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ECOLOGICAL WISDOM IN THE SPATIAL CONSTRUCTION OF TRADITIONAL VILLAGES IN OASIS: A CASE STUDY OF GRAPE VILLAGE IN TURPAN, CHINA

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Abstract:

Ecological wisdom is an expression in the context of the era of ecological civilization. Based on respecting the existing local ecological wisdom, the construction of ecological civilization should solve the changing needs of traditional villages' ecological, social and economic development. The grape village is a relatively well-preserved traditional village in Turpan, which contains rich samples of ecological wisdom in constructing human settlements. The ecological wisdom theory of symbiosis and coexistence of humans and nature is embodied in the construction of the village human settlement environment. From the aspects of overall shape, production and life, and ecology, this paper summarizes the construction wisdom system of traditional villages in Grape valley to deal with human settlement environment,

including (climate resources, human-land relationship, spatial relationship): (1) the village spatial pattern of "village-water-field-drying-forest-living"; (2) the production space of fertile land and field drying house in the lower part of the village is more likely to be in the distance from the water. 3. Living near the water, living in the upper and lower part of the living space; 4 gatherings in the water-rich place from zero vegetation can also flourish the courtyard landscape space; 5 because of the water can flourish forest belt space and other oasis villages to create wisdom. This study hopes to provide a valuable reference for the protection theory and practice of oasis traditional settlements.

Keywords: ecological wisdom; spatial construction; Turpan; Oasis traditional village;

Cultural landscape

1. Introduction

Ecological wisdom is a new situation in which residents build their livelihood by dealing with the relationship between man and land through generation accumulation, dealing with complex and changeable ecological relationships, and improving under the limited area's natural and social background. Ecological wisdom serves specific ethnic or regional communities, has conspicuous national attribution and geography, and embodies respect for and adaptation to regional resources and environment (Yang, 2001). The focus of the research on ecological wisdom is from the perspective of the living environment, rural revitalization, beautiful countryside and so on, such as "the ecological wisdom of Dong nationality from the structure of 'symbiosis of rice, duck and fish'" (Hu, 2019). "Analysis of the spatial form of raw soil dwellings in Mazha village" (Li, 2021); "study on the spatial characteristics, types and genetic mechanism of oasis historical and cultural villages and towns in Xinjiang" (Meng, 2017). The above research is mainly from the perspective of human geography and landscape architecture and studies the settlement space and construction model from regional resources. There are interdisciplinary references in the research results and methods.

Xinjiang oasis has valuable agricultural resources and unique agricultural types. The grapes that thrive in the desert oasis make them blend into the nature, integrate them with the desert oasis landscape, and create a living space for survival and development in the hot and hot summer environment. "study on the types and Application of Grape Cultural Landscape in Mazha Village, Turpan" (Guo, 2019). Through the study of typical settlements in Turpan, this study combs the ecological wisdom of different settlements. It creates a livable living environment and a stable oasis unit farming economy to make people constantly adapt to the dry and hot climate in Xinjiang. Build an ecological wisdom system of production and living space, and finally build an oasis living environment construction model to construct human settlements. This study is of positive significance to the construction of oasis human settlements in the context of the new era.

2. Material and methods

2.1 Study areas

The Grape village is located in the world-famous excellent tourist city Turpan, Xinjiang, China, It is 11 kilometres east of the city, the national AAAA tourist scenic spot "Grape valley". The grape Valley is 8 km long from north to south and 0.6-2.0 km wide from east to west. It includes four grass-roots units: grape community, Builuke village, Bashmari and Dafusangai village. The total area of a grape ditch is 30.2 square kilometres, and the total area of cultivated land is 7.466 square kilometres, of which grape area accounts for about 80 per cent. The grape village is the largest valley among the valleys in the Crosscutting Mountains of the Fire Mountain from north to south, gradually extending to the south. Due to the significant influence of Tianshan airflow, a microclimate area is formed in the valley, and the spring water flows for a long time. This area has a more pleasant living environment. 50% of the residents in Grape village choose farming as their primary source of livelihood, and most of them have grown grapes for generations. At present, the economic structure of farmers' families in the region is based on the livelihood model of growing grapes and some families are engaged in receiving home-visiting tourists. The overall landscape of the grape ditch can

be used as "Tian Ju according to the topography, along with the current, leading lanes through the streets, buildings with each other, scattered together." The villages are adjacent to each other. The spatial pattern results from the sharing and distribution of water resources along the way.

