



# 02

## Bayberry Factory

*A new model for dealing with urban-rural contradictions*

Urban expansion is a historical process that cannot be reversed, and such development has undoubtedly generated more demand for agricultural output, but at the same time, it has inevitably encroached on the original farmland and agricultural resources around the city. As early as the last century, this dual motivation began to produce contradictions, but the early contradictions could only be solved by the destruction of agricultural land and the migration of agricultural populations. With the industrialization of production and the advancement of intelligence, we now have more possibilities to seek new ways out in the land transition zone between urban and rural areas. In these places, I believe that the two different existences of urban and agricultural will converge to shape a new production model based on intelligence. Such a model would be universal, increasing agricultural production while also involving local farming populations, with a focus on creating sustainable urban-rural relations. Eastmoney Lake in Ningbo, Zhejiang Province, is located on the edge of the city and has rich plantation and fishing conditions. At present, urban development is gradually encroaching on villages and farmland around the Lake, some small villages have been demolished, but more large ones cannot be moved. So, the local area faces serious problems.

I started with local specialty fruits such as bayberry, which is difficult to preserve but has high economic value, as the main crop, and supplemented it with three other crops to improve yield and economic benefits. In response to the reduction of agricultural land, traditional fruit groves are crammed into modular units and then moved into the air, together with other functional units, to form a scientific and orderly combination model. This combination will be moved and reassembled by the tower crane with the season, forming a high-efficiency bayberry factory. In addition, the whole factory operates according to a system, in addition to the matching between crops, different auxiliary centers are involved in the recycling of production raw materials, the use of solar energy, the transportation of agricultural products, production, etc., and the workers are directly transformed by local farmers, these measures are to ensure sustainable economic and social development. This factory model is universal, and can be dominated by different crops in different regions to solve the contradiction between urban and rural areas.

Location: Ningbo, China  
Academic: 7/2022- 11/2022  
2022/2023 1st Semester  
Individual Work  
Tutor: Zhu Jiahuan



## CONCEPT

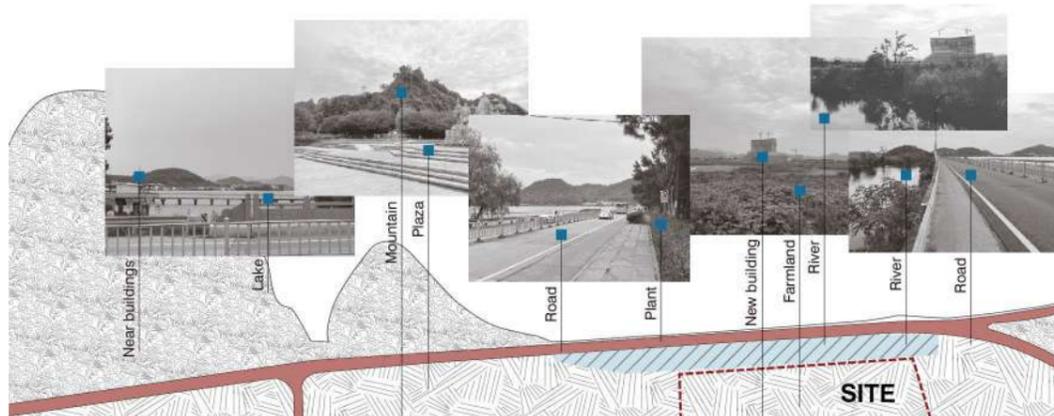
The sprawl of the urban fringes is upsetting the balance between urban and rural areas



At the same time, industrial development has brought new technologies to nearby growers, and advanced agricultural tools and intelligent management, transportation and production methods have helped to increase production

Farmers in these places are losing the land on which they work and live

## SITE STATUS



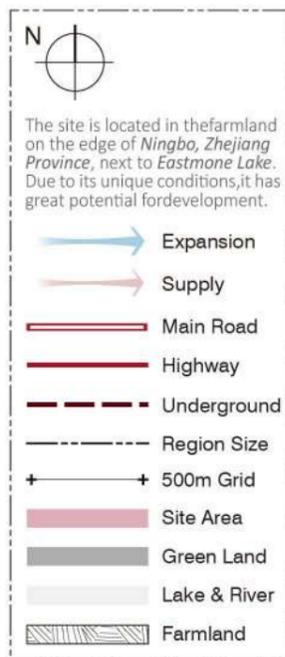
### Contradiction between urban and rural areas

Eastmoney Lake in Ningbo, Zhejiang Province, is located on the edge of the city, and the only main road connects the land by the lake, of which the northern side is gradually replaced by new communities, hotels and parks under urbanization, while the south side is still villages.

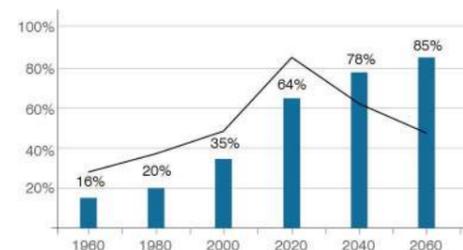
This rich place of cultivation and fisheries is full of growing vegetables and fruit trees. However, under the influence of urbanization, more and more young people choose to put down agricultural tools and go into the cities, leaving only the elderly and children in the countryside. When the weather encroaches or the busy farming season comes, the remaining farmers have little capacity to cope. How long can these farmers stay in the face of growing demand for agricultural products from cities? If the production mode that has remained unchanged for a long time do not update, how much production potential is left? If traditional crops are not supplemented by scientific research, how can they ensure yield and progress? Not to mention, the water quality in the lake has become more terrible than before, making it unsuitable for conventional aquatic fishing.

Farmers in similar areas are facing hardships that they lose their land, jobs, and even places to live, despite demand of agricultural products is keep growing.

## MAPPING

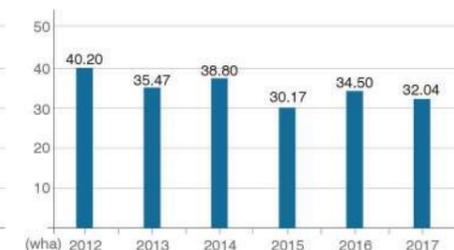


## RESEARCH ABOUT AGRICULTURE



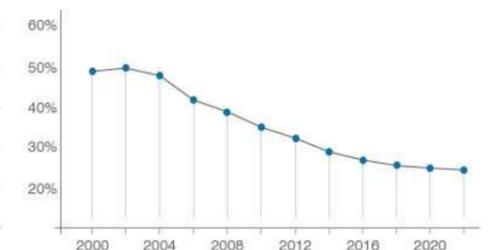
Urbanization progress

The urbanization process is continuous and irreversible



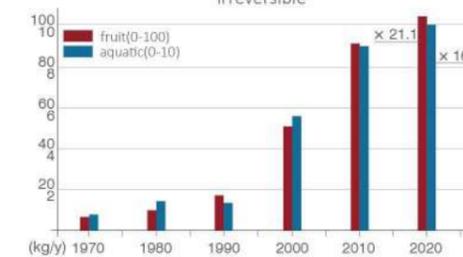
Reduction of farmland

The expansion of the city swallowed up the surrounding farmland and countryside



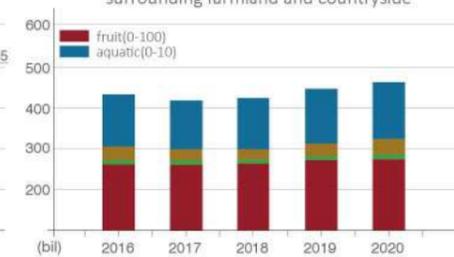
The plight of farmers

68 million farmers left the farmland, resulting in an 11% reduction in the agricultural labor



