Exploration of Low-Carbon Circular Development Model of Agriculture in Qinghai-Tibet Plateau Region

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Abstract. The Qinghai-Tibetan Plateau region is known as the "Third Pole of the Earth", "Water Tower of Asia" and "Roof of the World", and is one of the important ecological security barriers in China. However, the global warming, rapid development of second and tertiary industries as well as backward agriculture production mode have led to the deterioration of the ecological environment and the reduction of biodiversity in the region, which will impose serious constraints on the sustainable development of its agriculture. In recent years, the concepts of low-carbon agriculture and circular agriculture have gradually emerged to provide new direction guidelines for the modernization of traditional agriculture. This paper summarizes the rise and development of low-carbon agriculture and recycling agriculture, and complements the advantages of both to form low-carbon and recycling agriculture, which is proved to be crucial for sustainable development of the plateau. Through the SWOT analysis of agricultural development status in the Tibetan Plateau, the objective of the study is to explore the future development mode of low-carbon and recycling agriculture in the Tibetan Plateau region, so as to promote the green and sustainable development of agriculture in the region. The results of the study revealed that the establishment and development of low carbon circular agriculture can be realized through macroeconomic policy guidance, introduction of technologies, human resources and capital, promotion of energy-efficient and low-carbon farming and grazing techniques, and establishment of a benefit-oriented mechanism.

Keywords: sustainable agricultural development, global warming, low-carbon circular agriculture, energy conservation and carbon emission reduction, Qinghai-Tibetan Plateau.

1 Introduction

Against the backdrop of global warming and the crisis of agricultural food resources, the concepts of low-carbon agriculture and circular agriculture have gradually emerged, providing new guidelines for the modernization of the world's agriculture featuring green and sustainable.

Z. Zhan et al. (eds.), *Proceedings of the 2024 10th International Conference on Humanities and Social Science Research (ICHSSR 2024)*, Advances in Social Science, Education and Humanities Research 858,
https://doi.org/10.2991/978-2-38476-277-4_61

In this part, the background and characteristics of the rise of these two agricultural models are summarized based on data from previous studies. Through the study of the commonalities of the two agricultural models, it is found that low-carbon and recycling agriculture, which complements the advantages of the two agricultural models, is able to achieve the objectives of energy conservation, emission reduction and efficient utilization of resources in a mutually reinforcing way.

There are already many countries and regions around the world that are exploring this kind of agriculture model. The study of the current production, living and environmental conditions in the Tibetan Plateau region suggested that the development of low-carbon and recycling agriculture in the region is of great significance.

1.1 Rising and Development of Low-carbon Agriculture

Since the 21st century, the greenhouse effect has caused a number of hazards (global warming, extreme weather, and frequent disasters) that pose a great threat to human production and life. According to the China National Meteorological Administration (CNMA), the year 2023 is the warmest year since global meteorological records began, 0.14°C higher than the last high-temperature record year (2016), and the global average temperature from June to December has consecutively exceeded the historical extremes for the same period. Relevant studies indicate that the mean global surface temperature in 2023 is 1.42°C above the pre-industrial level (1850-1900 average) and 0.53°C above the average of 1991-2020 (climate base period).[1] Global emissions of fossil fuel carbon dioxide (CO2) in 2023 are rising again to a record level, which is expected to reach 36.8 billion tons, up 1.1 percent from 2022, according to data published in the journal Earth System Science Data. [2]Related forecasts suggest that 2024 may become even hotter.

Addressing climate change has become a common challenge facing the globe and is receiving more and more attention from countries and localities. Greenhouse gases such as carbon dioxide and methane are the main culprits causing the greenhouse effect. The increase of carbon dioxide content in the atmosphere comes from the increased frequency of fossil energy use by human. In addition to being influenced by natural factors, climate change is closely related to human activities, in particular the extent of the use of fossil fuels and the emission of greenhouse gases.

Carbon dioxide emissions have risen year by year in recent years, and high carbon dioxide emissions are not unique to cities and industry. Agriculture, as the backbone of the national economy, accounts for a large proportion of our fossil energy consumption and is itself a large source of carbon emission. Agriculture is also an important source of greenhouse gas emissions such as methane and ammonia oxide. As a major agricultural country, China's agricultural GHG emissions account for up to 24% of the total, with emissions increasing every year.[3] Excessive use of chemical fertilizers in human agricultural production activities, inappropriate production methods, and the extensive use of fossil energy in the processing of agricultural products are all sources of CO2 emissions.