(1) Natural elements：

A grape village has the independence and typicality of geographical unit and cultural unit. "Geo-environment" and "geo-structure" provide a sandy brown soil, which belongs to Piedmont alluvium and is suitable for growing grapes. In the grape growing season, there are suitable climatic conditions with special light conditions, the significant temperature difference between day and night, less precipitation, strong wind, an average temperature of about-8 degrees Celsius in winter, an annual frost-free period, etc. In the north of the village, there is a regular flow of springs. On both sides of the valleys and streams, there are layers of grape trellis and fruit trees covered with ditches, especially in the name of profitable products, attracting many Chinese and foreign tourists to visit the grape ditch. Especially from May to October, tourists will gather in the grape village to taste the sweet scenery of grapes.

(2) Human elements

Turpan area has rich and unique regional natural resources, location advantage resources, cultural and historical resources, which is the basis of constructing human settlements in traditional villages. As a typical local cultural landscape resource in China from ancient times to the present, the construction of human settlements in traditional villages in Grape valley follows the ecological wisdom system, which has the uniqueness and practicability of inheriting oasis culture.

Grape valley regional cultural element symbol: the coupling mechanism of the grape cultural landscape and natural elements, location elements and silk road traffic location, which promotes the formation mechanism of the construction and evolution of regional human settlements environment. The traditional village of grape valley is an excellent case in Turpan. The location selection respects the new principle of local adaptation and conforms to the core theoretical basis of the objectivity and unity of multicultural background in the grape cultural

landscape. Ecological Wisdom and Local Aesthetic experience (Cheng, 2005).

(3) Water elements

A "human" water system network is formed in the traditional village of grape valley, which is composed of the natural water system, an artificial canal and a small number of care. The distribution of "water system according to topography" results in different structural characteristics in grape valleys (Guo, 2019). At present, the overflowing water system in the ditch can support the artificial canal system on a large scale. The first people's canal introduces alpine snow water into the grape village, which runs through the north and south. The water quality is clear and calm, and it is the primary source of water for grape village farmland irrigation and residents' daily life. The grape gully water system is first dominated by the natural river system at the bottom of the valley; one of the two parallel trunk water systems is naturally tortuous. The other is relatively regular, and then the artificial canal is built as a people's canal, which is characterized by a "human" shape of the water system network. The central channel at the bottom of the valley is a natural river, and there are several artificial canals distributed in the south and north. Many branch canals extend from the central canal, and the branch canal system in different directions is to irrigate every grape field in each direction. The village groups along the Chatter river system are distributed on both sides, mainly on the west side. The two main roads in the valley are parallel to the main river and the main channel, along the direction of the valley and the direction of the natural ditch, from the north valley mouth to the south valley mouth.

2.2 Research methods

(1) Investigation and research

In this study, through field mapping and interviews, sort out the traditional oasis village grape culture landscape pattern and spatial form; use photos and cameras to record the overall environment, human environment and living situation of human settlements in each village grape growing area; measure and record the current situation of the research area with a tape measure, infrared and other methods, to provide useful data for this study.

(2) A summary study was summarized

The formation, development and regional natural and social factors of the grape cultural landscape are greatly influenced by the formation and development of the grape cultural landscape. Through the grape cultural resources in the traditional villages of Turpan oasis, with the help of the research methods and achievements of other disciplines, summarize, summarize and sort out the influencing factors of grape cultural landscape space. Reveal the relationship among the whole form, production space, living space and ecological space of the oasis traditional village within the scope of grape space or organization.