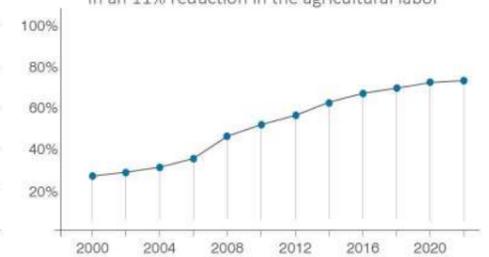
Demand for fruits and aquatic

Chinese's diet has changed dramatically, such fruits and aquatic products



Agricultural output value

Urbanization leads to the reduction of farmland while food demand is increasing



The evolution of agriculture

Urbanization leads to the migration of farmers and the rural demographic imbalance

# ANALYSIS OF BAYBERRY

The growth process of bayberry faces many natural threats, and too much rain and sunlight can cause a lot of yield reduction and quality degradation. In addition, bare fruits are also susceptible to pests. In case of poor climatic conditions, a large number of fruits will fall off early.

Because the fruit is exposed, the bayberry ripens in the hot summer, in order to ensure the yield of the bayberry, the responsible farmer needs to get up every day and mid-night during the ripening period, pick the bayberry deep in the mountains overnight, and send it out in a hurry.

After leaving the mother, the fragile bayberry is easy to lose moisture, and it is also easy to squeeze and bruise during transportation, so the transportation of bayberry must pay attention to space management and temperature control.

The production of bayberry is constantly increasing, but urbanization has led to the decline and aging of the rural labor force, and the increasing burden has been placed on the shoulders of the elderly.

## 1. Weather

## 2. Picking

## 3. Transportation

## 4. Workforce

## FOOD DEMAND

Rice

Vegetable

Fruit

Meat

Milk

Fish

Nuts

## DIFFICULTIES IN PRODUCTION OF BAYBERRY



Bayberry has high edible and medical value

## THE ECONOMIC VALUE OF BAYBERRY

Demand  
Production

Bayberry fruit can be processed into a variety of products, It can also be flown abroad. In 2022, bayberry in Dubai sells for 10 \$ each.

## Production distribution of bayberry



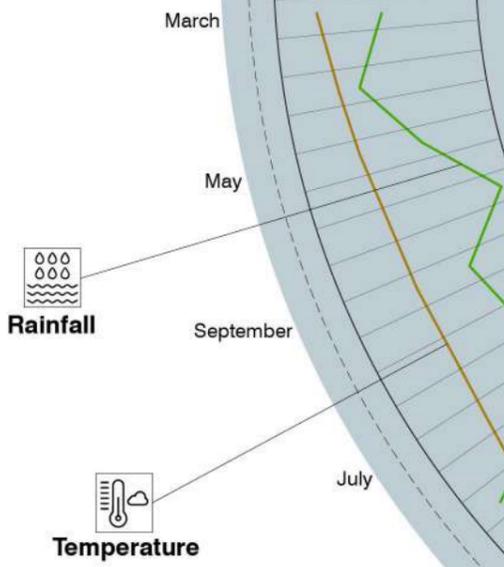
Zhejiang Province has the largest number and output of bayberry enterprises in the country, and even so, the area of bayberry forests is shrinking

## THE TECHNIQUE OF BAYBERRY CULTIVATION

Unitization

Digitization

Protection



## LOCAL SPECIALTIES

Bayberry is a specialty fruit of Ningbo, famous throughout the country for its large size and small pit, sweet and sour taste. However, the ripening period of bayberry is very short, and the fruit is not easy to preserve, so its price is also rising

# SELECTION



## 1. Bayberry

Bayberry is a typical southern fruit with high economic value, It usually matures between May to July



## 2. Rice

Although there is no shortage of food, rice can be grown with aquatic products, both can be eaten or sold



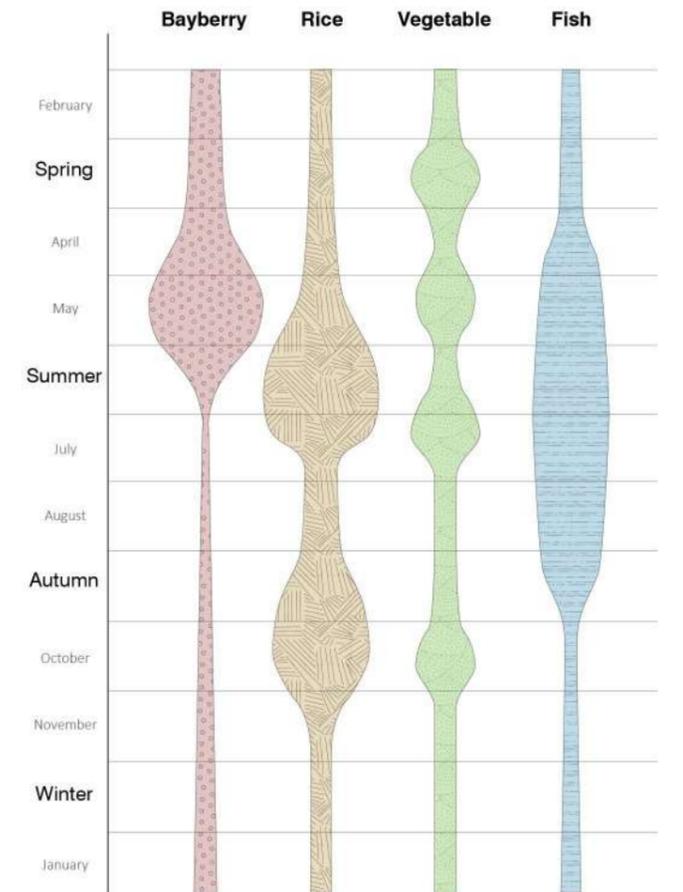
## 3. Vegetable

Choose vegetables that ripe three times a year, to meet the needs of employees for their own consumption



## 4. Fish

Fish is an important meat source in the southern China, and reasonable farming methods can help purify water quality



# COMBINATION



Bayberry+Rice

## Crop rotation

This measure is conducive to the recuperation of cultivated land resources, and promotes the sustainable use of cultivated land

