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Path Analysis of Agricultural Project Design Based on Function Expansion: A Case Study of Naya Mountain Villa

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Abstract The expansion of agricultural function is one of the important means for modern agricultural projects to promote agricultural economic benefits. Successful modern agricultural projects require good creative ideas and design programs. While developing high-efficient modern agricultural production activities, we should fully explore the intangible value of agricultural production activities, combine agriculture with agricultural products, natural conditions, cultural conception and other effective resources, to expand agricultural functions, and promote comprehensive benefits. In order to build a sustainable modern agricultural project operation system, Naya Mountain Villa project planning is taken as an example for analysis. Naya Mountain Villa began construction in 2011; the creative planning based on the agricultural expansion function was carried out in 2013; it had successful access to the capital market in 2015. The project realizes the effective integration of agricultural production system and agricultural function expansion, constructs a set of long-term stable profiting models, and lays an important foundation for entering the capital market. The project is a representative example of the function-expanding modern agricultural project. Through the analysis of the design ideas of the project, this paper discusses the function expansion elements of basic resources, public welfare and agricultural function expansion methods, the formation of general ideas, source and construction logic of creative thinking, and summarizes and abstracts some inspiring design methods of agricultural function expansion. Through the analysis of the key points in the design of the specific technical aspects of the project, this paper provides a reference for solving common difficult problems in the practical design. The summary and refinement of the thinking logic, thinking construction and specific design method of the project is inspiring and repeatable to some extent, which can provide reference for the relevant researchers.

Key words Modern agriculture, Design of Naya Mountain Villa, Function expansion

1 Introduction

Under the macro background of the construction of ecological civilization, the modernization of harmonious symbiosis between man and nature needs abundant material wealth and spiritual wealth, as well as high-quality ecological products and beautiful ecological environment^[1]. Expanding the spiritual and cultural outputs and ecological civilization outputs will certainly become the core element in the design of modern agricultural projects. With the continuous expansion of agricultural functions, and continuous increase of the related industries, the design of function-expanding modern agricultural projects has become a multi-disciplinary composite and systematic project^[2].

Land transfer policy^[3–4] has laid the foundation for enterprises to realize investment transformation in the field of agriculture^[5]. When modern agricultural projects are operated in an enterprise-based way, the integration design is crucial to agricultural professional technology system, agricultural production management system, agricultural function expansion strategy, idea, marketing, business management and many other disciplines and fields. At the same time, under the guidance of the national macro-policy, modern agricultural projects also put more emphases on social welfare attribute and industrial driving ability^[6].

The construction and continuous operation of modern agricul-

tural projects are closely related to the original planning and design. First, it needs to have the perfect agricultural production technology strategy support^[7], and propose the solutions to some agricultural technology problems regarding the agricultural production technology system, the variety and the technology matching, and spot management and so on. Second, it needs to have a profitable operation strategy, and use products, marketing, services and other ways to tap the intangible value of agricultural products or agricultural environment^[8]. Third, it needs to have a strong social public welfare function, to provide support for farmers' income increase, industrial development, ecological upgrading and other social needs^[9–11]. The design demand has gone far beyond the category of pure agricultural production area design.

Expanding the function of agricultural production^[12–13] is an important measure to solve the problem of rising cost of labor and land in the process of urban-rural integration. The common models are circular agriculture, ecological agriculture related to ecology and new agricultural technology, sightseeing agriculture, tourism agriculture related to spiritual and cultural demand, and market-related order agriculture. One or more of the above models may be selected by modern agricultural enterprises to construct a profit-making agricultural production and operation model. However, due to the differences in location conditions and the originality of designers' thinking, successful cases are not replicable in different places.

Naya Mountain Villa is one of the typical cases of expansion-

oriented modern agricultural projects in Chengdu area. It was constructed in 2011, the agricultural function expansion planning was carried out in 2013. Based on the formation of the profiting model of agricultural projects, it was successfully listed on the Q board of Shanghai Stock Exchange Trusteeship Center in 2015^[14]. The analysis of the project design can be used as reference for the relevant researchers.

2 The formation of design ideas

2.1 Location conditions Project implementation site is located in Jiulian Village, Yongshang Town, Xinjin County, within Chengdu half-hour economic circle, with the total land area of 61.2 ha. There are cement village roads in the area, a small number of self-built cement roads and pedestrian dirt roads.

Specific analysis: (i) The place of implementation is located in the second circle of Chengdu, the megalopolis in the west, within Chengdu half-hour economic circle. Based on the agritainment industry formed in Chengdu in recent years, the suburban consumption population is large, the consumption ability is strong, and the consumption level is constantly promoted, which forms effective support for the high-end agricultural products and innovative tourism agricultural service products; (ii) The development strategy of Yongshang Town is to rejuvenate the town with tourism, enrich the town with three industries, build the town with ecology, and make the town powerful with opening-up policy, and the ecological sightseeing agricultural projects are supported by the local government; (iii) The internal traffic condition is still not good, and it is necessary to optimize the main roadway, perfect the machine-ploughing road, create the sightseeing road network, to meet the common needs of agricultural operations and tourism.

Design elements: The type of project selected is high-grade tourism agriculture, the design scale is large, and there is a need to integrate the agricultural production system, agricultural function expansion, tourism creativity and supporting infrastructure, to form a stable interactive operation model of primary and tertiary industries.

