The Modern Agriculture Development of Arid and Semi-Arid Areas in China

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Abstract. It was very important to study the agricultural development of arid and semi-arid areas in China for national food security. This area accounts for about 1/3 of China's land area. However, due to long-term water scarcity, strong sandstorms, and severe soil salinization, local agricultural development was limited.Nowadays, with the continuous development of agricultural technology in arid and semi-arid areas, the agricultural development in arid and semi-arid areas of our country had undergone earth-shaking changes. In this paper, from the initial unification of plastic film cover in arid and semi-arid areas to the normalization of greenhouses and solar greenhouses, and with the development of electrification technology and the gradual maturity of information technology, agricultural development has gradually moved from traditional to the era of modernization, information and intelligence, the above four aspects to discuss the agricultural development process in arid and semi-arid areas of our country.

Keywords: Arid and semi-arid; Modern agriculture; Development.

1. Introduction

In China, arid and semi-arid refers to areas with arid climate, which accounts for about 30% of China's land area, and the distinction between arid and semi-arid areas is usually referred to as arid areas with annual precipitation less than 200mm and semi-arid areas with annual precipitation between 200-500mm [1-2]. In the arid region, there were many sands and rocks, abundant light and heat resources. Due to the abundance of heat, it was feasible to become a high-yield area when irrigated water and fertilization supply was applied. Nevertheless, rainfall is low, and the soil is mostly saline-alkali land [3], so insufficient water and environmental conditions is the main factors limiting plant growth. In face of this problem, the agricultural development process in arid and semi-arid areas in China gives us a good "answer".

2. The beginning of madern agricultural development-plastic mulching

As early as the 1950s, Japanese scientists invented plastic mulching technology. Mulching technology can effectively maintain soil moisture and soil temperature, enhance the growth efficiency of crops and increase crop yield [4]. At the same time, the mulching film has a significant effect of preserving soil moisture. Afterward in 1979, China began to introduce this technology and began to popularize it on a large scale. It was widely used in hundreds of crops across the country. At present,China's mulch covering area has exceeded 6.67 million hm^2, becoming the world's largest country in mulch cultivation. Film mulching technology has become one of the main technical measures to increase agricultural income in China and played an important role in increasing agricultural production and income in China [5]. Especially in arid and semi-arid areas, the problem of soil salinization caused by incorrect watering can be effectively solved. Reasonable use of mulch and fertilization can effectively increase the content of N, P and K in soil and provide nutrients required for crop growth and development [6]. For example, in Gansu province, the food crops covered by mulching film, such as corn, potato, wheat and other crops have been improved a great extent, and even have a large increase in production. This is of great significance to increase grain production and crop breeding in China.

However, in the southern region of Xinjiang, where drought is more severe, due to its flat terrain, Chen Xuegeng, academician of the chinese academy of engineering, led the team to overcome the key technology of mechanical film laying, making agricultural mechanized film laying technology realized in most areas of Xinjiang, which has greatly promoted the development of modern agriculture, but the effect of mulch covering is not significant in the face of extreme bad weather. Especially in Gansu Province, the temperature drops after autumn, and the rainfall is scarcer, but the light and heat resources are still rich. Therefore, in order to realize that crops can still grow under unnatural conditions, and to better grasp the light, temperature, water and other conditions required for agricultural growth, people in semi-arid and arid areas began to develop facility agriculture and build greenhouses on the basis of mulch cover.

3. The modern agricultural development with small and big greenhous

3.1. Modern agricultural development from greenhouses

In ancient China, there was a kind of greenhouse technology, when people used wood and straw mats to build simple and small greenhouses, in the early 19th century, people began to use steel and glass to build middle-sized greenhouses, and then people began to build more big modern greenhouses with the accelerated development of industrialization. Greenhouses can improve the quality and quality of crops more effectively. As far as the arid and semi-arid areas in China, greenhouses were mainly plastic greenhouses and steel structure greenhouses, and the new modern greenhouse is further improved by the solar greenhouse, the thermal insulation effect of solar greenhouses is better than that of traditional greenhouse [7-8]. After the greenhouse with the emergence of electrification technology, electrified greenhouses on the basis of traditional greenhouses on the light, warm, water and other conditions have a further accurate regulation, in the rapid development of information technology in modern times, people began to build automatic control of intelligent greenhouses. For Gansu, the greenhouse plastic greenhouses and steel greenhouses still occupies a large part.Gansu province facility agriculture area reached 76,000 hectares, the output of about 4.5 million tons, of which: plastic greenhouses area of 41,800 hectares, output of more than 1.8 million tons;Solar greenhouses cover an area of 27,733.33 hectares and produce about 2.7 million tons[9].Although the greenhouse does not have the precise control of light, temperature and water vapor compaired with modern intelligent agricultural greenhouses, it can still improve the temperature required by crops and play a role in retaining water and moisturizing. The solar greenhouse is covered with grass curtains and surrounded by walls on three sides, so it has stronger thermal insulation ability. Its ventilation technology has multiple functions to adjust temperature, humidity, water vapor, etc[10]. So, it can be used to plant different crops at any time in arid and semi-arid areas to ensure the natural conditions required for crop growth and achieve sustainable agricultural development. This plays an important role in the development of agriculture in arid and semi-arid areas in our country.

