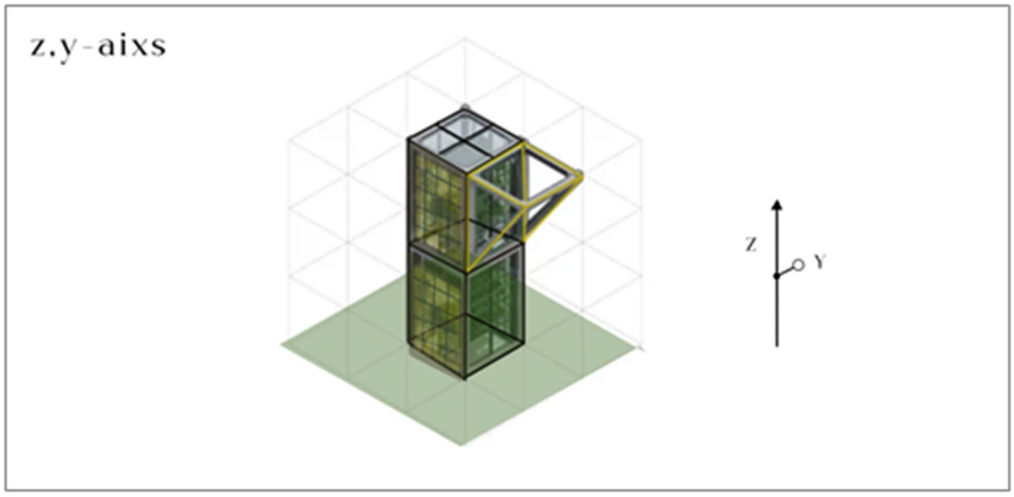

Figure 5 z,y-axis

5.5.3 From the picture in (5.5.2) the additional axis will be increased according to the amount of bees, based on the Z-axis, which can break the direction vector in the context of each household of the villagers in order to solve the area problem which seems not sufficient. (Figure 6)

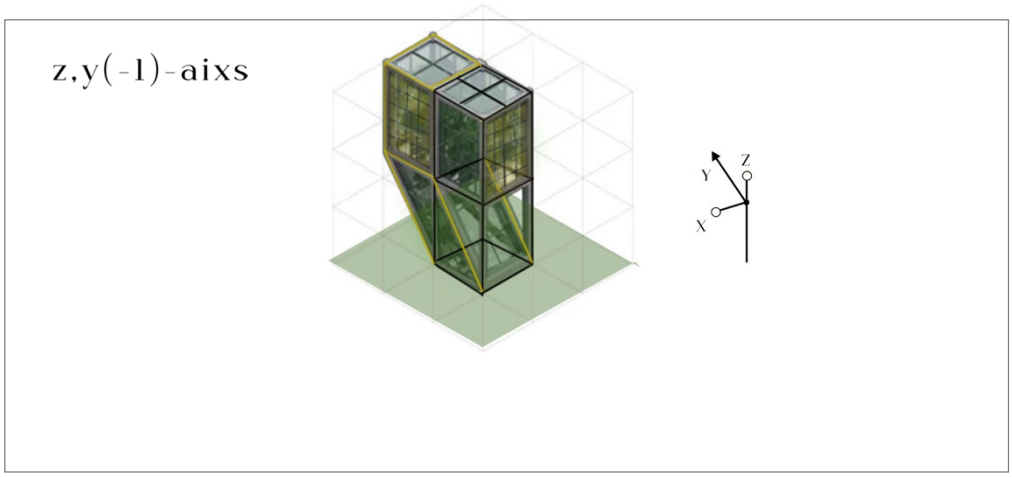

Figure 6 z,y-axis Reinforce the base under the Y axis

5.5.4 It can be seen that many forms of beekeeping can occur. Which the factors of each household are different, for instance, installation of various directions, sunlight, shade, access for harvesting of bees. The placement of the food for the bees or surrounding. (Figure 7)