At the same time, however, crops can also absorb and fix carbon dioxide in the atmosphere through photosynthesis, which has a considerable carbon sink function. In

addition, soil is a major carbon sink, and the carbon content of soil organic matter accounts for three quarters of the carbon content of the entire biosphere.[4] It is a core measure of soil quality, and soil with a high carbon content is conducive to the growth of crops. Promoting energy-saving and emission-reducing farming and animal husbandry technologies, biological carbon sequestration technologies, biomass energy and renewable energy technologies in agriculture, enhancing the carbon sequestration capacity of soils and crops, replacing traditional ammonia fertilizers with biological fertilizers, and substituting fossil energy sources with green energy sources are capable of transforming traditional agriculture into a new type of low-carbon agriculture featuring "low-energy consumption, low-emission and low-pollution". [5]

1.2 Rising and Development of Circular Agriculture

The rapid development of the global economy and the increase in population have led to a rapid growth in the demand for food and other agricultural resources, placing higher request on agriculture. Contemporary agriculture pursues higher productivity and greater yields, while neglecting the protection of the ecological environment and the sustainable use of resources. Combined with the effects of climate change, global food production and agro-ecosystems are confronted with severe tests. According to the report "The State of Food and Agriculture 2023" released by the Food and Agriculture Organization of the United Nations (FAO), the current agri-food system imposes huge hidden costs on human health, the environment and society, amounting to as much as 10 trillion U.S. dollars per year, which is equivalent to nearly 10 percent of the global GDP. Relevant data show that by 2050, global food production and the total area of arable land will dropped respectively by 17% and by 20%, while the new population will reach 2.2 billion.[6]

In this context, the development of circular agriculture to alleviate the negative impact of agricultural production and processing on the ecological environment and realize the sustainable use of resources are of great significance to the sustainable development of agriculture. Circular agriculture refers to an agricultural production and management mode that realizes multi-level recycling of materials and zero (or minimal) emission or zero (or minimal) interference of harmful factors of industrial activities on the environment through optimizing the structure of the whole industrial chain from production to consumption of agricultural products. The pattern is in accordance with the principle of 3R, namely "Reduce, Reuse and Recycle".[7] By reducing the input and consumption of chemical fertilizers, pesticides and other resources in agricultural production, the wastes generated at each stage of agricultural production, such as straw and animal manure, are processed and then reused in other links to establish a recycling chain, thus achieving the regeneration of resources and the reduction of costs in agricultural production and processing. In this process, we strive to maximize the efficiency of resource utilization and minimize the negative impact on the ecological environment, thus promoting the sustainable development of agriculture.

1.3 Concept of Low-carbon, Recycling-based Agricultural Model

Low-carbon agriculture and circular agriculture, as two modes of future agricultural development in the world, have similarities both in their concepts and their functions in agricultural development. Conceptually, the former emphasizes the need to reduce the amount of fossil energy used in agriculture, while the latter calls for "minimization " in its 3R principles. Also, both agricultural models focus on the regeneration and utilization of agricultural resources. In terms of the function of agriculture, both seek to avoid the misuse and overuse of resources in the agricultural production process, thereby minimizing the negative impact on the ecological environment and promoting the green and sustainable development of agriculture.

Given the analysis above, the two approaches can be combined with their strengths complementing each other to form a low-carbon circular agricultural model, which is expected to realize the efficient use of resources as well as the emission reduction and energy saving in agriculture in a mutually reinforcing way.

Under this agricultural model, circular agriculture helps to achieve low-carbon goals. Based on the establishment of the agricultural recycling chain, the use of chemical fertilizers can be reduced through the multilevel recycling of agricultural waste, such as returning straw to the field and converting manure into organic fertilizer to increase the organic matter content of crops[8]; Meanwhile, straw and manure can be used for the production of biogas and as biofuel for agricultural and livestock product processing factories. In this series of processes, we reduce the usage of chemical fossil fuels and save energy, thus realizing the goals of energy-saving and emission reduction.

