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# Development of Urban Agriculture in Xixian New Area

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**Abstract** Short for Xi'an – Xianyang New Development area, Xixian New Area is a modern garden city and the development urban agriculture is its key and bright point. With the aid of SWOT method, this paper analyzes strength, weakness, opportunity and threat of urban agriculture in Xixian New Area. Combining actual conditions of developing urban agriculture in Xixian New Area, it discusses general and specific development modes of urban agriculture. It is concluded that urban agriculture in Xixian New Area should bring into play its strength and avoid its weakness, select suitable development mode and road. Besides, it should give into play multi-function of urban agriculture, so as to promote coordinated and sustainable development of economy, society, ecology and environment.

**Key words** Xixian New Area, Urban agriculture, SWOT analysis, Development mode

## 1 Introduction

Urban agriculture is an industry that provides leisure tourism, experience agriculture and place for understanding rural areas and integrates agricultural production, living and ecology using rural landscape, natural ecology and environmental resources in combination with agriculture, forestry, animal husbandry and fishery production, agricultural management, rural culture and rural life<sup>[1]</sup>. Such new agricultural production mode can increase farmers' income, promote rapid development of local economy, benefit settlement of issues concerning agriculture, farmers and rural areas, realize transfer of rural force, speed up capital accumulation, bring along economic, social and environmental benefits of rural areas, and build a society of overall urban and rural development. On June 13, 2011, Shaanxi Provincial Government issued *Overall Plan of Xixian New Development Area*, marking formal establishment of Xixian New Area. Xixian New Area is situated between Xi'an and Xianyang. It takes Weiha as the axle, and starts from Xixian Circle Line under the planning in the west and Weihe intersection entrance to the west, with a total length of 50 km from east to west, and five to 10 km from south to north. The planned area is up to 882 km<sup>2</sup>, and planned construction land is 272 km<sup>2</sup>, including five new towns, Konggang, Fengdong, Qinhan, Fengxi and Jinghe. Within the area, there are about 900 000 people at present, and the urbanization level reaches 23%. The administrative division involves 7 counties (districts) and 23 towns (sub-districts) in Xi'an and Xianyang<sup>[2]</sup>. This Plan clearly states that Xixian New Area will develop urban agriculture with characteristics of ecological agriculture, leisure agriculture and export-oriented agriculture, and build vegetable basket base and modern agricultural base for international metropolis Xi'an City.

## 2 SWOT analysis of urban agriculture in Xixian New Area

### 2.1 Strength analysis

#### 2.1.1 Distinct strength in geological location. Xixian New Area

connects northwestern provinces with southwestern, central plain and east China areas. Within the area, there are Weihe, Jinghe, and Fenghe rivers, more than 40 historic relics of Zhou, Qin and Han dynasties. In addition, it also has vertical modern traffic network. Xianyang International Airport, as the largest air hub of communications in northwest of China, has opened 165 air lines of 77 cities, covering all provincial capitals in China, including Seoul, Tokyo, Singapore, Hong Kong, and Taipei<sup>[3]</sup>. Xi'an is also an important point on Asia – Europe Transcontinental Bridge, which is the largest railway junction in western China. With the construction and operation of Zhengzhou – Xi'an Expressway and construction of Xi'an – Lanzhou and Xi'an – Chengdu expressways, the strength in geological location of Xixian New Area will be more prominent. Besides, highway communication is also very smooth. There are 9 national highways, including Shanghai – Xi'an, Fuzhou – Yinchuan, and Beijing – Kunming highways, and Xi'an – Hanzhong, Xi'an – Yumenkou, Xi'an – Baoji highways, etc<sup>[4]</sup>.

**2.1.2 Rich agricultural resources.** With temperate semi-humid monsoon climate, Xixian New Area has distinct four seasons and fertile land. The annual precipitation is 600 – 800 mm, the sunshine and heat source are excellent, agricultural crop varieties are abundant, suitable for development of grain, vegetable, forest and fruit, flower and animal husbandry<sup>[5]</sup>. Other resources include livestock (such as milk cow, Guanzhong donkey, Qinshuan beef cattle, live pig, rabbit, sheep, chicken, and duck), fruit (such as jujube, walnut, pomegranate, watermelon, kiwi fruit and apricot), crop (such as wheat, corn, and beans), vegetable, flower, medicinal materials<sup>[4]</sup>. These resources provides important platform for development of urban agriculture.