3. Results

The construction process of human settlements in traditional villages in Grape valley embodies the ecological wisdom construction process of regional symbiosis and coexistence of humans and nature (Peng, 2019). Grape cultural landscape elements as a typical oasis cultural landscape in the current production and life, culture, art and other aspects of ecological adaptability, reflecting the respect of the grape village people for the natural ecology. Summarize the construction of universal ecological wisdom in response to the characteristics of grape landscape elements and the construction of water system to the local living environment, mainly include traditional village spatial structure, production and living space compound landscape, architectural visual art landscape, characteristic public space landscape construction and so on. By better focusing on the cultural landscape of the "thing-man" relationship at the site level, it reflects the coupling process of oasis regional resources in agricultural practice and the construction of living environment, and the livable, productive and living characteristics of courtyard landscape (Yang , Tian, 2014). The productive and ecological characteristics of the grape drying room building landscape; The characteristic construction of grape landscape elements in public space and hydrophilic space.

3.1 The Ecological Wisdom of the whole form of the Village

Grape valley is long and narrow, forming residential groups gathered compactly in the area along the mountain, showing a linear morphological pattern, and showing a linear spatial

pattern as a whole. The river system composed of valley topography, natural river and Tulu spring affects the overall structure of the village space. The radiation area of the banded water system becomes the primary consideration of the planting area, and the road and courtyard along the canal become a typical type of living space （Barbaix et al.,2020）.

(1) The spatial pattern of the village.

The natural geographical environment in the grape village is more complex, and the spatial structure of the village conforming to the natural growth of the valley topography is formed under the constraints of the limited topography, showing a "linear spatial pattern" as a whole. The villages are concentrated on the periphery of the small-scale linear water system. They are located in the valleys leaning against the mountains and water space, respecting the topography, reducing the damage to the topography, complying with the natural topography, maximizing the use of the land, and respecting the rational use of the natural ecological base. The living space, production space, and ecological space are in high agreement with the valley's water space and natural topography (Meng, He, 2019). After long-term organizational development, the natural development along the long and narrow mountains and valleys gradually formed a rich three-dimensional landscape, which together formed the overall spatial pattern of "village-water-field-air-forest-residence".

(2) The distribution of village function.

Residential buildings conform to the architectural layout that varies according to the direction of the canals. The roads are sometimes vertical to the river, and the buildings are built in a north-south orientation. Study on the pattern of the dam and the form of settlement and residence in river and lake environment (Fang, 2016). The topography of the Grape valley is complex; the whole is high in the north and low in the south, the bottom of the valley is the lowest, and the elevation rises gradually from the bottom of the valley to both sides, which is divided into three levels: from the bottom of the valley to the first stratum, the terrain tilts slightly to the bottom of the valley, scattered with banded residential areas. The cross-section of the transition area between the first class and the second stratum is short and relatively steep, and the second stratum forms a narrow flat terrace between north and south, mainly planting grapes and locally settling residential areas. The boundary of the third class is formed

by the mountain edge line extending along the north and south of the mountain to form the boundary of the valley. Along the mountain, there is the main road running through the north and south of the valley, and along the main road, there is a gathering layout of residential areas arranged in the shape of "one". In the third level, there are many residential areas along the hillside. It was built relatively late, mainly because the hillside is not easy to plant, mainly to arrange to house, highlighting the differential allocation of land resources.

(3) Road network structure organization.

Based on the fact that the natural basement of the grape ditch forms the spatial pattern of the combination of the natural and artificial water systems through the village, the village layout is mainly along with the dominant spatial layout of the water system and grape fields. The linear layout of the village first extends from the main road (Zhao, 2015). The natural and artificial water system and the road system are combined in space, and the main road extends longitudinally along the main channel, forming the development of both simultaneously. The road is extended in different levels of canals to maintain the village space organization and living space. The road network structure is primary and secondary clear, with a linear organization space form. The main body of the spatial structure in the village is the road network skeleton organization from the initial one-way simple road network system gradually developed into a complex road network while forming a rich roadway space, supporting the overall spatial form of the village (Li, 2019). Its trend is accompanied by the free change of topography, which determines the development trend of streets and lanes in which the organizational form of the road network changes with the water system. Finally, it constitutes the development context of the road network system constrained by the water system and topography.