On the other hand, the characteristics of low-carbon agriculture have enriched the model of circular agriculture. For example, with the application of low-carbon energy such as geothermal energy and water energy and modern information technology like Internet of Things (IoT) technology, the greenhouses can be established to develop of precision agriculture and irrigated agriculture, which reduces the use of water resources and chemical fertilizers and pesticides, and is in line with the principle of “energy use reduction”; And at the same time, the photovoltaic power generation and the use of biomass such as gasification or direct-fired power generation of straw provides energy for waste treatment in agricultural and animal husbandry product processing factories, which not only reduces emissions of waste gas and liquids but also provides reusable water resources and organic fertilizers for animal husbandry and plantation, thus realizing the maximum utilization of agricultural resources.

1.4 Models of Low-carbon Circular Agriculture Around the World

In view of the impact of global warming on the global economy and the potential of low-carbon and circular agriculture, many regions at home and abroad have begun to lay out the path of low-carbon and circular agriculture.

Some Western developed countries are exploring low-carbon and recycling-oriented agricultural development paths, actively planning and deploying them at multiple levels, including development strategies, trading mechanisms, standard-setting, business models and consumer guidance. For example, the United States established the

Chicago Climate Exchange in 2003 to help farmers gain revenue through carbon sink projects; Australia, in response to greenhouse gas emissions from livestock that accounts for up to 66 percent in the total emissions, has improved feed formulas in livestock management, increased the efficiency of livestock feeding and fodder cultivation, and set up biofactories to enhance the recycling of livestock manure.

In China, there are also some places that have achieved initial results in the probe of low-carbon circular agricultural models. A typical case is the integrated demonstration of comprehensive reduction technology for two-maturing farmland (refers to a farmland in the southern China where rice can be planted in summer and wheat can be planted in winter) in Jiangsu Province. Through the model of straw returning - rotary tillage - machine strip sowing (wheat) or machine insertion (rice) - chemical fertilizer and pesticide reduction - machine harvesting, the annual yield of rice and wheat increased by 3.83%, the rate of straw return to the field reached 100%, chemical fertilizer reduced by more than 20%, chemical pesticides reduced by 33%~50%, and farmland ecological environment significantly improved.[9]

1.5 Importance of Developing Low-carbon and Recycling-oriented Agriculture in the Tibetan Plateau Region

The Qinghai-Tibetan Plateau is known as the "Roof of the World", "the Third Pole of the Earth" and "the Water Tower of Asia", and is an important ecological security and strategic resource reserve base in China. But at the same time, the ecological environment of the Tibetan Plateau region is relatively fragile, and it is one of the most sensitive zones to global climate change. Research shows that over the past 50 years, the Tibetan Plateau has experienced significant warming and humidification, with the average annual temperature increasing at more than twice the global rate over the same period. [10]Extreme high temperatures and extreme precipitation events have occurred frequently on the Tibetan Plateau, along with glacier retreat, permafrost melting and increased instability of the "water tower" function, resulting in an increase in meteorological and derivative disasters, which have had a significant impact on local infrastructure as well as the production and livelihoods of local and downstream residents.

In addition, most of the local people still adopt the rough animal husbandry production and business mode with the management concept lagging behind, and the grassland overgrazing is serious, which leads to the degradation of the grassland and the aggravation of water and soil erosion. According to relevant research data, the area of grassland degradation has reached 700,000 square kilometers, accounting for about 25% of the total area of grassland on the Qinghai-Tibet Plateau. This has weakened the carbon sequestration capacity of the soil biosphere and affected local water quality, further aggravating the instability of the local environment.

Against this background, the significance of developing low-carbon and circular agriculture in the Tibetan Plateau region is self-evident.

2 SWOT Analysis of Developing Low-carbon Circular Agriculture in the Tibetan Plateau Region

Unlike other places, the Tibetan Plateau possesses unique natural geographical characteristics and humanistic environmental conditions. The current socio-economic development of the region is also unique. In order to explore the development model of low-carbon circular agriculture in this region, it is necessary to first fully understand the advantages and disadvantages of local agricultural development, as well as the opportunities and challenges faced.

