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Research on the Development of Photovoltaic Solar Greenhouse in Western China from the Perspective of Continuous Enrichment

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ABSTRACT

As one of the new energies, photovoltaic solar energy has four advantages compared with traditional energy: huge reserves, convenient application, durable supply, clean and harmless. With the progress of science and technology, the development of photovoltaic solar energy industry is extremely rapid. In the foreseeable future, photovoltaic solar energy will become an effective alternative to the depleted traditional fossil energy sources. In this context, the world's photovoltaic solar energy industry has entered a golden period of development. At present in the world, the use of photovoltaic solar energy is mainly concentrated in the field of solar power generation. Achieve sustainable development through rational use of natural resources. By collecting and sorting out the literature of photovoltaic solar energy industrial policy, this paper concludes that the research of domestic and foreign experts on photovoltaic solar energy industrial policy mainly focuses on two aspects: on the one hand, the research on the development of photovoltaic solar energy industrial policy; on the other hand, the interpretation of photovoltaic solar energy future development by the photovoltaic industrial policy promulgated and implemented by various countries. Through research, this paper finds that existing literature studies on the development of photovoltaic solar energy industry mainly focus on the forms, functions and industrial policies of photovoltaic solar energy in the sustainable development of energy, and needs to be strengthened in the following three aspects: First, the application of photovoltaic solar energy in modern agriculture is relatively less, more concentrated in photovoltaic solar power generation and the development of photovoltaic industry chain and related policy research fields; Second, there is still room for development in the research of photovoltaic solar energy on economic stimulation in remote areas. Existing research focuses on photovoltaic solar lighting in remote areas. There is a lack of research on the economic driving effect of large-scale photovoltaic solar energy in remote areas. Third, the current photovoltaic solar energy construction mode is the enterprise-led enterprise dividend sharing mode. The government, farmers and state-owned enterprises jointly participate in the PV solar power generation project mode, the evaluation of state-owned enterprises' social responsibility, and the conversion of cash transfer profit into technical support are few relevant studies. This study can be used as a starting point to conduct a feasibility study on large-scale construction of PV solar greenhouse in the arid and rainless regions of western China, so as to provide a sustainable way for farmers to get rich.

Keywords: *Photovoltaic Solar Greenhouse, Increase Production and Income, Continue to Be Rich*

I. INTRODUCTION

At present, the research and development, sales and after-sales service of the photovoltaic industry at home and abroad have been mature. Photovoltaic is known as one of the "cleanest energy sources" and is mainly used in solar power generation, solar cells and municipal street lighting. At present, there are few photovoltaic greenhouse construction projects in western China. Western China is a continental arid climate with high annual temperature, long sunshine time, less precipitation, vigorous evaporation and no severe winter conditions, which lays an excellent environmental foundation for the development of photovoltaic solar energy. Considering that in the drought season, especially in winter, green leafy vegetables in some areas mainly rely on foreign supplies, with long journey, high cost, high price and few varieties. It is difficult to meet the diverse needs of consumers. Although the western cities around the traditional warm shed, relying on coal insulation in winter, poor effect, heavy pollution, high cost, resulting in vegetable farmers less willing to plant. The purpose of this study is to propose that by installing photovoltaic solar panels on the top of the greenhouse, photovoltaic solar panels can absorb sunlight to generate electricity. The generated electricity is mainly heated by lead batteries to heat the electric radiator inside the greenhouse, so as to achieve indoor heat preservation effect. Meanwhile, the excess electricity can be sold to the national grid, so that the cost of vegetable growers growing green vegetables in the greenhouse can be reduced and dishes can be improved. In addition to the

income from green leafy vegetables, it can also obtain more income by selling surplus electricity to the State Grid. Natural resources can be utilized to mobilize the enthusiasm of vegetable farmers, form an industrial scale and gradually become an important local feature, form an industrial chain, and promote the sustainable increase of farmers' income.