3.2 Ecological Wisdom of production Space

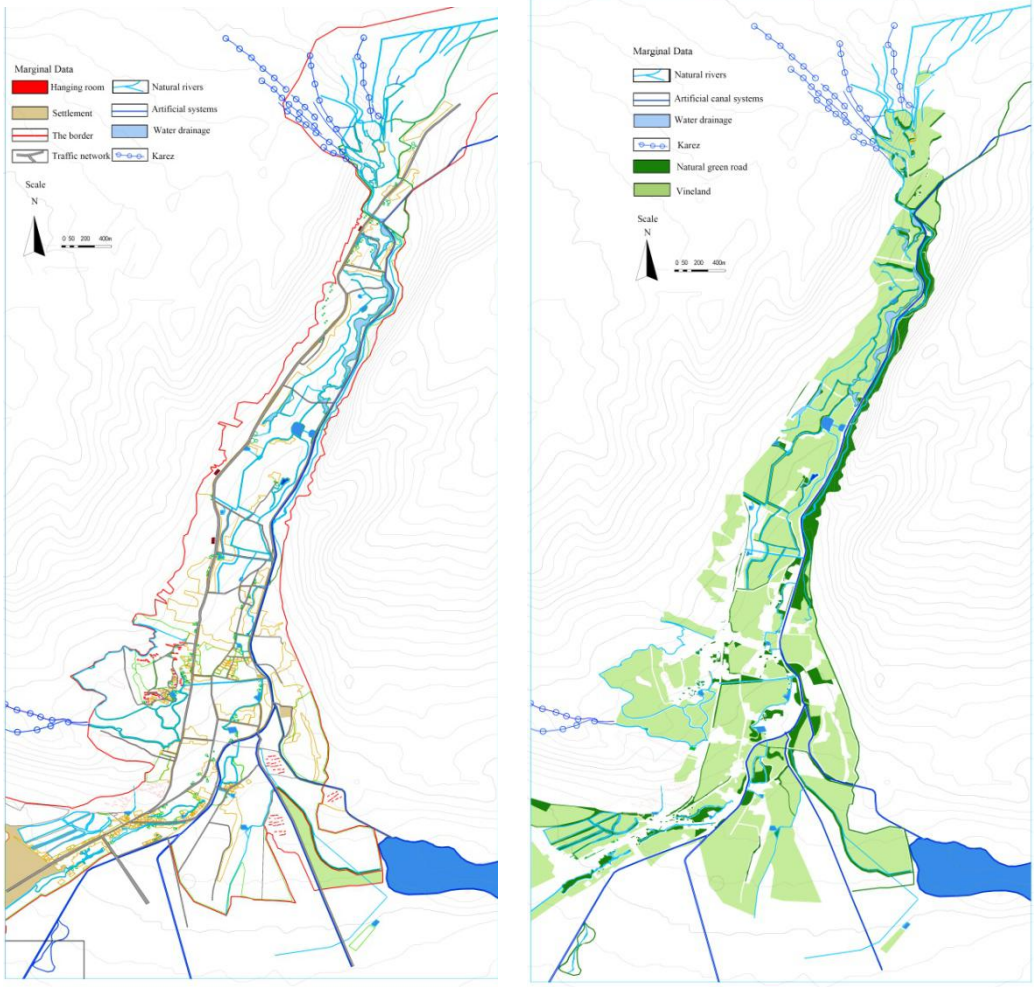
(1) The distribution pattern of grape drying room

The space in the valley limits the production space of the traditional villages in the grape valley oasis. Still, at the same time, it provides a favourable hillside topography for the drying space. As an essential production space, the layout of the grape drying room is mainly

distributed on the hillside and adjacent to the grape field, mainly considering the characteristics of the grape drying room and the factors such as the intensive use and convenience of the land. The landscape of the grape field and grape drying room is formed (Cai, 2011). The distribution pattern of grape drying room in Grape Village is mainly "residential and production combination", which is distributed in the second-floor space of the building; the hillside is supplemented by the potential type, distributed in the vertical space along the hillside, and a small amount is distributed around the grape field.

(2) The distribution pattern of grape field

The grape field in the grape valley traditional village is distributed in the nearby water source area, which belongs to the water-exchange area. Of course, the scale is also relatively small, reflecting that the scarcity of land resources in the "suitable field area" guarantees the convenient use of water in the grape field, as shown in Figures 1. In constructing the valley grape field, the suitable valley irrigation water system was constructed simultaneously, and the canal water in the forest belt was introduced into the grape field through the bottom of the valley. Horizontal and vertical channels are formed in appropriate locations to control water-saving systems, transport water carriers for irrigation, canals and natural water system grape fields work together to maintain the "three-dimensional" inter-mountain valley grape field landscape of grape villages (Meng, 2018).