2.1 Advantages of Low-Carbon Circular Agricultural Development in the Tibetan Plateau Region

1. Unique Physical and Geographic Characteristics

Due to its distinctive geographical location and natural environment, the Tibetan Plateau is one of the regions least affected by human activities, therefore the natural environment here is still in a primitive or semi-primitive state, which is recognized by UNESCO as one of the "four major clean and pollution-free regions of the world". The region covers vast areas, with diverse topography and climate conditions. River valley areas, such as Tibet and parts of Xinjiang, have lower altitudes, more abundant heat relative to the plateau, fertile soil, ample groundwater resources, and less wind, which is suitable for the development of planting; while high-altitude areas, such as the northern edge of the Qinghai-Tibet Plateau, have cold climates and insufficient year-round temperatures, which is suitable for pasture grass growth, resulting in the formation of alpine animal husbandry with plateau characteristics. An ecological cycle chain can be established between different types of agriculture to develop low-carbon recycling-type agriculture.

2. Abundant Green Energy

Green energy abundance gives the Tibetan Plateau region great potential for developing low-carbon recycling agriculture. The Qinghai-Tibetan Plateau is one of the richest regions in the world in terms of solar energy, and as the birthplace of the Yangtze, Yellow, and Lancang Rivers, it is also rich in hydropower resources. A white paper on the "Status of Ecological Civilization Construction on the Qinghai-Tibetan Plateau" published in 2018 points out that Qinghai Province will implement several megawatt photovoltaic (PV) power station clusters in the Qaidam Basin to build the world's largest PV power station; by the end of 2016, the installed capacity of photovoltaic power generation in Qinghai amounted to 6.82 million kilowatts, and the technically developable amount of Tibet's hydroelectric resources was 174 million kilowatts, ranking first in the country.[11] Reliable data show that 342 geothermal display areas are available for development in Tibet, with the vast majority of surface springs having a temperature of more than 80 degrees Celsius, and the potential for power generation from geothermal resources exceeding 1 million kilowatts.

3. Good Humanistic Environmental Conditions

In the long process of co-evolution with nature, the ideology of respect for nature, equality of all living beings, and the protection and good treatment of local flora and fauna has been deeply embedded in local traditional culture. The simple ecological protection and survival concepts of Tibetan farmers and herders reflect the idea of harmonious coexistence between human beings and nature. This has laid a good humanistic foundation for the development of low-carbon circular agriculture in the Tibetan Plateau region.

2.2 Disadvantages of Low-carbon Circular Agricultural Development in the Tibetan Plateau Region

1. Climatic Constraints

The Tibetan Plateau region as a whole is at a high altitude, resulting in thin air and low temperatures with insufficient year-round cumulative temperature. Most of the region being far from the sea plus the intense transpiration make it extremely scarce of surface water resources. As a result of these factors, the main agricultural areas are concentrated only in the river valleys. The ecological environment of the Tibetan Plateau is relatively fragile, and the carrying capacity of the natural environment and its ability to self-regulate and recover are poor. In recent years, global warming has triggered the melting of local glaciers and permafrost, redistribution of vegetation[12]as well as other meteorological disasters and environmental changes in this region, which undoubtedly bring many unknown challenges to the development of local agriculture.

2. Insufficient Human Resources, Poor Technology and Infrastructure

The issue of scarcity of talent is one of the constraint against the agricultural development in the Tibetan Plateau region. Despite the implementation of local policies for the introduction of talents in recent years, the lack of oxygen on the plateau, income treatment and other problems have led to the loss of talents. Scarce of skilled agricultural personnel in areas such as Qinghai and Tibet has made it arduous to popularize the concept of low-carbon circular agriculture among local farmers and herders. Therefore, promoting the establishment and development of low-carbon circular agriculture in the plateau region still remains a difficulty.