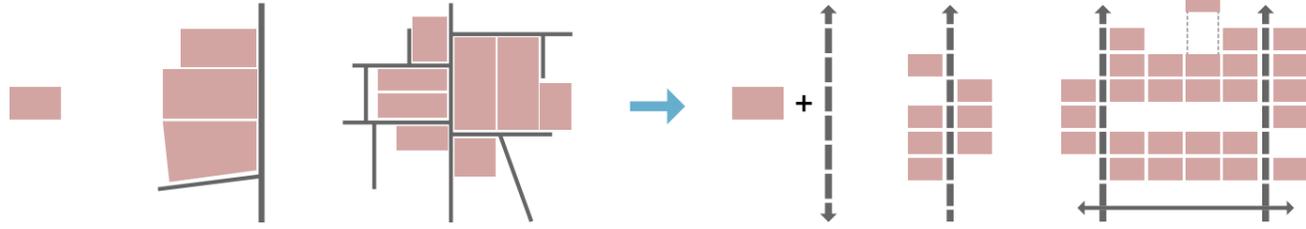


Vegetable+Fish

## Aquaponics

Aquaponics allows animals, plants and microorganisms to achieve a harmonious ecological balance relationship

## PARADIGM SHIFT



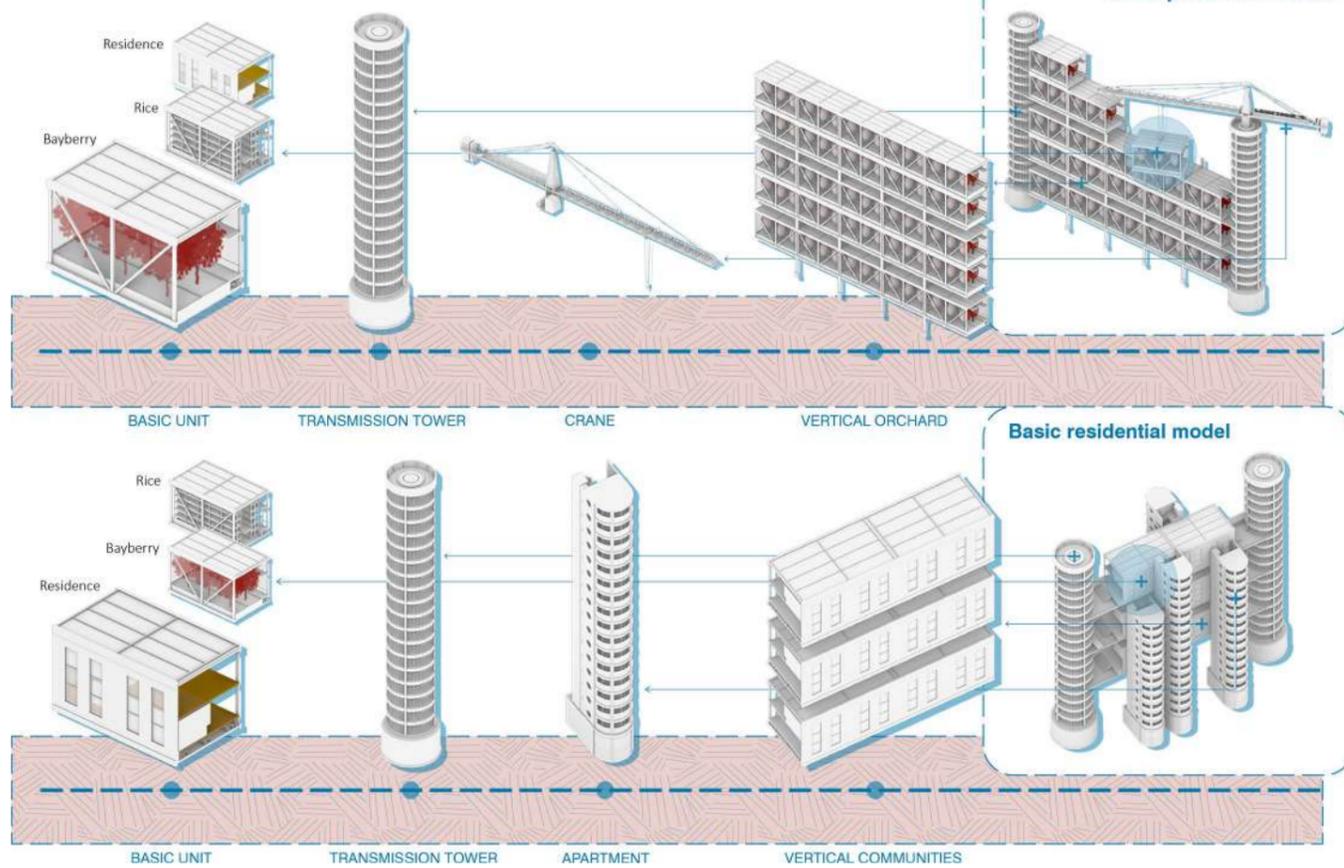
### Horizontal - Expansion of Planting Land

In order to ensure the increasing demand for agriculture, the cultivation land had to be greatly expanded, which is not conducive to urban development

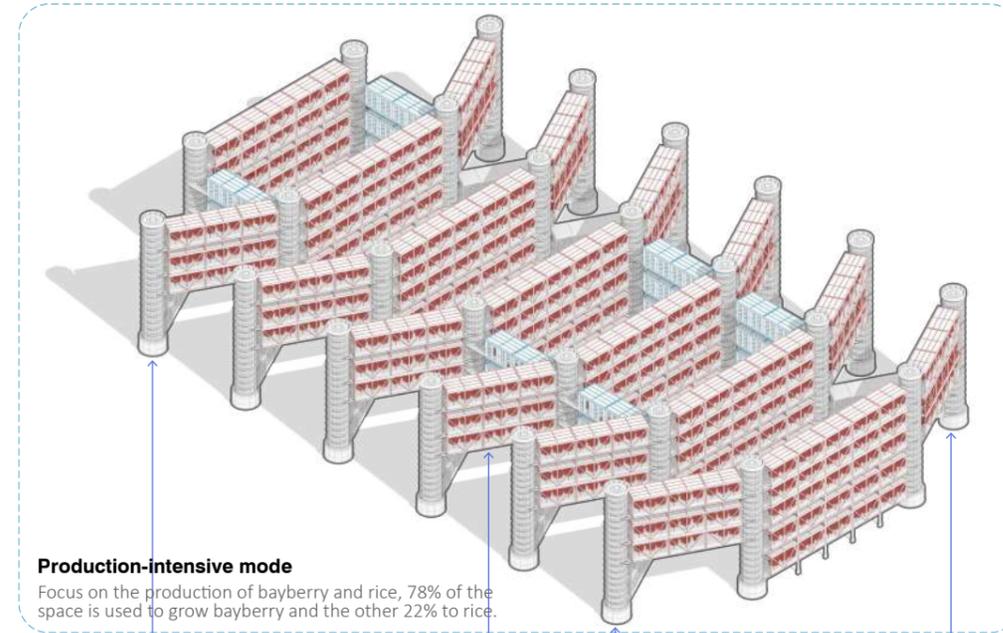
### Vertical - Stacking of Planting Units

Transform traditional planting into a vertical model to increase yields without wasting land or severing relations between urban and rural areas