Figures 1 Grape village water system. The relationship between grape field and water system. Self-drawn by author.

The traditional village of Huoyanshan grape oasis maintains the spatial form of the grape cultural landscape. Dominated by river systems and artificial canals, grape fields and grape drying rooms are the concentrated embodiment of grape cultural landscape patterns in traditional oasis villages in the spatial pattern. After continuous adaptation, adjustment and evolution, a stable landscape pattern of living environment are formed, "close to the water and changing fields." the living environment landscape pattern of the valley type survival adaptation of the field is low and dry high.

3.3 Ecological Wisdom of living Space

(1) Livable shade space

"In the areas of Turpan and Hami, the Gobi used to be boring and often did not rain all the

year-round. Since the province's establishment, tobacco households have been dense, the earth and atmosphere have shifted, and if it rains, it will have a climate that is not a repeat of the season. "In the process of adaptation and construction of ethnic residents in Turpan for more than a hundred years, combined with the needs of family life, the courtyard has different spatial structural characteristics (Zhou, Liu, Wang. 2019). In the shape of the space to explore a suitable, economical, and flexible living space to meet the residents' living and living functions. Grape planting is the first choice in the courtyard. The dense branches and leaves from an excellent shady space and the number of piers planted depends on the size of the courtyard, usually 5-8 piers and as little as 1-2 piers, which can adjust the microclimate in the courtyard and create a comfortable shaded space under the high canopy.

As shown in figure 2, the courtyard under the grape trellis is often the most frequently used space in spring and summer. The excellent scaffolding and the building facade surround the indoor and outdoor transition space, which organises and connects other spaces in the courtyard. The experience of this kind of oasis micro space is vivid and clear. The courtyard space of folk houses in Turpan offers shade to people for the hot summer, forming the second living room and second bedroom: the living room during the day, the bedroom at night, and the ample space in family life, with comfort, intimacy and sense of security. A space place for summer nights. The high friend frame in the centre of the courtyard is the central activity place of the living space in the Turpan area. The activity space with a high utilization rate is used as the transitional space between the courtyard and the interior space of the building, forming a high scaffolding under the courtyard space to adjust the microclimate; improve the sharing of the use of the place.

Figures 2 Construction of shade space in the courtyard of Grape village. Photographed by author.

(2) Increase shade and cool down, regulate micro-environment

The grape drying room in the courtyard is one of the common architectural elements in the courtyard in Turpan. The compound living and production space can create a cool microclimate of the courtyard living space, save the time cost of travel, and transform the multi-functional space. Summer summer, autumn and winter storage, family-style grape drying room combination mechanism: the first-floor living room is the living space, the second-floor grape drying room is the production space. The thick and towering grape drying room, which forms the mode of living above and below (life + production), solves the trouble of the shady space of the residents in summer and provides natural air conditioning for the residents. The function of heat preservation in winter saves space in summer. Family-style grape drying rooms are primarily built in the highest part of the courtyard to facilitate ventilation, generally presented in residential buildings, upstairs across the street or upstairs in the passageway, ventilation and protection from the sun simultaneously, save effective land use and increase shady area. Reduce the temperature of the courtyard and streets, form a

comfortable courtyard, not only full of shadows, form a shady space, meet the grape drying function and improve the living environment.

(3) Forest belt turns green as water flows through

The natural forest belt, water system and grape field jointly form the ecological corridor and natural patch landscape form of the oasis traditional village and maintain the oasis living environment system in the arid area. The internal characteristics of the courtyard come from the need to create "introversion"; the walls distribute the desert, green plants and blue water replace the external hot sunlight and the colour of the Gebi. Life is sheltered here, in the survival experience and spirit against the Gebi and the desert. The interior of the gully settlement and the Gebi settlement is created a vibrant manufactured oasis "Garden of Eden" (Meng, 2019). The traditional village of grape cultural landscape oasis is the epitome of the typical oasis human living micro-environment in Turpan ancient oasis to adapt to the natural characteristics, the architectural form, colour and unconscious decorative beauty of the grape drying room; the image reproduction of grape production, diet and processing process.