2.2 Environmental conditions It is located in Chengdu traditional agricultural planting area, with low hills, mild climate, and plenty of water, suitable for all types of crop production. The field, land, forest, slope and water landforms in the area are all available, and there are two fishing ponds, with a large area of paddy fields and wet fields.

Specific analysis: (i) Topography and climate are suitable for crop production constituted by field, horticulture, fruit tree and forestry. It is easy to realize the mode of farming and breeding circular agriculture and three-dimensional agriculture based on crop production; (ii) The small reservoir and wet field resources can develop fish farming and rice-fish three-dimensional agriculture; (iii) The original vegetation cover and the different landform features form the foundation for the construction of the characteristic scenic spots and attractions.

Design elements: The agricultural production model should

include circular agriculture, three-dimensional agriculture and ecological agriculture; the agricultural products should include cultivation, breeding and fishery products; the functional expansion elements are extracted from the agricultural production projects being carried out, focusing on high-quality agricultural products, and the tourism and experience function is expanded from the products, agricultural production activities, farming environment combined with natural resources advantages, respectively.

2.3 Social supporting conditions There are sound basic water, electricity, gas and other social supporting facilities; there are five large red-spot plots in the area.

Specific analysis: (i) The social supporting conditions can fully support the construction and later operation of the project; (ii) There is a certain area of construction land in the area, which can provide support for the construction of facilities and activities that must use non-agricultural land.

Design elements: Agriculture, agricultural products and agricultural function expansion should meet the needs of consumers in mega-central cities, material, spiritual culture and ecological product level is higher; the core reception area has the construction land demand, and the layout should be made according to the existing construction land location.

2.4 Conditions of the construction unit The predecessor of this project is the leisure sightseeing agricultural base and ecological organic agricultural production base that Chengdu Naya Mountain Villa Ecological Agriculture Co. Ltd. began to invest in and construct in 2011, covering a total of 13.3 ha. There is one reception center that covers an area of 2 000 m², and 3.4 ha of ecological fishing pond, and 1.67 ha of three-dimensional agricultural (loquat, ecological chicken) production area. The basic roads, car parks and other supporting facilities can meet the production needs based on agricultural production activities, agritainment dining, fishing and a small number of residential services, initially with "hematopoietic function". The construction unit plans to transfer the land and expand the park to 66.67 ha, and build a high-quality eco-agricultural production base and tourism base.

Specific analysis: (i) The "hematopoietic function" initially formed before planning can accumulate the funds for the late construction. (ii) The development plan of the construction unit needs to effectively integrate the comprehensive design of agricultural production technology system and sightseeing tourism service system.

Design elements: There is a need to form a feasible and stable agricultural production technology system and tourism operation technology system, well integrate the two system functions, realize resource reuse, and guide the construction with concise text and graphic method.

2.5 Public welfare and specific needs

2.5.1 Public welfare. Based on the ecological environment protection and sustainable development, it is not only necessary to solve the possible environmental pollution caused by production, but also necessary to explore the social functions of agricultural

production activities and species resources, to protect the environment, and achieve ecological upgrading. Based on the needs of local social and economic development, we should have the ability to realize the social needs of increasing farmers' income, industrial development, science and technology demonstration, *etc.*

Specific analysis: The overall design should have the feasibility of construction, maneuverability of operation, and long-term stable economic benefits, and the above-mentioned functions are naturally achieved through the sustainable and healthy operation of the project.

Design elements: Agricultural production system design needs to take into account high-quality agricultural production, agricultural function expansion, environmental protection, ecological upgrading and landscape construction carrying function; the project as a whole should have stable economic benefits, and there is low difficulty in production technology, easy for farmers to participate in and increase the income.

2.5.2 Specificity. The project was implemented in Sichuan Painting and Calligraphy Association's permanent fixed activity point.

Specific analysis: The painting and calligraphy association personnel are the province's senior talents in calligraphy and painting, whose demand on culture is significantly higher than the general public, having a strong influence. The project construction site, as a perennial fixed activity point of provincial painting and calligraphy association, has a vast area of hilly and mountainous rural environmental resources, with a strong advantage of traditional painting and calligraphy arts and culture integration. Therefore, the artistic conception of Chinese traditional culture and the artistic conception of traditional painting and calligraphy should run through this project.

Design elements: Chinese traditional cultural heritage should run through the overall situation, highlight the poetic and picturesque concept of aesthetics, and comprehensively enhance the level of farming tourism culture.

2.6 Thinking creativity of agricultural function development

2.6.1 Identification of target markets. The location condition of Chengdu half-hour economic circle provides enough tourist sources and higher consumption ability, and puts forward higher requirements for the creativity of agricultural expansion function. The specificity of Sichuan Academy of Poetry and Painting as a perennial activity point requires the integration of Chinese traditional cultural conception into the project. Various landforms redound to the sound farming environment in the hilly area, and it has the advantage of developing high-quality agricultural production and characteristic rural tourism.

Therefore, the target market should be oriented to the consumers of super-central cities, with the Chinese traditional culture, high-quality agricultural products, innovative agricultural expansion and natural scenery of hilly area as characteristics, to create a certain scale medium and high-grade sightseeing scenic spot.