## WORKFLOW

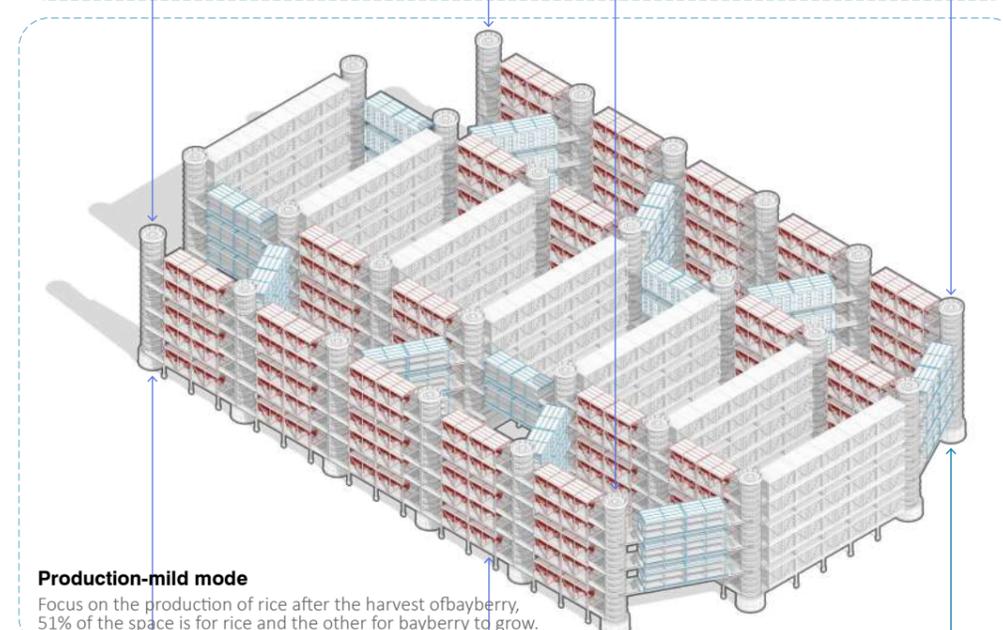


## COMBINATION



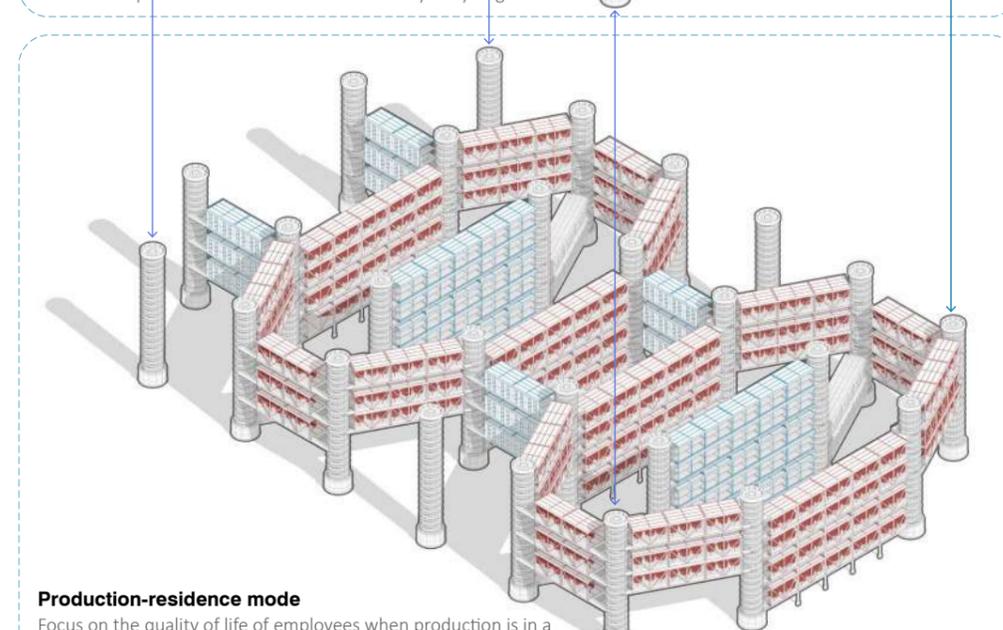
### Production-intensive mode

Focus on the production of bayberry and rice, 78% of the space is used to grow bayberry and the other 22% to rice.



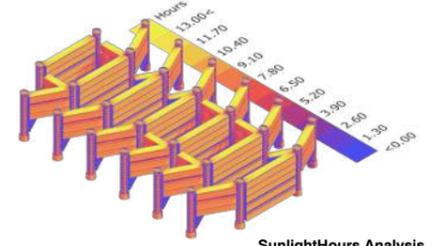
### Production-mild mode

Focus on the production of rice after the harvest of bayberry, 51% of the space is for rice and the other for bayberry to grow.

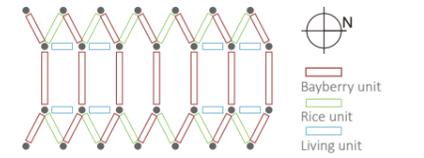


### Production-residence mode

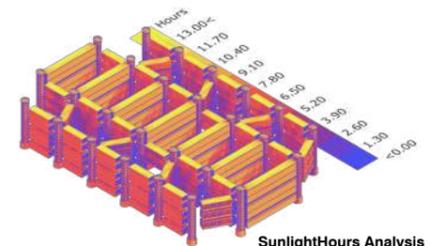
Focus on the quality of life of employees when production is in a fallow period. 1/3 of the space is used to house the living unit.



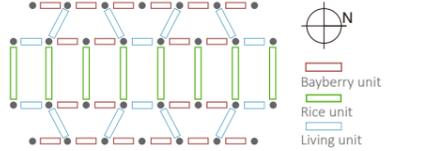
SunlightHours Analysis



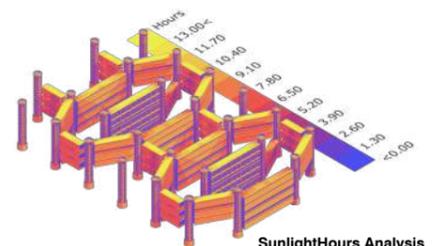
Bayberry is harvested in spring and summer, so the model pays attention to the direct light resources of the sun, and symmetrically arranges production units of reasonable height from west to east to ensure that sufficient light can be obtained throughout the day. Among them, living units are installed according to needs to meet production needs



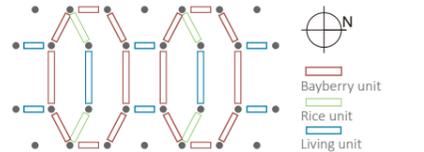
SunlightHours Analysis



During the growth period of bayberry, in order to ensure the growth of rice, the model gives sufficient direct light to the rice, and places the bayberry on the east and west sides, which is suitable for the growth of bayberry and does not waste resources. The living unit is planted between bayberry and rice, as a link between 2 sides.