Grape cultural life: the continuation and expansion of aesthetic art, such as drinking, enjoying the cool under the grape trellis, the presentation of grape elements in public space, the decorative art of life aesthetics, the cultural intention of diet in poems and songs, and the essential cultural intention in folk festivals. The application and practice of grape cultural elements in public space reflect the equal emphasis on local cultural function and aesthetic comfort and embodies the local expression of local culture in life. Place names and village names reflect the deep spiritual picture of people living in the world and the authenticity of another world. The most common landscape intention of the oasis is the stout old mulberry, which is set up in the low courtyard in the horizontal space, forming a rhythm, highlighting the vertical space tall and straight, in the dry and hot environment will often become a symbol of life in the water landscape space.

Man's dependence on nature is mainly manifested in the use of local materials and colours. As a significant oasis visual recognition system, it forms the ecological characteristics of the local space of the oasis. Condensed in the concept of time, space, ecology, infiltrated into the social management, daily life and other aspects of the architectural pattern, folk literature,

audio-visual art aesthetic spirit creation.

3.4 Ecological Wisdom of Ecological Space

The shaping of near-water and hydrophilic space is a critical landscape type of characteristic space construction. The utilization of near-water and hydrophilic space has become a vital landscape node in the Turpan area known as "Huozhou". It provides daily communication space for neigh bourhood life and organizes the link of important landscape space. Along the water in the courtyard, each household strives for more space close to the water, put on a bed or a seat to enjoy the coolness of the hot summer water landscape, listen to the gurgling of water, and form a hydrophilic space closely related to people's lives. In the middle of the water logging dam pool, the villagers set up a peninsula by bending the canal and only set up a fence at the shore to easily store cattle and sheep. The small peninsula has many trees with shade and near water and effectively provides a space for sinking water, a good place for adults and children to live. It embodies the living state of regional villagers who are "close to water and hydrophilic". Native trees and the canal system, such as mulberry and elm, form shady summer spaces and ventilation corridors (Li, 2011). The plant can be regarded as a green corridor, bringing vitality and a visual aesthetic. Therefore, the green corridor has connectivity in traffic and plays a vital role in the aesthetics of the ecological and cultural landscape. The impact of water on the ecological environment: the canal water maintains the oasis, and the artificial canal is designed to run through the village to nourish the red willow and other sand vegetation, which is an integral part of the ecological environment of human settlements in the oasis. It is also a place for daily communication and summer entertainment for oasis residents.

(1) The Construction of the Space of "Water Lane"