2.6.2 Strategies for expanding agricultural functions. According to the environment condition of the field, land, forest and slope, the original vegetation with high coverage rate and the good climate condition of Chengdu Plain, the agricultural activity in the planting direction and the three-dimensional agricultural model have no technical restriction and can be designed flexibly. In order to form a comprehensive agricultural product system, we should increase agricultural production projects, expand creative functions and integrate cultural conception on the basis of the existing ecological pig, fruit tree, fish pond and agritainment service functions.

The technical difficulties of agricultural function expansion lie in: first, we should well integrate the Chinese traditional cultural conception into agricultural activities and rural tourism activities based on production; second, we should form a multi-type system of ecological agricultural products to meet the needs of self-sufficient traditional agricultural catering culture; third, under the condition that the yield of ecological agricultural products is relatively low, the comprehensive benefit of agricultural production should be improved.

The agricultural function expansion strategies: first, the artistic conception with the fisherman, the woodcutter, the farmer, and the scholar as theme should run through the overall situation, thus realizing the Chinese traditional cultural integration; second, we should adopt three-dimensional agricultural technology measures to improve production efficiency, and use ecological agricultural products, creative agricultural tourism activities, membership sales and other strategic measures to enhance the value of agricultural products; third, the specific bearing capacity of agricultural technology should be considered in the whole design, and the design content with the agricultural technology requirements involving regional division, species composition, landscape construction and so on, must well support the site implementation of circular agriculture, ecological agriculture, three-dimensional agriculture and other technologies; fourth, based on scientific and rational overall design, the agricultural functions should be expanded from the product, activities, environment and landscape and other aspects.

2.6.3 Natural realization of public welfare functions. (i) Ecological environment protection and function promotion. The function of environmental protection is solved by recycling agriculture technology. For the excrement and sewage from small scale pig breeding industry, it is necessary to make regional planning and breed collocation in advance in order to apply farming and breeding recycling technology, and to solve the problem of pollution of breeding industry; construct the ecological fish pond, use the natural breeding mode with low feed input, and utilize the natural purification function of fish pond ecosystem, to realize the natural purification of water body. The organic waste and sewage produced in the sightseeing tour are collected and pretreated by composting and biogas technology, and finally enter the farming and breeding cycle in the form of fertilizer. There should be supporting sanitation

tion facilities for the domestic wastes which are treated in the urban waste treatment system.

Ecological upgrading function needs to be combined with the overall design of the project to carry. First, the circular agricultural technology and ecologically improved species should run through the regional layout, and planting and breeding production, and it is necessary to directly enhance the irrigation conditions, vegetation cover conditions, soil fertility and organic matter conditions, as well as the ecological management of the obsolete and dangerous landforms, to achieve the ecological environment upgrading function; second, based on the overall regional scenic spots, it is necessary to beautify the environment, and promote beautiful rural construction.

(ii) Local socio-economic demands. Through the construction of long-term stable and profitable agricultural project production and operation mode, the project agricultural production system and sightseeing tourism operation system can form a long-term social interaction, naturally realize agricultural technology and operation model demonstration, and synchronously promote the development of local agricultural industry. This project is not labor-intensive large-scale agricultural production project, it does not have the agricultural production driving ability of "company + farmers", so we should make use of the advantage of a large number of labor forces in the tertiary industry service of the project, take the initiative to use local farmers, in order to increase the income of farmers.

(iii) Natural realization of public welfare. The public welfare of agricultural projects should be realized naturally based on the long-term stable operation of the projects, and the isolated public welfare design is not sustainable.

2.7 Summary of design ideas Under the guidance of previous analysis, combined with the actual agricultural production, the advanced agricultural technology, agricultural function expansion creativity, economic strategy, public welfare and other elements are combined for the comprehensive analysis, thus forming a general design idea.

2.7.1 Core orientation. Through the Chinese traditional culture characteristics, with Naya Mountain Villa as the source, with the fisherman, the woodcutter, the farmer, and the scholar as theme, five core service areas are constructed; with the core area as the center, we should build the internal functional areas integrating agricultural industry, sightseeing tourism and ecological scenic spots, expand the modern agricultural function characterized by the artistic conception of Chinese traditional culture, high-quality agricultural products and creative agricultural tourism activities.

2.7.2 Development mode. The agricultural production mode should choose circular agriculture, ecological agriculture and three-dimensional agriculture; the mode of agricultural function expansion should choose sightseeing agriculture, tourism agriculture and experience agriculture; the multi-point replication is conducted after the successful single point construction.

2.7.3 The mode of agricultural industry. It should be dominated

by planting, animal husbandry, supplemented by fishery; it should expanded in the customized direction of high-quality agricultural products, picking experience, and ecological products.

2.7.4 Agricultural technology mode. The core is planting and breeding cycle and eco-agriculture, and it is necessary to clearly define the layout of producing area, variety scheme and technology orientation in the planning.

2.7.5 Agricultural function expansion. On the basis of conventional high-quality agricultural products, it is necessary to explore the intangible value of agricultural products, agricultural environment and agricultural activities, expand spiritual and cultural output and ecological environment output function.

2.7.6 Supporting infrastructure. The general layout should be formed according to agricultural activities, service activities and ecological upgrading needs, and there is a need to improve irrigation systems, road systems, ecological governance and environmental protection conditions.

2.7.7 Economic assessment. The product program can be achieved to effectively enhance the income, and the feasibility after the economic assessment can support long-term operation.

2.7.8 Public welfare function. It needs to be considered in the overall design of the project, and to be realized naturally in the specific operation, mainly including pollution control, ecological upgrading, industry driving and farmers' income increasing function.