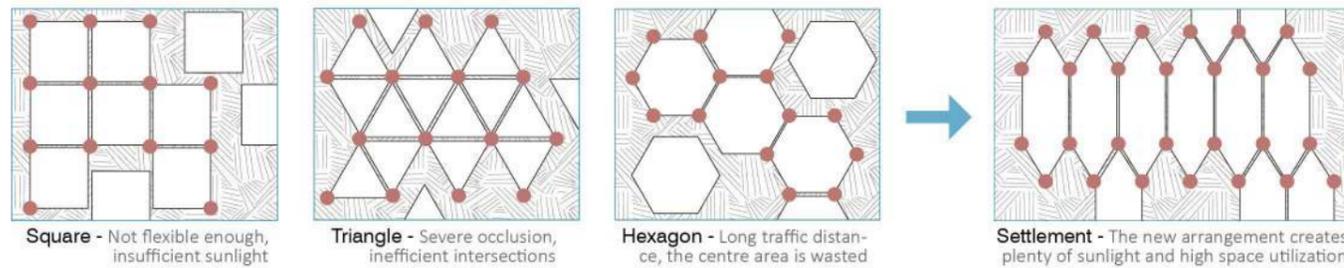


SunlightHours Analysis



During the fallow period, the focus returns to life, so the model becomes a group layout, with densely arranged growing bayberry trees as the boundary to wrap the living unit. Groups use living units to connect and communicate, usually do not affect each other, but maintain contact and circulation. Rice units are appropriately interspersed.

## ARRANGEMENT



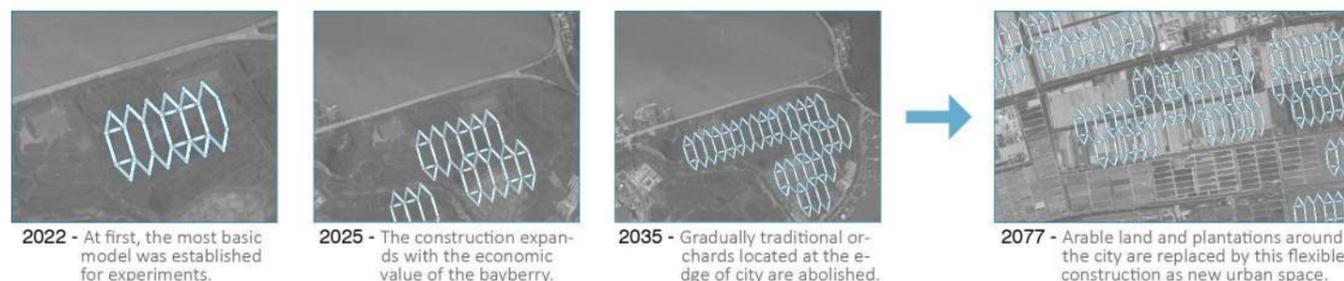
**Square** - Not flexible enough, insufficient sunlight

**Triangle** - Severe occlusion, inefficient intersections

**Hexagon** - Long traffic distance, the centre area is wasted

**Settlement** - The new arrangement creates plenty of sunlight and high space utilization

## GROWTH PATTERN

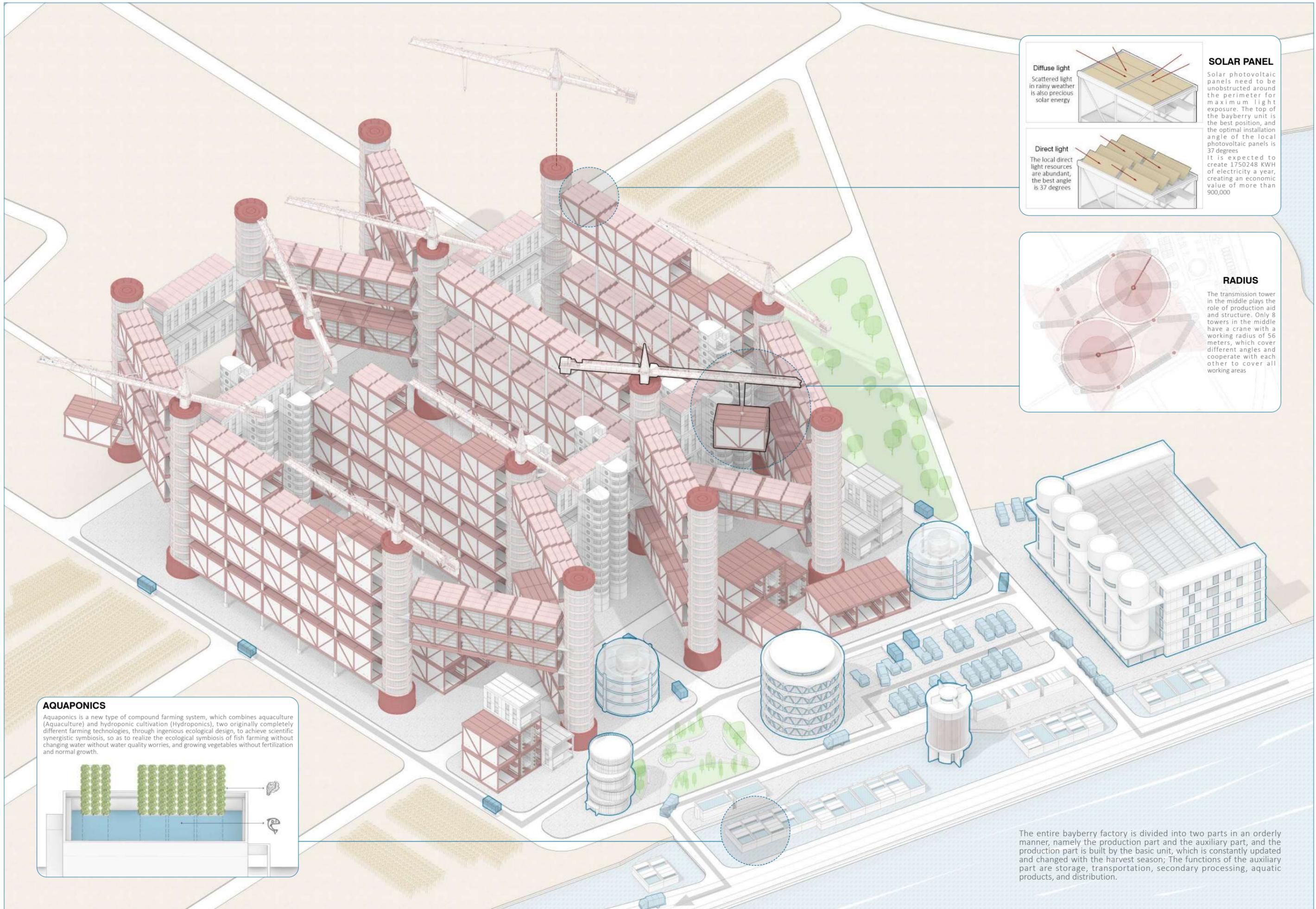


2022 - At first, the most basic model was established for experiments.

2025 - The construction expands with the economic value of the bayberry.

2035 - Gradually traditional orchards located at the edge of city are abolished.

2077 - Arable land and plantations around the city are replaced by this flexible construction as new urban space.