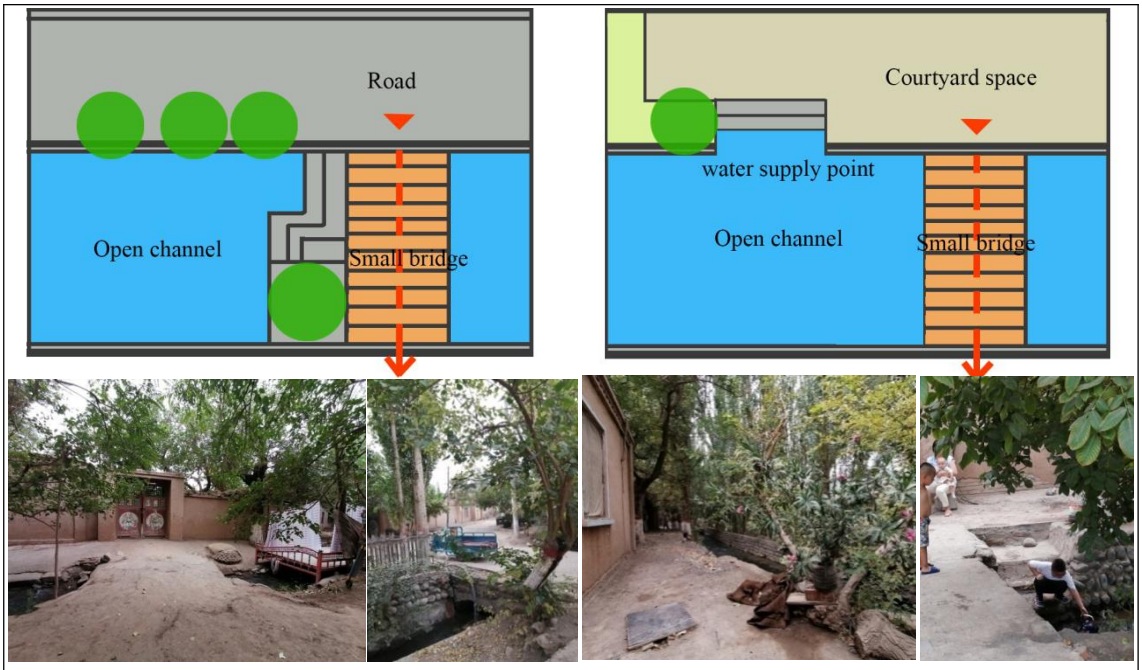
The streets and alleys associated with the grape cultural landscape are spatially shaped by closed, bare soil courtyard walls and grape scaffolding along the streets and alleys—the best place for nearby residents to relieve summer heat in summer. A single courtyard is a more familiar local courtyard system. Towards a unified flat courtyard organization facing artificial canals will be gurgling canals in front of each house, as shown in Figures 3. It is convenient to get water in daily life. Those who live far away from the canal bank put beds and houses

under the house as a place to rest at night. The open-channel flows, the water gurgles, the central canal system connects with the branch canal, the overflow system runs along the streets and lanes, and the clear water surface with different widths has become a place for children to play by the stream in summer (Kang, Wang, 2019). Daily activities such as water collection and raccoon washing along the canal, the waterlogging dam space form a gathering place for residents, which constitutes a vivid daily water landscape under the oasis pattern in arid areas, which is also the essential feature that distinguishes it from other oasis rural landscapes. Residents have established a beautiful and fertile water landscape and a beautiful oasis garden.

Figures 3 Construction of near-water and hydrophilic space in Grape village. Photographed by author.

(2) Landscape logo dominated by canal system

In the dry and hot oasis environment, people's utilization and desire for water are reflected not only in the production space of grape cultivation but also in the daily life of the local people and become an essential form of the intention of the local landscape. Such as the blue-green compound water space, the node space of mulberry elm trees at the water mouth, and the multiple forms of the courtyard space along the street, all reflect the various forms of water utilization by the local people. In the process of spontaneity, a highly recognized landscape intention is constructed (figure 4) (Wang, 2016).



Figures 4 Multiple combination forms of street-facing water system and grape courtyard landscape. Self-drawn by author, Photographed by author.

4. Discuss

The particularity of geographical conditions and ecological fragility of the Turpan area and the characteristic ecological wisdom accumulated in the production and life experience of traditional villages in this region highlight the regional cultural characteristics of the oasis. At present, the grape cultural landscape of Turpan is a typical example of the inheritance of the historical context of the oasis and the revitalization of the countryside.

This paper studies the settlement space type, space form and landscape construction with the grape cultural landscape as the core from the aspects of overall shape, production and life, ecology, etc. The main results are as follows: (1) at the overall morphological level, according to the natural environment and water characteristics of grape cultivation, this paper reveals the law of rational utilization of land and water resources formed by the differential allocation of the grape cultural landscape in the "human-land relationship". (2) at the production level, it summarizes the typical grape cultural landscape space form of "water-field-air-house": the space pattern of waterway dependence and blue-green combination; the spatial distribution characteristics of the grape field and grape drying room according to the mountain; living

space: place space where water is gathered and born. Ecological level: deal with the hot and dry heat in Xinjiang, improve the ecological grape planting landscape of small living environments, and create the characteristics of public space and hydrophilic space.

Through the spatial analysis and study of the cultural landscape in Turpan, this paper sums up the construction wisdom system to deal with the human settlement environment, including (climate resources, man-land relationship, spatial relationship, architectural unit). This study hopes to provide a valuable reference for the protection theory and practice of oasis traditional settlements.

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