2.7.9 The above design ideas are an indivisible whole, and they should be mutually integrated and complementary.

3 Examples and design points

3.1 Oriented planning The oriented planning is the core idea that runs through the whole design, which requires the need to embody the artistic conception of Chinese traditional culture, the local flavor of agricultural tourism, and the demand of ecological civilization for ecological agricultural products, agricultural spiritual and cultural products and ecological products, and to clarify the idea, principle, orientation and construction goal of the overall plan.

3.1.1 Planning concepts. Far away from the noise, return to nature; harmonious interaction among farming, hometown, culture and folk; ecological agricultural products, safe, healthy, pollution-free.

3.1.2 Planning principles. Scientific planning, step-by-step implementation; taking actions that suit local circumstances, making overall arrangements; combination of short-term and long-term goals, sustainable development; interaction between the primary and tertiary industries, chain-like development; government support, engine drive.

3.1.3 Project positioning. The integrated creative agricultural park which integrates the functions of modern agricultural production, tourism, agricultural experience, popular science education, folk-custom display and leisure and entertainment, the leading enterprises in eco-agriculture and rural cultural tourism industry in

the region.

3.1.4 Construction objectives. (i) Agricultural production. It is oriented by eco-agricultural concept, and the product is safe, healthy, and pollution-free; the production capacity meets the park’s tourism reception and member consumption needs. (ii) Tourism reception. The tourism infrastructure is perfect, the catering and accommodation reception capacity is more than 400 people, and the service quality is good. (iii) Function expansion. There is a need to expand the farming experience, painting and calligraphy art, scenery tour, popular science education, folk culture and other characteristic rural tourism activities, with good demonstration and driving ability. (iv) The environment construction. The ecological environment is good, the landscape layout is reasonable, the landscape node is perfect, and the whole environment becomes the region’s bright spot.

3.2 Agricultural system and function expansion Agricultural system and function expansion need to integrate the artistic conception of regional layout, functional reuse of producing areas, agricultural production system, agricultural products and tourism-based agricultural products, agricultural production and experience activities, farming environment and ecological environment and other resources, and they should not be separated.

3.2.1 Basic elements of agriculture. The basic elements of agriculture are a whole set. Based on the technical requirements of ag-

ricultural production, the basic elements of agriculture should be put forward in accordance with the present situation, topography, climate and other natural resource conditions in the region. The basic elements of agriculture in some projects may also be adapted according to the needs of the owners, but they should also meet the technical requirements of agricultural production.

Fruit trees, fish, live pigs and agricultural tourism services were available before the project was planned. On this basis, according to the present natural condition supporting ability, combined with the agricultural working experience and personal creativity of the main designers, the following agricultural basic elements are put forward by combining the agricultural production types, three-dimensional agriculture, circular agriculture and new technology of ecological agriculture: (i) Variety direction: fruit tree, rice, oil crop, pig, chicken, rabbit, fish breeding, vegetables, mulberry, lotus root, grapes, flowers. (ii) Production mode: circular agriculture, ecological agriculture, three-dimensional agriculture. (iii) Typical demonstration: rice-oil crop, rice-fish, stocking under forest, mulberry-pig cycle.

3.2.2 Agricultural production and management areas. The regional layout should carry out the core guidance of the first design idea, and it is specifically implemented in terms of functional area division, farming area, landscape area design, crop type and so on.

Table 1 Design of agricultural production area and management area

No.	Name	Land area 667 m ²	Planning progress // 667 m ²			Remark
			Phase 1	Phase 2	Phase 3	
1	Naya Mountain Villa	13	13			Core reception area
2	Moonlight over the Lotus Pond	9			9	Core reception area
3	Fatanju	18			18	Core reception area
4	Pear Flower and Drizzle	12			12	Core reception area
5	West Sichuan Farmhouse	6			6	Core reception area
6	Flower Garden	34	34			Sightseeing tour
7	Camping Beach	26	26			Sightseeing tour
8	Fragrant Rice	20	20			Production/sightseeing tour
9	Ecological fish pond	51	51			Production/sightseeing tour
10	Happy farm	9	9			Production/sightseeing tour
11	Modern Agricultural Exhibition Area	12	12			Production/sightseeing tour
12	Fruit forest	173	25	148		Production/sightseeing tour
13	Deep, Blue Sea and Mulberry Fields	47		30	17	Production/sightseeing tour
14	Landscape Zone in Land of Fish and Rice	75		35	40	Production/sightseeing tour
15	Fresh Lotus Root	31		31		Production/sightseeing tour
16	Forest park	220		110	110	Production/sightseeing tour
17	Farming experience area	155			155	Production/sightseeing tour
18	Ecological farm	7		7		Production
Total planned construction area		918	190	361	367	

In the design of producing area and management area, planting will not change the use of agricultural land. The land for agricultural facilities is supported by the current agricultural land management policy. Because of the demand of construction land in the core reception area, it needs to be laid out in the existing 5 construction land locations.

The specific design is as follows. Five spots in the core reception area: Naya Mountain Villa; Moonlight over the Lotus Pond; West Sichuan Farmhouse; Fatanju; Pear Flower and Drizzle. Twelve landscape and agricultural function areas: Flower Garden, Camping Beach, Fragrant Rice, ecological fish pond, happy farm, fruit forest, Deep, Blue Sea and Mulberry: Fields,

Landscape Zone in Land of Fish and Rice, Fresh Lotus Root, forest park, farming experience area, modern facility agricultural area. One ecological farm.