3.2. Greenhouse development from electrification to intelligence

Although greenhouses occupy the main part in Gansu, there is still the construction and use of electrified greenhouses, which are mostly used for flowers, vegetables and fruits. In such places as Linze county and Shandan County in Gansu Province and Yongjing county in Hui Autonomous Prefecture of Linxia,the construction of electrified greenhouses is vigorously promoted, which has helped local farmers get rid of poverty and get rich, and the agricultural and rural economy has achieved good development. This is in response to the 20th National People's Congress of China report pointed out that comprehensively promote rural revitalization and accelerate the construction of an agricultural power. Especially in the Yongjing Industrial Cooperation Demonstration Park in Hui Autonomous Prefecture of Linxia, there are 193 standardized efficient and energy-saving electrified and solar greenhouses, which keeps the temperature required for strawberries grown in greenhouses at 22℃, effectively solving the problem that crops are afraid of cold [11]. Under the

conditions of this information age, the construction of electrified greenhouses has not only enriched people's Daily life, but also further promoted the agricultural development in China's arid and semi-arid areas.

Under the promotion of the construction of electrified greenhouses in Gansu province, like as Zhangye city, Wuwei city and Lanzhou New Area, began to promote the construction of smart agriculture, vigorously develop the construction of intelligent greenhouses. In Zhangye Minle County beyond the modern agriculture Co., LTD, there were 500,000 square meters of high standard intelligent glass greenhouse were builded. After the construction of the intelligent greenhouse, it is expected to produce about 10,000 tons of tomatoes annually, and the products are mainly sold to east of China, south of China, northeast of China and the first and second-tier cities [12]. In Wuwei city, an online service platform is built through the integration of information technology such as fifth-generation, big data analysis of the internet of things and artificial intelligence. It provides intelligent agricultural application services such as remote monitoring, real-time monitoring of planting environment, disaster early warning, and identification of diseases and pests, and realizes remote automatic control of motors, ventilation windows, rolling blinds and other equipment in smart greenhouse. In a real sense, modern information technology was applied to realize modern agriculture,and the construction of modern intelligent greenhouse control system was promoted at a high level in Lanzhou New Area.The intelligent greenhouse control system is a special environmental automatic control system for the development and production of agricultural greenhouse, agricultural environment control and meteorological observation[13].It can accurately measure agricultural environmental factors such as wind direction and speed, indoor temperature,humidity, light, indoor air pressure, soil temperature and humidity,and the system will automatically regulate the environmental control equipment such as window opening, film rolling, fan wet curtain, biological light supplement, irrigation and fertilization according to the requirements of crop growth, and automatically regulate the internal environment of the greenhouse, further achieving the suitable growth range of crops, provide a good environment for crop growth. Tthe high-standard intelligent greenhouse established in Zhangye area, and the intelligent greenhouse control system promoted by Lanzhou New Area, it further realizes the grand blueprint of building China into a modern socialist country in an all-round way, and also responds to the comprehensive promotion of rural revitalization pointed out by the 20th National Congress of the Party, and basically realizes agricultural modernization by 2035. By the middle of this century, China will become a strong agricultural country. In the future, the construction of smart agricultural information will enable the development of agricultural production to achieve a comprehensive upgrade,bring the digitization to the fields,and strive to promote the modernization and intelligence of the agricultural industry, better serve the revitalization of rural areas and accelerate the development process of agriculture.

4. Smart agriculturedevelopment will tailored to local conditions

Compared with semi-arid areas, the natural environment of southern Xinjiang, which is more severe in arid areas, is more abundant in light, soil salinity is even more serious, and the annual precipitation is even lower than 80 mm. Therefore, the way of intelligent agriculture is no longer indoor smart agriculture, but was achieved in vast territory, like as: Unmanned aircraft spray pesticides spraying, intelligent drip irrigation, integrated irrigation system of water and fertilizer, agricultural mechanization planting and harvesting of Beidou navigation, etc., whether from the perspective of agricultural economy or from the problem of natural environment, this intelligent agriculture breaks the time and energy consumption of traditional agriculture and more effectively solves the problem of too much pesticide spraying, fertilizer application and so on. Artificial intelligence equipment and digital industrialization of agriculture makes the production, processing and export of agriculture integrated. This comprehensive information intelligent development of agriculture not only responds well to the harsh natural conditions but also realizes the artificial intelligence of the agricultural industry faster. In the course of agricultural development in our country,

the great transformation from quantity to quality has more leading role in agricultural development of arid and semi-arid areas in our country.

5. Conclusion

After more than half a century of people's unremitting efforts, the agriculture in China's arid and semi-arid areas has undergone earth-shaking changes, and the development process of agriculture was also moving step by step toward the development of modern smart agriculture. Now the world is undergoing major changes not seen in a century and a new round of scientific and industrial revolution is expanding, smart agriculture must recognize this historical background. Deeply grasp the new development pattern, adhere to the new development concept, adhere to scientific and technological self-reliance as the strategic support for the development of smart agriculture, and continue to promote the healthy development of smart agriculture [14]. To further accelerate the development of the rural economy and fully realize the prosperity of farmers,in this sense, traditional agriculture is the past, the construction of intelligent agriculture is today, and the future goal is to build three modern agricultural systems like as industrial system, production system and management system. Enhance agricultural innovation, market competitiveness and total factor productivity, and use smart agriculture to achieve high-quality agricultural development [15]. For the arid and semi-arid areas of our country, it will be someday soon.

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