**SOLAR PANEL**

**Diffuse light**  
Scattered light in rainy weather is also precious solar energy

**Direct light**  
The local direct light resources are abundant, the best angle is 37 degrees

Solar photovoltaic panels need to be unobstructed around the perimeter for maximum light exposure. The top of the bayberry unit is the best position, and the optimal installation angle of the local photovoltaic panels is 37 degrees  
It is expected to create 1750248 KWH of electricity a year, creating an economic value of more than 900,000

**RADIUS**

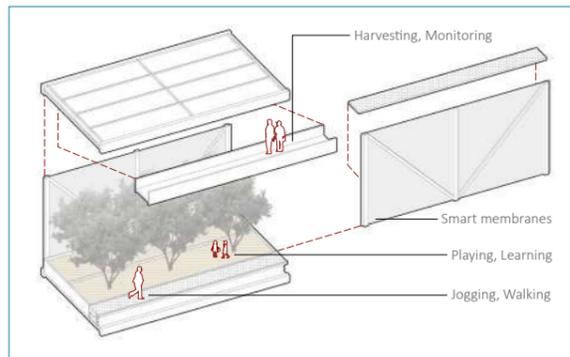
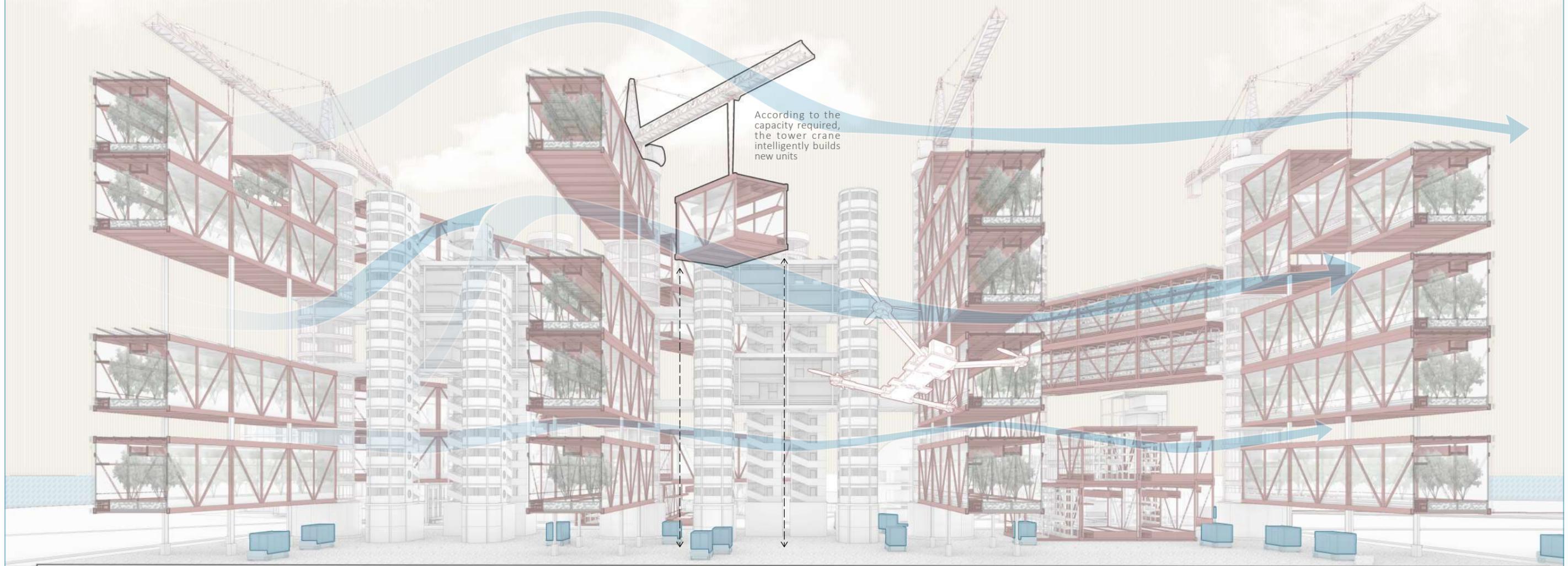
The transmission tower in the middle plays the role of production aid and structure. Only 8 towers in the middle have a crane with a working radius of 56 meters, which cover different angles and cooperate with each other to cover all working areas

**AQUAPONICS**

Aquaponics is a new type of compound farming system, which combines aquaculture (Aquaculture) and hydroponic cultivation (Hydroponics), two originally completely different farming technologies, through ingenious ecological design, to achieve scientific synergistic symbiosis, so as to realize the ecological symbiosis of fish farming without changing water without water quality worries, and growing vegetables without fertilization and normal growth.

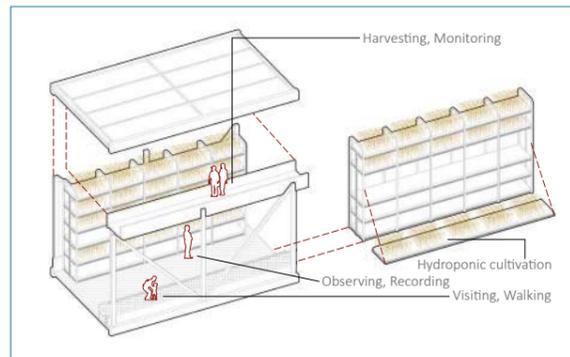
The entire bayberry factory is divided into two parts in an orderly manner, namely the production part and the auxiliary part, and the production part is built by the basic unit, which is constantly updated and changed with the harvest season; The functions of the auxiliary part are storage, transportation, secondary processing, aquatic products, and distribution.

On the basis of ensuring the output of bayberry, the intelligently placed bayberry unit also needs to consider the problem of lighting and ventilation. Properly pulling the vertical spacing of the bayberry units helps to form convection and accelerate air exchange. At the same time, rice units and living units follow the same rules. Between the spacing of the vertical arbutus plant is an open space for the transportation of ripe bayberry and the placement of various units, as well as an activity venue for employees and researchers in the factory.



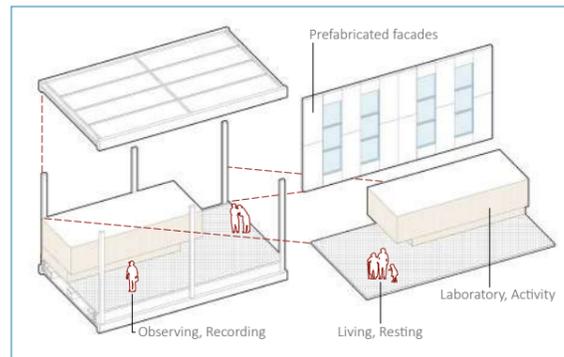
**BAYBERRY UNIT - Active from April to July**

Up to 6 bayberry trees are planted per bayberry unit, with double aisles on the sides, the lower layer for walking and the upper layer for transportation; Arbutus can be used as a landscape arch for everyone to visit and visit; Thanks to a smart film that intelligently regulates light and temperature, the bayberry harvest season can be extended by one month before and after.