3.2.3 Agricultural product programs and ideas. Agricultural product programs and ideas come from the composition of the variety in the basic elements of agriculture, and the intangible value generated by the production process of the variety should be explored as far as possible. (i) Rice and rape: The paddy field and lower wet field are laid out in the scenic spot of Fragrant Rice, and the rice-rape two-season rotation pattern is adopted for open-field production; there is a need to expand the self-squeezed vegetable oil, selenium-rich rice, rice-fish three-dimensional agriculture and agricultural land landscape, experience, technology and landscape functions. (ii) Vegetable: It is laid out on a small scale in the flat land of farming experience area and modern agricultural demonstration area, and it is dominated by open-field production; there is a need to expand ecological vegetables, and farming experience, and experience function. (iii) Strawberry: It is laid out on a small scale in the flat land of farming experience area and modern agricultural demonstration area, and the greenhouse production and open-field production are combined; there is a need to expand green or organic strawberry products, picking experience, and experience function. (iv) New strange crop: It is mainly laid out in the greenhouse of modern agricultural demonstration area, and the variety is from all kinds of new strange horticulture crops; there is a need to expand the new strange varieties, high-end agricultural facilities, and landscape functions. (v) Fruit tree: It is laid out in the sloping land of the fruit forest landscape area, it is expanded based on the original fruit tree planting area, and the open-field planting is adopted. The varieties include orange, grapefruit, loquat, peach, pear; there is a

need to expand the experience and technical functions of ecological fruit, picking experience, three-dimensional agriculture (under-forest chicken). (vi) Mulberry: It is laid out in the scenic spot of Deep, Blue Sea and Mulberry Fields, as well as the obsolete and dangerous terrain in the whole project area, and the variety is mulberry; there is a need to expand the ecological products and technical functions of Deep, Blue Sea and Mulberry Fields, ecological management, mulberry fruit and mulberry vegetables, recycling agricultural green fodder. (vii) Chicken: It is laid out in the scenic spot of fruit forest, and the under-forest stocking is adopted; there is a need to expand the agricultural technology and the experience function of ecological stocking, and egg picking. (viii) Ecological pig: It is laid out in the existing pig farm, and based on the existing large-scale fruit tree planting area, the ecological pig breeding combining captive breeding and stocking, and the breed is Xiaoxiang pig and hybrid pig; there is a need to expand the product and activity functions of high-quality ecological pork, and pig killing to celebrate China's Lunar New Year. (ix) Fish: It is laid out in the landscape areas of ecological fish pond and Fragrant Rice, and the low-feed ecological stocking model is used; there is a need to expand the products, technology and experience function about ecological fish, rice-fish three-dimensional agriculture, and leisure fishing. (x) Sightseeing rabbit: It is laid out in the landscape area of Flower Garden, and the stocking and cage breeding are combined; there is a need to expand the landscape, experience function of viewing and interaction. (xi) Forest tree: It is laid out in the forest park landscape area, the variety is perennial tree, and the open-field planting mode is adopted; there is a need to enhance the large area landscape, forest tourism, ecological upgrading, resource accumulation, ecological service and production functions.

Table 2 Agricultural product programs and ideas

No.	Agricultural product type	Production mode	Production scale//667m ²	Annual production capacity	Unit	Usage			
						Brand sales	Used by the park itself	Farming experience	Landscape
1	Rice	Open field	215	129.0	t	√	√		√
2	Rape	Open field	215	12.9	t	√	√	√	√
3	Vegetable	Open field	9	10.0	t		√	√	√
4	Strawberry	Open field	8.2	6.0	t	√	√	√	√
5	Fruit tree	Open field	173	190.0	t	√	√	√	√
6	Green mulberry fodder	Open field	47	141.0	t		√	√	√
7	Chicken raised under forest	Under forest	50	12 000	head	√	√	√	
8	Green egg	Under forest	50	1 000 000	pieces	√	√	√	
9	Ecological fish	Pond and paddy field	35	40.0	t	√	√	√	
10	Ecological pig	Captive breeding	7	500	head	√	√	√	
11	Sightseeing rabbit	Stocking, cage breeding	5	500	head		√	√	
12	New strange horticulture variety	Greenhouse	3.168				√	√	√
13	Forest tree	Open field	220						√

3.3 Integration design Agriculture, environment, tourism and other scattered elements in the project are integrated, to build the modern agricultural tourism scenic spot with rich connotation, and various types of agricultural expansion functions are achieved in the operation of the project.

3.3.1 Functional orientation of tourism in functional areas. The scenic spot construction of five core reception areas such as Naya Mountain Villa and "fisherman, the woodcutter, the farmer, and the scholar", was used for poetic expression of natural elegant Chinese traditional cultural conception. Based on the characteristics of the core

scenic spots, ten thematic landscape areas are laid out to form ecological and natural farming culture tourism atmosphere of distinct features,

and enhance the existing agricultural tourism areas with rural characteristics to a higher level of the ancient poetry style (Fig.1).