On the other hand, backwardness in technology and infrastructure also poses a major obstacle to the development of local agriculture. In the Tibetan Plateau region, winters are harsh and prone to disasters such as hailstorms and floods, and crops without the protection of greenhouses have a low survival rate in winter. Herders at high altitude in the region still adopt a rough and inefficient production and management mode with low utilization of grassland resources, leading to a large amount of greenhouse gases generated in the process of fodder production and feeding. Meanwhile, there is a lack of facilities for the utilization of groundwater and geothermal resources. For example, a portion of the snow and ice melt water from the Tibetan Plateau region flows through underground aquifers and aquifers to neighboring basins and oases, where there is a

lack of funds for the construction of water conservancy facilities, so these groundwater resources are not fully utilized.[11]

2.3 Opportunities for Low-Carbon Circular Agricultural Development in the Tibetan Plateau Region

1. Good Policy Environment Conditions

In recent years, in response to the changing international economic environment, the State has continued to increase its policy support for the Qinghai-Tibetan Plateau to effectively safeguard the basic livelihoods of the people in difficulty. The "three rural issues" - agriculture, rural areas and peasants - has always been given high priority by the Party and the State, and over the past few years the Central Government has encouraged the development of recycled and ecological agriculture in a number of consecutive No. 1 documents, which also support to accelerate the development of organic agriculture in places where it is possible to do so.

On March 14, 2023, the People's Government of the Tibet Autonomous Region issued a list of subsidy policies for the benefit of the people and agriculture in 2023, with a total of 26 subsidies. Among them, it mentioned that grassland ecological protection subsidy and subsidies for good breeds of livestock are provided for herders. [13]This provides p incentives olicy support for the transformation of local agriculture towards environmentally friendly, low-carbon and recycling-oriented agriculture.

2. Good Market Environment Conditions

The past few decades since the reform and opening up have witnessed China's economy developing at a high speed. In parallel with the constant increase in national economy and social wealth, the consumption level of the residents has been improving with the consumer demand rising to unprecedentedly height. Nowadays, China's economy is shifting from high-speed development to high-quality development and the supply-side structure is steadily optimized. Constantly improving consumption concept of the residents contributes to continuous growth of the demand for safe, healthy, green and environmentally friendly ecological agricultural products.

Under this context, the development of low-carbon and circular agriculture in the Qinghai-Tibetan Plateau region is a great trend of times. For instance, it can help improve animal feed through the use of agricultural wastes such as residues and cultivate good livestock breeds. Additionally, low-carbon farming techniques such as straw return to the field and crop rotation can be promoted in river valleys and other places suitable for crop cultivation. Adoption of the agriculture modes above will reduce both carbon emissions and the use of chemical fertilizers and pesticides to create green and environmentally friendly agricultural products with plateau characteristics. Such agricultural products caters to the needs of today's consumers and have broad market prospects.

2.4 Challenges of Low-Carbon Circular Agricultural Development in the Tibetan Plateau Region

1. Backwardness of the Original Production Model

At present, most farmers and herders on the Tibetan Plateau have backward ideas and rely on a crude and inefficient model of consumptive resource utilization to develop agriculture. Sixty-five percent of the inhabitants on the plateau depend on agriculture and animal husbandry for their survival, and the blind overgrazing of herders has led to the large areas of grassland being eaten up, resulting in the exposure of bare land and the degradation of pastures. Due to overgrazing, nearly 30 percent of the grassland has been degraded seriously as of now and the vegetation coverage has significantly reduced.

2. Rapid Development of Secondary and Tertiary Industries

In recent years, with the rapid advancement of the western development strategy, as well as the accelerating speed of China's industrialization and urbanization, many leading companies within the secondary industry such as PetroChina Qinghai Oilfield Branch, Salt Lake Group, Western Mining have entered the plateau one after another. The secondary industry has been developing rapidly and kept in a steady growth with the abundant resources of oil, natural gas, and mining contained in the plateau. Furthermore, the development of network technology has greatly augmented the popularity of the Tibetan Plateau. Chaka Salt Lake, Potala Palace, Qinghai Lake, etc., these attractions with unique religious culture and richly endowed by nature have attracted many tourists to come and have a glimpse of them. In 2022, the Tibetan Plateau region will receive more than 300 billion tourists, and the total income from tourism will be close to 50 billion yuan.

However, this is a great challenge for the development of local agriculture. As most of the agriculture in the Tibetan Plateau region is concentrated in the river valleys, the rapid development of the secondary and tertiary industries has further crowded out the space for local agricultural development. Some factories do not handle industrial waste properly before emission and discharge it randomly, polluting the local water quality. To make matters worse, the construction of road network occupies land resources and reduces the available land resources, and some projects even destroy large areas of grassland, which then degrade into "black soil beach" that cannot be repaired. Some tourists have little awareness of environment protection, leading to plastic bags and other garbage fluttered in the wind on the plateau.