**2.1.3 Enormous agricultural scientific research strength.** Shaanxi Province is one of China's education and scientific research centers. It has powerful science and education strength, its comprehensive scientific and education strength is only second to Beijing and Shanghai. For the nonce, Xi'an has 37 regular higher educational institutions, 36 private colleges and universities, ranking the first among provincial capitals. Besides, Shaanxi Province has more than 20 agricultural scientific research centers

at provincial and ministerial levels<sup>[4]</sup>. Generally, technical personnel gather together, scientific institutions come together there. In addition, neighboring on agricultural sci-tech city Yangling, it has scientific personnel and technical consolidation advantages, which also provides technical guarantee and support for development of urban agriculture in Xixian New Area.

**2.1.4 Proper development plan.** Plan is the key to urban agricultural development, and the level of plan directly determines result of urban agricultural development. The *Overall Plan of Xixian New Development Area* clearly states that Xixian New Area will develop urban agriculture with characteristics of ecological agriculture, leisure agriculture and export-oriented agriculture, and build vegetable basket base and modern agricultural base for international metropolis Xi'an City. Xixian New Area builds 18 eco-garden towns with characteristics of cultural tourism, agricultural garden, Guanzhong folk custom and Binshui leisure characteristics. Taking vertical city mode of intensive construction land as key point, it builds model towns and keeps the original rural lifestyle, and forms the urban and rural spatial pattern of "city group + green corridor + ecological town"<sup>[6]</sup>. The plan makes detailed design and arrangement for distribution of 5 new towns. The plan covers large-scale industrialized operation and individual household participation; it covers farmland, fruit orchard, vegetable garden, beautiful town, and roof flower; it covers traditional agriculture and leisure, education, culture, science and technology, processing industry and modern service. In sum, proper plan and diverse forms provide rich content for development of urban agriculture in Xixian New Area.

## 2.2 Weakness analysis

**2.2.1 Low quality of employees.** According to major data of the second agricultural census of Shaanxi Province<sup>[7]</sup> (Table 1), 6.178 million people are engaged in agriculture, of whom 49.5% are men and 50.5% are women.

**Table 1** Quantity and composition of people engaged in agriculture

	Shaanxi	Guanzhong
People engaged in agriculture//10 <sup>4</sup>	1115.9	617.8
Gender of people engaged in agriculture//%		
Men	46.1	49.5
Women	53.9	50.5
Composition of age of people engaged in agriculture//%		
Younger than 20	4.7	7.0
21-30	14.1	19.0
31-40	24.1	22.4
41-50	25.5	24.5
Older than 50	31.6	27.1
Composition of education of people engaged in agriculture//%		
No schooling	9.8	13.9
Primary school	34.9	40.2
Junior middle school	49.2	40.5
Senior middle school	5.7	4.8
College and above	0.4	0.6

Table 1 indicates that most rural labor forces in Guanzhong area have low education, most farmers just receive junior middle school education, and the trend of aging, women and multiple job holding is significant.

**Table 2** Quantity of agricultural technical personnel Unit: 10<sup>4</sup> people

	Shaanxi	Guanzhong
Junior	3.29	1.64
Intermediate	1.44	0.77
Senior	0.40	0.20
Total	5.13	2.61

Table 2 shows that most people engaged in agriculture do not understand technology and they just plant crops according to their experience. Since their education level is low and they lack scientific and technical awareness, they are slow in response to new achievements and new technical information, fail to accept, digest and absorb new technologies, and can not apply new technologies into actual operation. All of these seriously slow down development of urban agriculture in Xixian New Area.

**2.2.2 High opportunity cost of urban agriculture.** Opportunity cost of urban agriculture refers to the cost for agricultural production, in other words, it is income obtained from transferring to non-agricultural industries. With development of urban economy, opportunity cost of agricultural labor forces rises significantly. In this process, agricultural labor transfer plays a key role. According to *Statistical Communiqué of Shaanxi Province on 2011 National Economic and Social Development*, GDP of Shaanxi Province in 2011 was 1 239.13 billion yuan, and the proportion of primary, secondary and tertiary industries is 9.8%, 55.2% and 35% respectively<sup>[8]</sup>. More young agricultural labor forces move to secondary and tertiary industries, leading to shortage of labor and rise of opportunity cost of urban agriculture, consequently impairing development of urban agriculture. In theory, agricultural land value should be combination of economic, social and ecological benefits. In reality, agricultural land owners or users possess only economic benefits of land and small portion of social and ecological benefits. Therefore, externality of agricultural land use is often neglected in the process of transfer, leading to agricultural land resource moving to non-agricultural industries that have higher economic benefits<sup>[9]</sup>. This will influence healthy development of urban agriculture in Xixian New Area.