II. RESEARCH METHODS

This paper "Research on the Development of Photovoltaic Solar greenhouse in Western China from the Perspective of Continuous Starting from natural environment with little rainfall, the program aims to study on three aspects of improving farmers' production and income by combining photovoltaic solar energy and greenhouse. According to the current situation of theoretical analysis, the conception of "writing thinking" is tested empirically. The comprehensive analysis adopts the analysis method of complementation of theoretical analysis and modern literature analysis and combination of comparative analysis. On the basis of fully studying a large number of relevant literatures at home and abroad, the advanced teaching experience and achievements of foreign countries are used for reference. Based on theoretical analysis, questionnaires were issued to local farmers and consumers about fruit and vegetable price, variety diversification, total quantity and time, vegetable quality, main cost of planting, psychology of whether to change the status quo, and important sources of funds. Collect, sort out and analyze data to provide first-hand information on the development possibility of photovoltaic solar conservatories in western China; At the same time, this paper mainly uses the comparison method to compare the cost and benefit of traditional greenhouse and photovoltaic solar greenhouse. The development of photovoltaic solar energy industry can promote economic development in areas with less drought. Based on the results of empirical analysis, this paper puts forward the method of realizing the path.

III. DISCUSSION

In the context of climate change and poverty alleviation, research linking clean energy and poverty reduction has attracted more and more attention from scholars. For example, advancing rural electrification and linking energy to agricultural development in sub-Saharan Africa has the potential to reduce poverty, promote gender equality, reduce vulnerability to climate change, and increase economic diversification, Chirambo noted. Clean energy reduces the drudgery of daily life for the poor by taking people away from the drudgery of collecting firewood and doing something more productive. Mainali et al. explored how locally available biomass resources (cow dung and agricultural residues) could be used to upgrade energy and water services in rural Bangladesh. The potential trade-offs between risk reduction benefits and poverty reduction benefits of different renewable technology investments in the Pacific region are also explored. Asumadu-Sarkodie et al. reviewed national energy statistics for Ghana's energy sector to seek to end poverty and improve well-being. The long-term operation of community renewable energy power systems and the sustainability of projects in rural areas of Central America (including Panama, Nicaragua and Costa Rica) are also important subjects of study.

Modern energy supplies improve human living conditions and productivity, and poor green households without access to energy are the main markets for renewable energy. The United Nations Framework Convention on Climate Change and the Climate Convention clearly recommend that poor families should be highlighted in climate discussions. Solveig et al. 's research shows that the national social and economic reform program implemented in China may make a significant contribution to climate change mitigation, and poverty reduction can also be achieved by providing more financial support in rural areas, technical training and developing specialized industries in combination with geographical environment. In developing countries, Zhang et al. discuss how broader rural development programs based on rural electrification and poverty reduction can promote sustainable development of power projects. Terrapon-Pfaff et al. analyzed the impact and sustainability of small-scale renewable energy projects in developing countries and noted that access to sustainable and affordable energy services is a key factor in reducing poverty in developing countries. In addition, low-income green households in South Korea are generally satisfied with their PV systems. Thus, there is a close link between the wide spread of clean energy in rural areas and poverty reduction. The use of renewable energy to alleviate poverty carries great human expectations.

Solar energy is considered one of the most renewable and sustainable energy sources. The application of solar photovoltaic in poverty reduction has been preliminarily explored in many countries around the world. When Bhattarai compared subsidies for biogas technology and solar home systems in Nepal to the rural poor, he found that solar subsidies were more readily available to the poor. In sub-Saharan Africa, although studies have demonstrated that solar home systems can alleviate poverty, increase income, and save money, further studies have shown that off-grid solar PV systems are not financially or economically viable because these technologies are not subsidized. Similar results occurred in Cameroon, where earlier case studies suggested hybrid micro hydro and photovoltaic power systems in remote villages could work, but Mboumboue looked at the relationship between renewable energy and the livelihoods of the poor and found that less than 10% of rural green households in Cameroon had access to modern energy. By contrast, the solar power business model has been unprecedentedly successful in Bangladesh. Local photovoltaic technologies not only improve the income, health and quality of life of the rural poor, but also enable the electrification of more affluent rural green households, thereby preserving their environmental resources, including land, trees and animals. In addition, evidence from India and Senegal both demonstrate the feasibility of photovoltaic renewable technologies in rural development and poverty reduction.

Combined with the natural environment of drought and low rainfall, which is difficult to change in the short term, on the basis of cost saving, it can not only use clean energy, in line with the national commitment on carbon emission, but

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also improve the enthusiasm of farmers, achieve production increase and income, and continue to get rich, which will develop from the individual problem of farmers to the important issue of national or social economic development. China is an industrial country with the beginning of agriculture, because of energy conservation, encouraging farmers to pay spontaneously, government industry support, farmers and state-owned enterprises cooperation to achieve lasting prosperity.