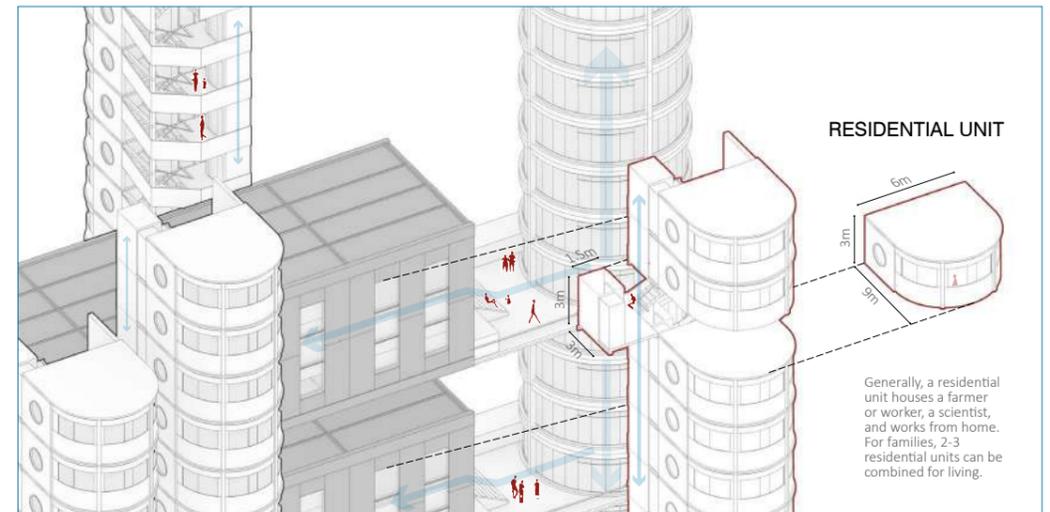
**RICE UNIT - Active in June, July and November**

Each rice unit can place up to 12 groups of planting plates for rice with a height of less than 1.3 meters, which can be freely assembled to grow crops of different heights and volumes. There is a lifting workbench in the middle of the unit for workers to pick and monitor crops, and a passage next to the rice can also be used for everyone to pass or visit.

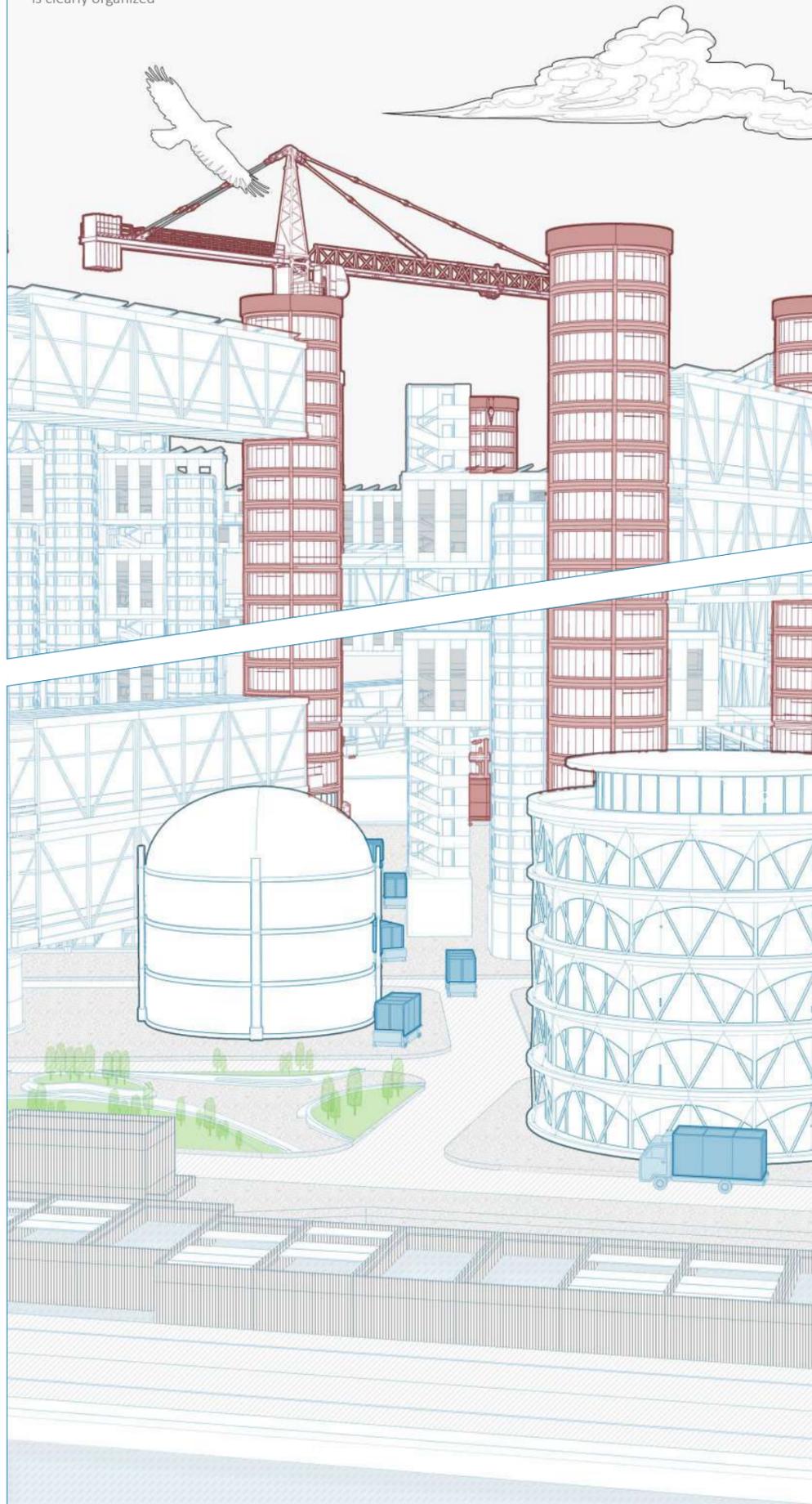


**COMMUNITY UNIT - Active all year round**

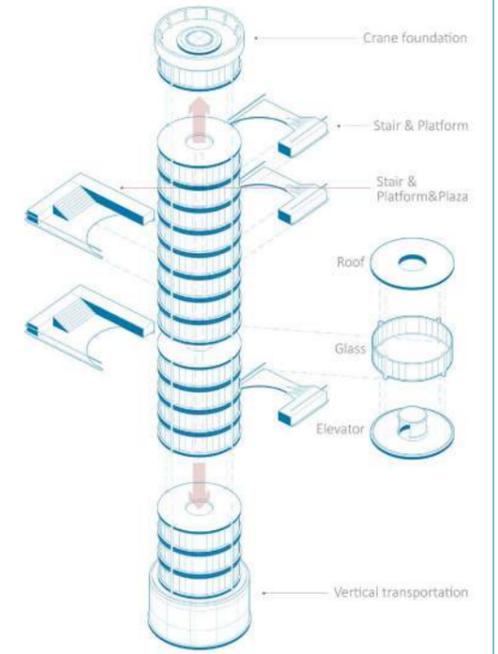
The role of the community unit is to provide workplaces and public spaces for employees and researchers living in the factory, and each unit is replaced with a modular wall and divided into two floors, which do not interfere with each other. Research here will continue to focus on the production potential of bayberry and other crops, providing a more scientific and efficient planting combination in the future.