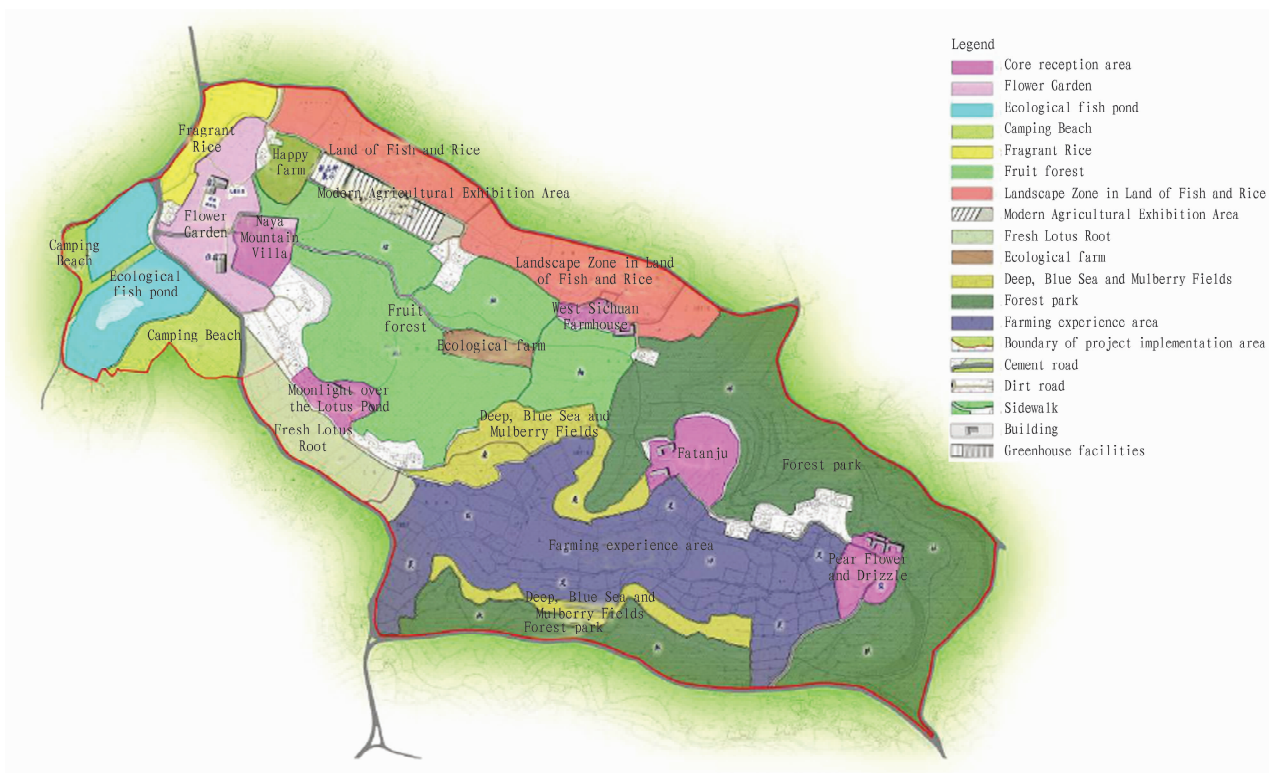


Fig. 1 General planning layout of Naya Mountain Villa

Core attractions: Naya Mountain Villa, Moonlight over the Lotus Pond, Fatanju, Pear Flower and Drizzle, West Sichuan Farmhouse. It aims to build the theme landscape with distinct diverse cultural connotation while providing reception, catering, accommodation, personnel distribution function.

Regional landscape: ten landscape themes (Flower Garden, Fragrant Rice, ecological fish pond, Camping Beach, happy farm, Modern Agricultural Exhibition Area, Moonlight over the Lotus Pond, Land of Fish and Rice, fruit forest, Deep, Blue Sea and Mulberry Fields, forest park, farming experience area). The original vegetation is relied on for optimization, to reflect the Chinese traditional cultural conception featured by natural harmony and harmony between man and nature in the design of the scenic area.

3.3.2 Creative activities of sightseeing agriculture. The special solar term events takes calligraphy and painting and four seasons as theme, to promote the intuitional experience of the traditional culture; the common farming experience activities are extracted from the agricultural production system; the sightseeing tourism activities are created according to the environment and resources conditions.

The following three types of activities can be used to expand the new functions of agricultural products, agricultural activities and natural resources, and form more spiritual and cultural products: (i) Solar terms activities: painting and calligraphy art festival, appreciation of flowers (spring), moonlight over the lotus

pond (summer), autumn harvest festival (autumn), killing pig for the Spring Festival. (ii) Farming experience: picking up fruits in the hills, catching chicken and picking up eggs, harvesting lotus root, self-ploughing experience and so on. (iii) Holiday leisure: fishing, barbecue, camping, green dining experience, national holiday and so on.

3.3.3 Effect map. The planning intention is directly expressed with an effect map, as shown in Fig. 2.



Fig. 2 Aerial view of Naya Mountain Villa

3.4 Evaluation of economic benefits

3.4.1 Funding. The project estimates that the construction in-

vestment is 100.002 6 million yuan, the circulating fund is 5 million yuan, and the total investment is 105.022 6 million yuan. More than 20 million yuan was invested before the planning, and the building part of the scenic spot of Naya Mountain Villa and the main body of the ecological fish pond have been completed, which initially possesses the function of "self-hematopoiesis". After the planning, through profit accumulation, social financing, government subsidies and other channels, the follow-up fund problems are solved.