3.1 Similarities and differences between photovoltaic solar conservatories and traditional conservatories.

Greenhouse vegetable planting can realize agricultural products out of season market. Traditional agriculture adjusts crops according to seasonal changes, with relatively simple products and limited planting frequency and income due to the influence of winter temperature. The greenhouse planting can make use of the effect of heating and light transmission, so that agricultural products can be planted continuously throughout the year, the varieties are not restricted by the season, can meet the needs of the vast number of consumers at different times of different agricultural products, so as to achieve multiple harvests a year, multiple income; In addition, greenhouse planting can reduce the pollution of dust, wind and sand to agricultural products and prevent pests and diseases also have a certain protective effect. So as to produce greener and pollution-free agricultural products. However, with the arrival of winter, especially in many northern regions, the heating facilities in the greenhouse are not perfect or the traditional coal-burning heating method is used. Human and industrial temperature control makes the temperature in the greenhouse uneven, which limits the growth of agricultural products. In the process of coal combustion produced carbon dioxide and coal tar and other harmful substances to produce secondary pollution. Due to the cold temperature in winter, large-scale ventilation is not possible, which leads to the decline of dishes, the price of coal, labor costs and the output and selling price of agricultural products, so that the majority of farmers lose their enthusiasm for production.

This paper focuses on the feasibility of developing photovoltaic solar housing projects in western China to enable farmers to achieve sustainable prosperity. Photovoltaic solar energy mentioned in this study is one of the main forms of solar energy utilization. Polysilicon solar panel is a kind of influence on light and can be converted into electrical energy equipment, can produce photovoltaic effect of materials mainly monocrystalline silicon, polysilicon and so on. Photovoltaic solar panels made of polysilicon as the main raw material are discussed here. The main working principle is that when the light shines on the photovoltaic solar panel, the light will be absorbed by the silicon material, and the energy of the light will be transferred to the silicon atom, which makes the electrons move and become free electrons, thus forming a voltage difference. When the circuit is connected externally, under the action of the voltage, there will be a current flowing through the external circuit to produce a certain output power. The essence of this process is the conversion of light energy into electric energy. Photovoltaic solar conservatory is a conservatory where multiple photovoltaic solar panels are connected and fixed at the top of the conservatory to form a continuous circulation system that absorbs and converts light energy into electricity. Automatic temperature control electric heating and sensors with electric storage function are installed inside the conservatory, so as to automatically control the temperature inside the conservatory, so that green leafy vegetables can grow and produce efficiently in winter. Excess power can be sold to the National Grid for a second income.

3.2. Cost comparison between traditional greenhouse and photovoltaic solar greenhouse.

Traditional greenhouses take Karamay, Xinjiang, China as an example. Currently, there are 25,000 greenhouses in Karamay, northern Xinjiang. In winter, out-of-season vegetables such as tomatoes and peppers are mainly planted, and the winter temperature is low. Winter heating mainly relies on coal heating and electric heating two ways. According to the relevant data show that the local heating period mainly from the beginning of December to the next February, the temperature in the greenhouse to 15℃ suitable for plant production as the standard, take coal heating as an example, one mu of the whole heating season needs 10 tons of coal, the market price is 1200 yuan/ton, the cost of coal furnace covers 200 each set, 1 mu needs 8 sets, a total of 1600 yuan. Based on five years of depreciation, the average heating season of the coal-fired furnace and stove jacket usage fee is 400 yuan. The total is 12,320 yuan; If the use of electric heating, the same temperature of the same area, per mu of land a heating season required electricity is 15,000 degrees, the price of 0.39 degrees, in addition to the need for two radiator, each 2000 yuan, assuming three-phase electricity and cable, 2000 yuan, still with 5 years of depreciation, power supply cost is 6650 yuan/mother/heating season.