**2.2.3 Low organizational level of agriculture.** Compared with requirement of urban agriculture, Xixian New Area is low in organizational level. Its agricultural production is still mainly small-scale and separate household management. Most farmer households still are engaged in varied operation on limited cultivated land, agricultural industrialization develops slowly, agricultural professional cooperatives develop in poor environment, and industrial organization system is to be further improved.

## 2.3 Opportunities

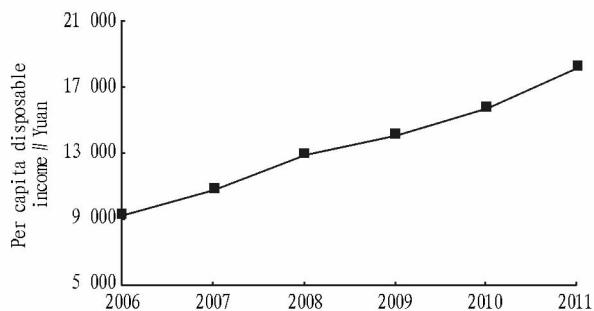
**2.3.1 Policy opportunities.** Xixian New Area is one of zones specified in the *National Plan for Development Priority Zones* is-

sued by the State Council. The construction of Xixian New Area is also taken by Shaanxi Provincial Party Committee and Provincial Government in implementing *Development Plan for Guanzhong – Tianshui Economic Zone*, speeding up integration of Xi'an and Xianyang, and building Xi'an into an international metropolis. The *Official Reply of the State Council on the 12th Five – Year Plan for the Large-scale Development of the Western Regions* made on February 21, 2012 incorporates Xixian New Area into five priority zones in western regions, and states clearly to build regional core area and modern garden city. In addition, 5 group areas of Xixian New Area are interdependent and interrelated. Thus, it breaks original system of "province and city co-management and taking city as major part", increases administrative efficiency, reduces operation cost, lessens repetitive construction, and effectively and reasonably allocate land, capital and personnel resources, bringing Xixian New Area into real construction stage<sup>[10]</sup>. These policies create new opportunities for development of urban agriculture in Xixian New Area.

**2.3.2** Large processing space of agricultural products. Developing agricultural product processing industry can vitalize rural economy, bring agricultural products to market, cultivate famous products and enterprises, and increase farmers' employment opportunities. At present, however, no matter in China or Xixian New Area, there is still large development space for agricultural product processing industry. There is still a big gap between China's agricultural product processing industry and that of developed countries. In developed countries, output value of agricultural product processing industry is generally above 3 times agricultural output value, while in China, it is less than 80%; the developed countries have agricultural product processing degree higher than 90%, while China only has 20% – 30%; in developed countries, the proportion is about 80% for industrial production and processing food into gross food consumption, in China, this proportion is lower than 30%; in developed countries, labor forces engaged in agricultural product processing are much more than those engaged in agricultural production, in China, the situation is opposite. Domestically speaking, southern developed cities have agricultural product processing degree higher than 80%, while Xi'an only has about 30%, and most are simple primary processing<sup>[11]</sup>.

**2.3.3** Large market of potential customers. The *Statistical Communiqué of Shaanxi Province on 2011 National Economic and Social Development*<sup>[8]</sup> indicates that the disposable income of urban residents in Shaanxi Province rises year by year. It reached 18 245 yuan in 2011, 2 550 yuan over the previous year, having increase of 16.2%.

Consumption of residents is an increasing function of income, so the increase in income will definitely bring about growth of gross consumption and structural optimization. In living, people care more about living quality, health and green food; in recreation, people are eager for pastoral landscape, leisure and relaxation. Then, the demand for rural natural leisure style is increasing. These indicate that urban agriculture has huge consumption



**Fig. 1** Per capita disposable income of urban residents in Shaanxi Province (unit: Yuan)

market which is a great opportunity for urban agriculture of Xixian New Area.