3 Measures to Establish a Low-carbon, Recycling-oriented Agricultural Model in the Tibetan Plateau region

Based on the SWOT analysis of developing low-carbon circular agriculture in the Tibetan Plateau region, and drawing on the experience from how the models of low-carbon recycling agriculture in other regions are developing, the following

measures can be considered to gradually establish and promote low-carbon circular agriculture in the region.

3.1 Strengthening Macroeconomic Policy Guidance

1. Formulation of a Strategic Plan for Low-carbon Circular Agriculture Development

National and local authorities should formulate a long-term development plan for low-carbon and recycling-oriented agriculture in the region in accordance with China's objectives of "dual-carbon" strategy and the carbon-neutral 14th Five-Year Plan, taking into account the socio-economic development of the Qinghai-Tibet Plateau. The plan are supposed to clarify the priorities, main tasks and objectives of each stage. A special committee on low-carbon and recycling agriculture should be set up at the local level to coordinate and plan the relevant work and to promote the popularization of the concept of low-carbon and recycling development in the region.

2. Improvement of Corresponding Institutional and Regulatory Guarantees

Local governments should introduce relevant policies, such as setting up settlement subsidies and science and innovation funds to encourage talents with relevant backgrounds to settle in the region and devote themselves into the development of low-carbon and recycling-oriented agriculture. Besides, allowance system for the research of green energy development and the cultivation of good livestock breeds should also be carefully considered.

3.2 Introducing Technologies, Human Resources and Capital Essential for The Development of Low-carbon And Recycling-oriented Agriculture

1. Establishment of a Mechanism for The Two-way Flow of Talent and Technology

First of all, the local government can cooperate with relevant scientific research institutions and invite experts and scholars from home and abroad who have studied low-carbon and recycling agriculture to come to the Tibetan Plateau for conducting field research on the conditions and obstacles to the development of low-carbon and recycling agriculture in the local area. They can cooperate with local farmers and provide technical and knowledge training guidance to them, while combining the rich practical experience of farmers. On this basis, the local government can encourage farmers to go out of the plateau to study in pilot bases in China where low-carbon and recycling agriculture has been carried out, and then return to the plateau after they have completed their studies, which can better promote the establishment of low-carbon and recycling agriculture models in the Tibetan Plateau region.

2. Cooperation on Relevant Projects to Attract Funding

With the deepening of supply-side structural reform and rising consumer demand for green, environmentally friendly and energy-saving products, many enterprises are

seeking green transformation and upgrading to better meet consumer demand. The Qinghai-Tibetan Plateau region has great potential for the development of low-carbon circular agriculture. At the initial stage of the development, it is reasonable for local government and some related farm cooperatives to conduct project tenders, seeking financial support from other enterprises to promote the establishment of greenhouses, biofactories and other technical facilities that will contribute to the development of low-carbon circular agriculture.

3.3 Promoting Energy-efficient and Low-carbon Farming And Grazing Techniques

1. Breeding Excellent Livestock Breeds, Grasses Species and New Crops

For the plateau livestock industry, improve feed formulas and cultivate excellent ruminant breeds. Additionally, research and develop grass species that can adapt to the plateau climate and have a strong environmental carrying capacity so as to alleviate the problem of grassland resources shortage due to the increasing amount of local livestock. As for the plantation industry in the river valleys, research and develop, or introduce new crop varieties with strong resistance to pests and diseases, as well as a strong greenhouse gas absorption capacity.

2. Promoting Energy-saving, Emission-reduction, Intensive and Efficient Methods of Farming and Animal Husbandry

In the case of highland animal husbandry, joint grazing should be adopted to replace the original individual, rough and inefficient nomadic pastoralism. In places where grassland has been degraded and soil erosion is serious as a result of prolonged grazing, measures are supposed to be taken to prohibit grazing or implement protective grazing with grasses and trees laid on the surface of fallow land to increase the organic carbon content of the soil, thereby improving its carbon sequestration capacity. In river-valley plantation zones, implement and promote farming techniques of mixed crop rotation and farming technique of tilling and rotary tillage, which can increase the carbon sink capacity of the soil and reduce the use of chemical fertilizers.