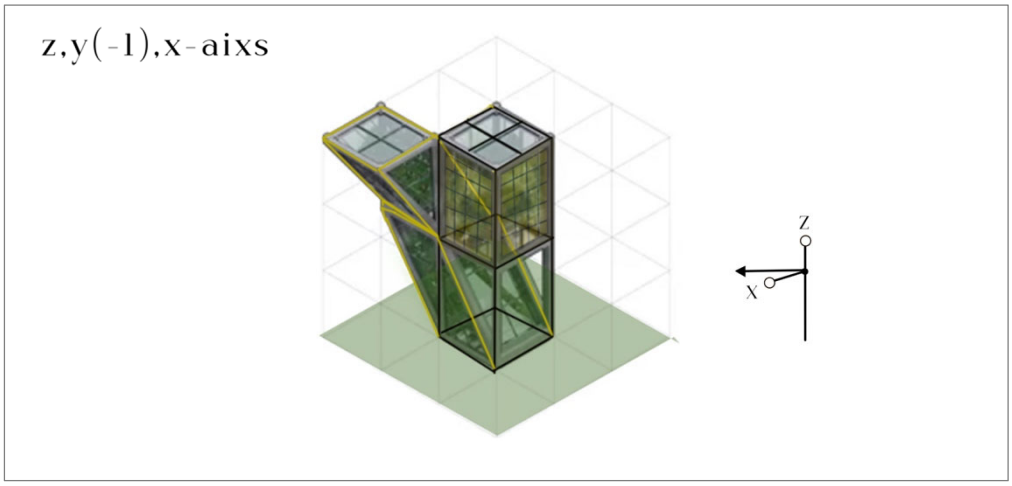

Figure 7 z-axis reinforce the base under the Y axis and Tilted along the X axis

6. Discussion

From the study of community beekeeping project for bee conservation in Bang Krachao. The physical environment of each area is an important factor in determining a relationship format dependency coexistence between humans and bees. The community is less dense and with a total of 1,829 households, population 5,170 people. It illustrate that each household has a population that is spread out with forests penetrating in each area gradually some have sufficient areas of their own, and others have few areas of their own. The lack of beekeeping, including the area to plant the vegetation that is food for the bee population is not enough. However, it is not a problem for the bee population, in which they can fly to find food in the surrounding area with flowers or pollen. Bees can fly to another home where there is sufficient plant growing space, so they always rely on each other. Therefore, using the format of creating a network to help as another way that can help with the increasing of bees population and conservation of bees. In order to be targeted, villagers must be involved with the bee conservation organization. It is considered to be a good result in both interdependence and the plants that the villagers grow as a food source for bees can be eaten from pollination of bees and is also a vegetable that is non-toxic. Creating a mesh network that is related there is mutual exchange.

For the villagers' houses: the number and density of villagers' houses per the whole area of the project is proper. The villagers live in a natural environment and the community is not too dense. The area of the entire Bang Krachao flower plot is 50% of the total area covers an area where bees can find food around 2 radius km.

For the bee house, the area of each house is different. Some have enough space for raising, and some have shared space. Using concepts that bring 3D, X, Y, and Z axes to calculate wooden structures for the beekeeping frame, it can reduce unnecessary areas of the house territory and able to adjust the axis according to the suitability of each house.

In order to achieve maximum efficiency for farming which villagers can apply to the context of each house and can plant trees to cover ivy in the framework of the Ban Phueng wood frame in order to use the existing space efficiently. It can also create a natural atmosphere to reduce the stress of bees in order to produce more honey. It should be remembered that the adequacy of food factors, disease areas or enemy bees should be given to the highest efficiency in beekeeping.

7. Conclusions

The study of the various components of the area in the Bang Krachao community, which is the location of this project, is found to be appropriate in terms of the environment of the area, villagers and

organizations. This research can propose a prototype model of co-dependency model between humans and bees, which has a specific style that can be adapted to the area, with the important factors in creating the quantitative balance of the number of houses in the project in relation to the size of the flower plot area and the size of the bee house. Additionally, the whole area can be developed into an ecological conservation network that is interdependent in the community as well as being an ecotourism that promotes conservation along with generating income for the Bang Krachao community.

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