**2.3.4** Practical experience and lesson of domestic and foreign urban agricultural development. Urban agriculture is a new form of agriculture and appears as early as the middle of the 19th century in Japan and American and European countries. With several decades of development, the urban agriculture of each country has formed its unique mode, for example, American and German community gardens, Japanese sightseeing agriculture and facility agriculture, and French family farm and education farm. In China, Shanghai and Beijing firstly introduced urban agriculture in the 1990s. Later, the urban agriculture is popularized to whole country. The practical experience and lesson provide precious experience and lesson for Xixian New Area and make the urban agriculture of Xixian New Area stand higher and develop better.

## 2.4 Threats

**2.4.1** Imperfect infrastructure. Urban agriculture is a new industry with high input and output. Development of urban agriculture needs perfect infrastructure. At present, urban agriculture in Xixian New Area remains at the starting stage, the infrastructure (such as farmland improvement, road pavement and agricultural supporting infrastructure) is not perfect, so it needs introducing and investing huge capital to Xixian New Area for urban agriculture.

**2.4.2** Not mature of development of market economy. Market resource allocation mechanism is not perfect: (1) many products are resource based, while few agricultural products contain high technology and deep processing element; (2) Transaction of agricultural products lacks specialized logistic center; (3) Agricultural market system is not perfect, farmers are ill-informed and their production lacks foresight and overall planning, industrial standards for agricultural products are not uniform, agricultural product quality is to be improved, and market risk fails to be reduced; (4) The cultivation of market entity is not adequate, for example, quantity and quality of agricultural industrial leading enterprises are to be improved, and private enterprises and medium-sized and small enterprises develop slowly; (5) In integration of urban agriculture with cultural resource, tourism resource and natural resource, various supporting mechanisms are not well established, and there is no agricultural core competitive power due for interna-

tional metropolis<sup>[4]</sup>.

**2.4.3 Farmers' interest safeguarding system to be inspected.** Xixian New Area solves drawbacks of urban development from the viewpoint of social construction for the first time. The innovation point is urban and rural integration. This transforms the practice of exchanging land with house in the past. Farmers have to bring two capitals to city, one is labor and the other is land. Thus, to develop urban agriculture, it should protect farmers' benefits to the maximum extent. This is unprecedented attempt and a threat faced by urban agriculture of Xixian New Area, so it needs proof in practice.

### 3 Building development mode for urban agriculture of Xixian New Area

The practice of urban agriculture in developed countries proves that functions of urban agriculture in different countries are varied. China is a developing country, so the functional localization should reflect China's productivity, draw lessons from foreign countries and reflect China's characteristics, show function of metropolitan barrier and economic functions<sup>[12, 13]</sup>. Thus, urban agriculture of Xixian New Area should adopt circle type development; the first circle is core area, the second circle is expansion area, and the third circle is external area. The specific distribution can be carried out in accordance with functions of urban agriculture with reference to weight of five new towns<sup>[14, 15, 16]</sup>.

#### 3.1 Overall development mode of urban agriculture in Xixian New Area: Circle Type

**3.1.1 Core area: roof agriculture and courtyard agriculture.** Core area is the downtown with developed traffic, high building density and population density. The urban agriculture of this area is situated between traffic corridor and urban buildings, and distributed in wedge form, and its major functions should be social culture and ecology. In this area, the urban agriculture takes the form of corridor road, garden roof, public landscape element, courtyard, and green balcony, etc.

**3.1.2 Expansion area.** Although developed greatly in recent years, there is still large space between buildings and also suburban areas. Functionally, this area should focus on economic benefits and develop new high sci-tech gardens. It can implement variety project, biological project, greenhouse project and green project. It should take providing high quality agricultural byproducts and beautiful green ecological environment as major task. In all, this circle is modern agricultural park with developed economy, high technological content, multiple levels, multiple functions and sustainable development. It is hoped to develop urban agriculture into modern facility agriculture with intensive capital and knowledge, highly enterprize, large-scale, marketization and high added value in production and management mode, to improve agricultural productivity to the maximum extent.

**3.1.3 External area.** This area is relatively stable farming area and also concentrated area of urban agricultural production. It mainly has ecological and production functions. At the same time

of developing large-scale agriculture, this area should develop high quality grain, vegetable, forest and fruit, animal husbandry, aquatic product and seed and sprout industries in accordance with local conditions, to make agriculture orient towards intensive, facility, fine and deep development. To bring the connection between city and agriculture in external area closer, it should start from raising traffic efficiency and taking advantage of natural conditions, and developing agriculture along the traffic trunk lines firstly.