3. Enhancing the Application of Modern Agricultural Technologies and Green Energy

In river valleys and other areas suitable for growing crops, the abundant geothermal energy and water energy in the Tibetan Plateau region can be used to establish greenhouses, develop precision agriculture and irrigated agriculture relying on modern agricultural information technologies such as big data technology, Internet of Things (IoT) technology, light technology, during which the various environmental conditions during crop growth can be monitored in real time to realize the fine management of crops, thus saving water resources and reducing the use of chemical fertilizers and pesticides at the same time[14].

3.4 Establishment of a BEnefit-oriented Mechanism

1. Promoting the Establishment of a Carbon Trading Platform in the Tibetan Plateau Region

According to Chen Fahu, director of the Qinghai-Tibet Plateau Institute of the Chinese Academy of Sciences, the Qinghai-Tibet Plateau region accounts for less than 1 percent of the country's carbon emissions, while its carbon sinks reaches 10 percent of national carbon sequestration capacity[15], which means it possesses a huge potential for emission reduction. The development of low-carbon and recycling agriculture can further release its potential for emission reduction and generate huge market value. Therefore, it is possible to set up a carbon trading market platform, build professional organizations for establishing corresponding technical standards of carbon emission reduction according to different types of agriculture, so that local farmers can directly benefit from carbon sink projects, thus increasing their motivation to carry on the development of.

2. Expanding the Industry Chain of Agricultural and Livestock Product to Increase Their Market Value

Under the low-carbon circular agriculture mode, the introduction of modern agricultural technology and green farming methods are able to improve the yield and quality of agricultural products, and further explore the added value of agricultural products. For example, create organic agricultural products with characteristics of the Qinghai-Tibetan Plateau, such as plateau vegetables and organic yak meat, and improve the competitiveness of the products in the market through quality enhancement and brand building. In addition, deep processing of agricultural products should be encouraged to extend the industrial chain and increase their added value. For instance, develop food and health care products with plateau features to meet the diversified needs of consumers.

Furthermore, the geographical, climatic and cultural characteristics of the Qinghai-Tibetan Plateau should be fully taken into account with giving full play to the advantages of different regions on the plateau to build a diversified industrial system. In suitable areas, form industrial chains with integration of ecotourism, specialty farming, green food processing and other industries to promote the integrated development of low-carbon circular agriculture and other local industries.

4 Conclusion

The Tibetan Plateau is China's ecological barrier and carbon sink. Against the background of global warming and the local backward agricultural and animal husbandry production methods that have seriously affected the local ecological environment, it is of great significance to develop low-carbon and recycling agriculture in this region. In this paper, from the connotation of low-carbon agriculture and recycling agriculture, it is concluded that the two modes of agricultural development are closely interlinked and complement each other.

On the basis of the concept of low-carbon recycling agriculture development, this paper takes the principle of specific analysis for specific problems as a guide. Through SWOT analysis of the development of low-carbon recycling agriculture mode on the Tibetan Plateau, it is found that the advantages of the development of low-carbon recycling agriculture on the Tibetan Plateau lie in its unique natural geographic characteristics, abundant green energy and good humanistic environmental foundations. However, the limitation of climate conditions and the backwardness of technology and facilities are the constraints to its development. National and local policies as well as rising consumer demand for green agricultural products will provide opportunities for the development of low-carbon and recycling agriculture in the region, while the rapid development of other industries in the region will also have an impact on its development in the region.

Based on above analysis, this paper makes a preliminary and systematic exploration of the low-carbon and recycling agricultural development model in the Tibetan Plateau region. It is revealed that the support of relevant national and local policies, and the establishment of a two-way flow of talent mechanism and project cooperation to attract capital, technology and talent, are able to provide support for the promotion of energy-saving and low-carbon agricultural farming and animal husbandry technologies. At the same time, make good use of the potential of local carbon sinks to set up a carbon trading platform and promote the integrated development of low-carbon and recycling-oriented agriculture and other industries. Through the above measures, it is expected to promote the gradual establishment and popularization of the low-carbon and recycling agriculture model in the region.

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