If the farmer installs a photovoltaic solar greenhouse, according to the same standard as above, the land of one mu is 666 square meters. According to the light slope, the actual solar panels built on the greenhouse are 222 square meters, and the power of photovoltaic solar panels of one square meter is 100W. However, the solar energy generation is more affected by sunshine, the stronger the sunshine and the longer the sunshine time, the more electricity generation. For example, in the morning, at noon, at night, cloudy and rainy, one square meter photovoltaic solar panel can generate 1.2 kilowatt-hours of electricity per day according to the daily sunshine time of 10 hours. Then, a photovoltaic solar greenhouse can generate 24,000 kilowatt-hours of electricity in a heating season, and 97,236 kilowatt-hours of electricity in a year, and completely rely on electricity for heating. The amount of electricity required for a heating season per mu of greenhouse is only 15,000 degrees, and 82,236 degrees of electricity are more in a year. According to the calculation of clean power recovery price of 0.25 yuan/degree, the income generated by sales of excess electricity is 20,559 yuan. The photovoltaic solar panel is calculated according to the power of 100 watts, and the unit price of installation including materials is 310 yuan/square meter. The payback period is calculated according to 8 years, so the annual cost is 8602 yuan. Two radiators are needed, each costing 2000 yuan. The depreciation is 400 yuan per year according to the calculation of 5 years. The total annual cost is 9,002 yuan. But the annual income from electricity sales

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alone is 20,559 yuan. Sales of electricity can make up for the cost of the construction of solar photovoltaic greenhouse, and the remaining balance is 11,557 yuan/mu.

Greenhouse vegetable sales are also one of the main incomes of photovoltaic solar panels. Take planting leek as an example, photovoltaic solar panel greenhouse leek can be harvested three seasons a year, per mu yield of the first crop yield of about 7000 kgs; The second harvest is about 6000 jin. The third harvest can collect about 18,000 kilograms of leeks in a year at about 5,000 kilograms. According to the annual purchase price of leeks in the wholesale market of Sanshi Agricultural products in 2020, the income of one mu of leeks is 44,820 yuan/mu. As well as green leafy vegetables, out-of-season fruits such as strawberries and blueberries could be cultivated, if the technology is ready. In addition, the photovoltaic solar greenhouse is also suitable for breeding fish and peacock and other products with high economic value.

3.3. Features of this article

The main features of this paper are as follows: 1) Make full use of the local climate conditions, combine the traditional photovoltaic solar power generation with the greenhouse, and have obvious spatial stratification advantages. (2) Compared with traditional greenhouse, it has more obvious advantages in promoting farmers' production increase and income; (3) Take a dry and rain-less county in western China as a pilot area to develop modern agriculture, drive the four-in-one linkage mechanism of capital flow, technology flow, logistics flow and population flow, and form local characteristic industries. (4) In the process of solar greenhouse construction, the power company, enterprises and farmers cooperate to finance, which reflects the good spirit of "the government, enterprises and farmers are all one family and sing a show together". At the same time, it is also a favorable opportunity for the government to test the active participation of state-owned enterprises in national construction and assume social responsibilities, laying a good foundation for local industrial upgrading and promoting economic development.

3.4. Innovation of this paper

The innovation of this paper is reflected in the following three aspects: (1) It constructs a theoretical model for the development of photovoltaic solar housing projects in arid and rain-less areas in western China under the condition of continuous prosperity. It breaks through the single limitation of the traditional greenhouse income, and puts forward the view that the combination of the greenhouse and photovoltaic solar energy can realize the income and sustainable development of energy. (2) The function mechanism of photovoltaic solar conservatories on local economic development was explored.

IV. CONCLUSIONS

As an outstanding representative of a developing country, China has taken the initiative to shoulder social responsibilities while developing its economy. After making commitments on carbon emissions, the Chinese government has taken the initiative to reduce carbon emissions in all aspects and achieve carbon standards without affecting people's lives. In this paper, combined with the natural environment of drought and little rain in western China, photovoltaic photovoltaics and traditional greenhouses are combined to promote farmers' production and income, and clean energy and basic agriculture are combined to realize the mission of transforming scientific and technological achievements to help modern agriculture. At the same time, farmers selling electricity to the State Grid proposed in the paper is also an outstanding performance of farmers helping the development of the country. The paper puts forward solutions to the problems of capital and technology in the construction of photovoltaic solar heating greenhouse, and leads to the basic point of view that the social responsibility undertaken by state-owned enterprises is converted to make up for the farmers, and the feasibility of the project is concluded.

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