#### 3.2 Specific development mode of urban agriculture in Xixian New Area: combined function type

In downtown of Xi'an and Xianyang, buildings stand in great numbers and traffic extends in all directions. Urban agriculture should increase beauty and green, beautify environment, and improve citizens' living quality, to bring into full play functions of urban agriculture "lung of city". Fengdong New Town, Fengxi New Town and Qinhan New Town focus on industrial distribution, so its urban agricultural development should rely on corresponding spatial distribution. Fengxi New Town is oriented towards Xi'an international metropolis comprehensive service sub-center and new strategic industrial base; Qinhan New Town should rely on historical and cultural axis of Qin Dynasty and Han Dynasty. Urban agriculture of these three new towns should focus on social and cultural functions, provide sightseeing, leisure and recreational activities for citizens through opening landscape green land and sightseeing, to relieve people's living and working pressure and to improve citizens' health. In addition, urban agriculture can attract nearby rural labor forces to work in cities, so it plays a great role in stabilizing society. Jinghe New Town can introduce new and high agricultural technology and conduct experiment and demonstration. Airport New Town, with the aid of convenient conditions of Xi'an - Xianyang international airport, actively develops airport adjacent agriculture and modern agricultural facilities with high added value, optimize agricultural resource elements, gradually build modern intelligent ecological agricultural park with high sci-tech content, strong demonstration effect, high economic benefits and beautiful ecological environment, and develop urban leisure agriculture on these bases. Generally, urban agriculture has become demonstration base and window with the aid of radiation of science, technology, information, economy and social force, and accordingly brings along development of sustained, high-efficient agriculture and even agricultural modernization.

### 4 Conclusions

On the basis of the above analysis, urban agriculture can adopt following countermeasures, as shown in Table 3.

Xixian New Area is endowed with favorable strength in urban agriculture, and excellent external opportunity and development space. However, there are also unfavorable conditions and many threats. Therefore, urban agriculture of Xixian New Area should learn domestic and foreign useful theories and practical

**Table 3 SWOT analysis of urban agricultural development in Xixian New Area**

Strength (S)	Weakness (W)
1. Distinct strength in geological location 2. Rich agricultural resources 3. Enormous agricultural scientific research strength 4. Proper development plan	1. Low quality of employees 2. High opportunity cost of urban agriculture 3. Low organizational level of agriculture
Opportunity (O) 1. Policy opportunity 2. Large space of agricultural product processing 3. Large potential customer market 4. Domestic and foreign practical experience and lessons of urban agriculture	SO strategies Bring into play strength in location, resource and science and technology, seize favorable policies, explore agricultural product processing space, expand customer demand market, learn domestic and foreign experience in urban agricultural development, make proper plan and energetically develop urban agriculture in Xixian New Area.
Threat (T) 1. Imperfect infrastructure 2. Not mature of development of market economy 3. Farmers' interest safeguarding system to be inspected	ST strategies Energetically develop agricultural economy with the aid of location, resource, science and technology advantages, and proper plan, further regulate and improve market economic mechanism, and maximize benefits of urban agriculture through many development modes, so as to protect farmers' benefits, increase farmers' income and promote overall urban and rural development.
	WO strategies Take advantage of favorable policies, learn existing experience, combine actual reality and potential of Xixian New Area, increase capital investment, improve quality of employees, introduce agricultural leading enterprises, fully explore functions of urban agriculture, reduce opportunity cost, and raise economic, social and ecological benefits of urban agriculture.
	WT strategies Under internal and external threats of urban agriculture, government should provide guidance and support, urban and rural residents should change ideas, take active attitude, innovate upon thinking, and improve both internal and external environment, to provide guarantee for development of urban agriculture.

experience, base on its realities, maximize favorable factors and minimize unfavorable ones, suit measures to local conditions and select proper development mode and road. In addition, it is recommended to open up channels, raise construction funds from many sides, strengthen propaganda of urban agriculture, absorb social capital, encourage participation of all the people, bring into full play production, ecological, living, education, leisure and sightseeing functions of urban agriculture, and promote coordinated and sustainable development of economy, society, ecology and environment, to make contribution to building Xixian New Area into a modern garden city.

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