3.4.2 Income analysis. The income of the project comes from the service activities after the production of agricultural products and function expansion, and the agricultural products form the benefits in three ways (market or order sales; tourism-based agricultural products; characteristic food and beverage), as shown in Table 3.

Table 3 Income estimates

No.	Items	Unit	Annual production capacity	Sales	Proportion %	Sales unit price//yuan	Estimated income 10 ⁴ yuan	Remark
a.	Agricultural production							Market, order sales
1	Selenium-rich rice	t	129.0	64.0	49.61	40 000.00	256.00	Fragrant Rice Scenic Spot
2	Ecological rapeseed oil	t	12.9	7.0	54.26	32 000.00	22.40	Fragrant Rice Scenic Spot
3	Vegetables	t	10.0	5.0	50.00	10 000.00	5.00	Happy Farm, Modern Agricultural Exhibition Area
4	Strawberry	t	6.0	2.0	33.33	36 000.00	7.20	Happy Farm, Modern Agricultural Exhibition Area
5	Ecological fruit	t	190.0	120.0	63.16	18 000.00	216.00	Fruit forest, Pear Flower and Drizzle Scenic Spot
6	Green mulberry fodder	t	141.0	0.0	0.00	0.00	0.00	Deep, Blue Sea and Mulberry Fields Scenic Spot, pig farm production area
7	Chicken raised under forest	head	12 000.0	6 000.0	50.00	200.00	120.00	Fruit forest scenic spot
8	Ecological egg	pieces	1 000 000.0	800 000.0	80.00	1.30	104.00	Fruit forest scenic spot
9	Ecological fish	t	40.0	20.0	50.00	36 000.00	72.00	Ecological fish pond, Fragrant Rice Scenic Spot(Part)
10	Ecological pig	head	500.0	400.0	80.00	5 000.00	200.00	Pig farm production area
11	Sightseeing rabbit	head	500.0	0.0	0.00	0.00	0.00	Flower Garden Scenic Spot
			Subtotal				1 002.60	
b.	Sightseeing tour							
12	Sightseeing experience		300 000	300 000	100.00	150.00	2 250.00	200 persons/day, 300 days, 50% efficiency (including tourism-based agricultural products)
13	Accommodation service		45 000	45 000	100.00	300.00	1 350.00	100 standard rooms, 5 core areas, 300 days, 30% occupancy
14	Food and beverage service		100 000	100 000	100.00	150.00	1 500.00	1/3 of the total number of visitors (including self-made characteristic agricultural food and beverage)
			Subtotal				5 100.00	
c.	Total income						6 102.60	

3.5 Public welfare objective analysis

3.5.1 Income for farmers. In Yongshang town, the per capita net income of farmers in 2013 was 125 24 yuan^[15]. When the project is completed, about 200 production and service posts suitable for farmers will be available, giving priority to local farmers and

3.4.3 Cost analysis Agricultural production costs are mainly labor, seed, fertilizer and power fuel costs. According to the characteristics of agricultural production, the estimated production cost is 9.526 million yuan. The agricultural production itself can solve part of the service expenditure in the service activity, so it can be appropriately underestimated to be 27.461 5 million yuan; the depreciation expense is 6.668 million yuan; the total operating cost is 43.655 5 million yuan.

3.4.4 Economic analysis The pre-tax profit is 17.370 5 million yuan, the business tax payment is 3.315 million yuan, the enterprise income tax is 3.513 8 million yuan, and the estimated after-tax profit is 10.541 7 million yuan. The total rate of return on investment is 16.54%, the payback period of investment after tax is 6.08 year, and the internal rate of return on investment after tax is 18.24%. The results of the economic assessment are feasible.

workers, with an annual salary of more than 20 000 yuan. This will drive 200 farmers and directly increase the income of over 7 000 yuan per person per year.

3.5.2 Industry promotion. The agricultural production project can directly improve the production skills of local rural labor, indi-

rectly promote the development of agriculture and rural tourism. A demonstration base of agricultural tourism has been built, which can promote the comprehensive ability of local ecotourism agricultural industry.

3.5.3 Ecological benefits. Through the construction of agricultural facilities such as road network, irrigation system, field planting area, landscape area and so on, the ecological sightseeing agriculture project, and modern agricultural expansion operation mode can achieve good recycling of resources and harmless disposal of waste, effectively improve the ecological management ability of the project area and further improve the regional ecological environment.

4 Discussions

4.1 Important basic information Regional conditions and policy environment are the two kinds of most important basic information of agricultural project planning.

4.1.1 Regional conditions. The first is topographic map, which is used to identify the land use area, construction area and the general map; the second is the geographical climate feature, which is used for crop selection and the construction of agricultural production technology system; the third is the construction land situation, which is used to determine the construction area, road system construction and agricultural production area planning; the fourth is the state of natural resources in the project area, and through the full use of existing natural resources, it can effectively reduce the cost of construction.

4.1.2 Policy environment. The function expansion of modern agriculture has a strong feature of multi-industry integration. It is necessary to analyze the local policy environment, clarify the support status and restrictions to agriculture, tourism, processing industry and other aspects, obtain access qualification, and win more local support. Because of the agricultural production and construction of service facilities, the construction land or the land for agricultural facilities must be required. It is one of the necessary conditions for the construction of agricultural projects involving the interaction between primary and tertiary industries by obtaining the land quota legally according to the policy requirements.