Looking at the factory from the main road, you can clearly see the aquaponics area, then the production area where trucks and smart trailers move, and finally the planting area with towers with basic units. The three districts are connected by direct roads, and agricultural work is clearly organized

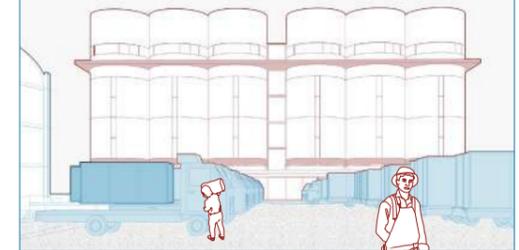


The biggest feature of the entire bayberry factory is its unit combination that intelligently changes with the relationship between supply and demand, and the proportion between the bayberry unit, the rice unit, and the living unit is constantly adjusted, and even on the same production tower, three units will appear at the same time.

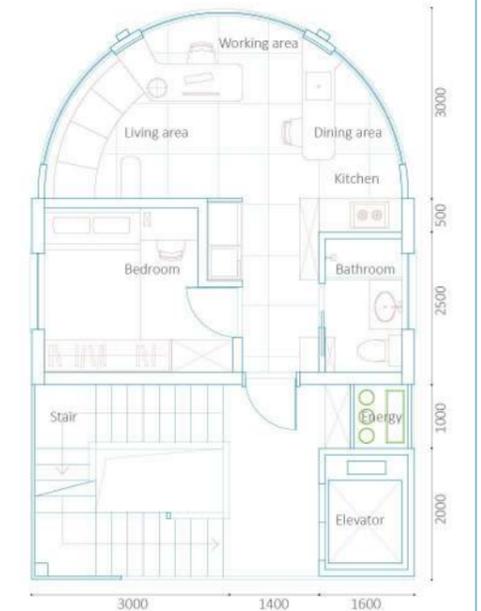


Each production tower plays the role of structural support, vertical transportation and production support

Trucks transport fresh bayberry and crops, as well as processed products from the factory



The living unit is 32 square meters in size and is specially equipped with a work area



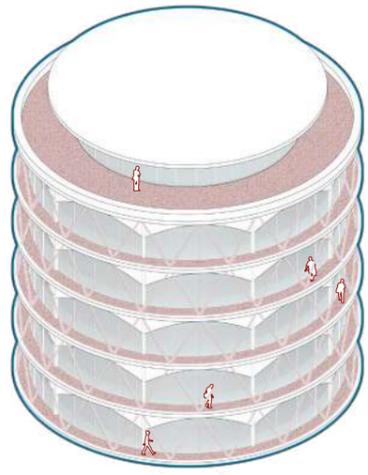
**The Plan of Living Unit**  
Each dwelling unit is equipped with an energy transmission well to provide and recycle domestic water and to supply electricity generated by photovoltaic panels



**Inside the Bayberry Unit**  
Non-harvest bayberry is also a landscape crop, and walking here by nearby residents does not affect the researchers' work

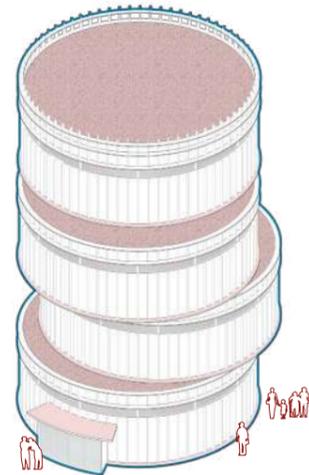


**Living in Bayberry Forest**  
A small number of community units are inserted in three-dimensional agriculture to connect residential units to meet the daily needs of workers and researchers



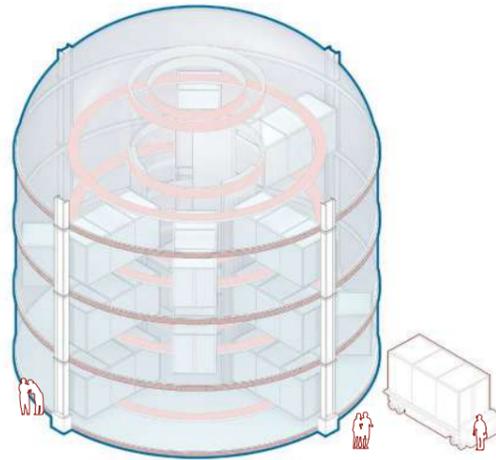
### Agricultural Science Research Centre

In order to meet the growing demand for agricultural products, it is not enough to just expand the planting area or optimize the system. The center studies scientific methods that can improve crop yields and farming cycles, so that it dedicates to promote the rational allocation of agricultural resources



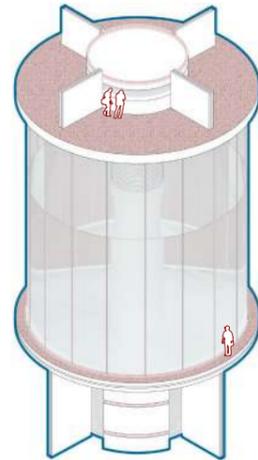
### Science and Education Exhibition Centre

In addition to presenting their own research results, it is indispensable to use education and publicity to arouse public thinking about the relationship between agriculture and industry. Nearby residents can take their children here to learn the latest agricultural techniques



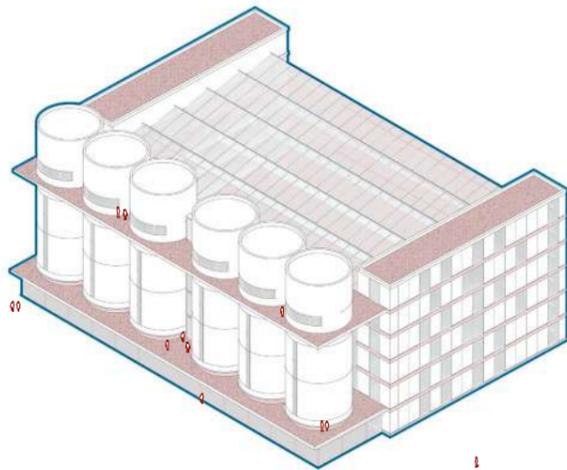
### Transport and Cold Storage Centre

The ripening period of bayberry is concentrated and the storage time is short. Therefore, once the ripe bayberry is picked, it will be placed in a refrigerated compartment, and quickly transported by autonomous board to a three-dimensional refrigerated center



### Water Circulation and Storage Centre

The water purified by aquaponics is temporarily stored in the center and becomes domestic water, after which the wastewater is used for irrigation or repurified by aquaponics, and finally the purified water is discharged back to Dongqian Lake to reduce water quality eutrophication



### Agricultural Products Factory

The economic value of agricultural products is much higher than that of the crops themselves, the factory set up next to bayberry produces agricultural and sideline products, such as beverages, wine and health products, which are transported to urban markets by the same transport routes



### Community Pocket Plaza

The impact of industrialization on agriculture is not only reflected in the increase in production methods and crop yields, but also in the lifestyle of agricultural workers. The small pocket park is not only a place for farmers to rest, but also an important occasion for everyone to socialize

## BAYBERRY FACTORY SYSTEM