4.2 The link between planning and reality Expanded modern agricultural project planning and design needs the complex creative thinking covering agricultural professional technology, policy guidance, social needs, modern enterprise management and operation and many other fields. The formation of this kind of thinking needs to have long-term practical work experience of many industries, and constantly deepen the study of relevant professional concepts and knowledge.

In order to ensure the successful completion and long-term stable operation of modern agricultural projects, it is necessary to form a comprehensive solution to the problems in agricultural professional technology, policy guidance, social needs, enterprise operation mode and so on. The first is the overall design of agricultural production system, and there is a need to solve the specific technical problems in agricultural production mode selection, variety scheme, modern agricultural technology application, site man-

agement and so on. At the same time, it should also effectively bear the demand of social public welfare such as agricultural function expansion, ecology and industry driving. The second is the creation of operation strategy, and there is a need to achieve the goal of synchronously realizing agricultural function expansion, product scheme design, and interactive strategy of primary and tertiary industries, so as to construct a long-term and stable profitable model. The third is the natural realization path to farmers' income increase, ecological upgrading, industrial driving and science and technology demonstration and other social and public welfare functions in the overall design.

4.3 Multi-disciplinary composite features of the designers

The planning and design of modern agricultural projects often involves many disciplines, including agriculture, economy, architecture and planning. Agricultural direction is the basis for the formation of competitive agricultural products and expansion of agricultural functions. The subject of architecture includes the commonness of urban construction and agricultural facilities construction, and it needs to provide support for two different construction projects. The emphasis of economic discipline is to evaluate the economic feasibility of the project, to avoid economic risk, and to form feedback on the design of agricultural product system from the point of view of value and benefit. Planning disciplines create ideas for the basic conditions of project products and the environment, and provide support to the project management and operation of the project. The integration of the above-mentioned multi-disciplinary fields requires that designers have a good ability to complement and cooperate with each other. The demand for agricultural professional designers is relatively high, which needs to become a bridge for information communication between other professionals.

To sum up, the planning and design of modern agricultural project is a complex systematic project, and the specific project is affected by the location conditions, social conditions and specific agricultural technology strategy, so it is difficult to replicate directly. But in the process of design, the choice of modern agricultural industry model and the universal complex multi-disciplinary and multi-domain thinking method, can be used as a reference for the design of this kind of project again. With the steady progress of ecological civilization construction in China, the function of agriculture will more reflect the characteristics of spiritual and cultural products and the needs of ecological civilization. Agricultural project planning will involve a wider range of specialized fields, and the demand on agricultural planners' multi-disciplinary complex thinking ability will be further increased.

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(From page 19)

the labor cost accounted for 61.5% of total cost. In particular, the fruit picking workers have become a major part of the expenses incurred in the production of citrus, accounting for 30%–40% of the total cost, which is comparable to the developed countries and regions where labor costs are high.

(iv) Abnormal weather is unpredictable. The winter management of late-maturing citrus and late-harvested citrus trees is of crucial importance. In recent years, abnormal weather occurs frequently, affecting late-maturing and late-harvested citrus production and sales by varying degrees. For example, Changshou and Kaizhou suffered frost damage in the end of 2012; they suffered spring drought in March 2013; in addition to extreme low temperature in the whole city, the production and sales of late maturing and late-harvested citrus were greatly influenced.

5.3 Recommendations (i) Selling at favorable price and not selling off. The production situation of citrus in the 2016 season in the whole country was favorable for citrus production and sales, and the price in the beginning of the year was moderate. The Spring Festival in 2017 will be ahead of previous years. Thus, it is recommended to grasp the market situation and promote the citrus sales at favorable price. After the Spring Festival, it is estimated that the price of middle maturing varieties will decline, and later, with the late-maturing varieties put into the market, it would pull the rise of price. Therefore, it is recommended to properly arrange the sales process and ensure bumper harvest and high income. Special attention should be paid to the sales of blood oranges. Due to the rapid growth of blood oranges in Chongqing and Sichuan this year and the pressure of homogenous competition

in the market, the sales should be arranged in advance.

(ii) Building and strengthening brands with the aid of channels. It is recommended to make full use of the existing sales channels such as broker team, circulation owners, e-commerce, and direct sales outlets, to give prominence to regional advantages of high quality and safety and diversified varieties, strengthening building of brands online and promoting sales offline, enhancing regional brands such as Fengjie navel orange, Liangping pomelo, Kaixian spring orange, Wanzhou rose fragrant orange, and Wushan Newhall orange, and make use of advantage of being close to the export, and actively coordinating and organize export of citrus.

(iii) Strengthening winter management and ensuring increase in both yield and income. It is recommended to prevent fruit falling and water shortage during winter, and take frost damage prevention measures such as fumigation and film mulching, to ensure increase in both yield and income. Besides, it is recommended to implement proper harvesting and post-harvesting treatment technologies, and forbid brutal harvesting, improve quality and safety awareness, raise post-harvesting storage and commercial treatment level, and raise the added value of fruit.

(iv) Strengthening information service and upgrading the industry. It is recommended to build a big data center for Chongqing citrus industry, to raise the production and marketing integration capacity. Besides, it is recommended to bring into play the information service functions, promptly collect and issue supply and demand information, monitor the production and marketing progress, and undertake pre-warning of possible sales problem, so as to provide references for production and management personnel to respond to market changes.