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## Development of "traditional Chinese medicine agriculture" to establish ecological agriculture with the Chinese characteristics

Lijian Zhang, Min Lin, Chengzhi He and Qi Cheng

### Abstract

Agriculture evolved from ancient times and moved toward the future with the development of human nature, society and thought. With the reform of economy, society and science and technology, agriculture is facing new opportunities, challenges, bottlenecks and changes as the basis and premise of human survival and development. At present, the active development of "Traditional Chinese Medicine agriculture" is the integration of ancient and modern agriculture, under the pressure of resources, environment and the quality, safety and sustainability of agriculture, the theoretical innovation and realistic choices of the development of ecological agriculture with international and Chinese characteristics. Here we discuss the consistency of TCM agriculture and ecological agriculture and the role of China and agriculture in the development of sustainable agriculture. Some suggestions for the development of TCM agriculture are also provided.

**Keywords:** traditional chinese medicine, agriculture, eco-agriculture, sustainable development

### Introduction

#### Preface

Agriculture, which evolved from the ancient antiquity, goes into the future with the development of the nature, society and thinking of human. As the basis and prerequisite for survival and development of mankind, agriculture is faced with emerging chances, challenges, bottlenecks and changes as a result of the reforming of economy, society, science and technology. At present, the active development of "traditional Chinese medicine (TCM) agriculture", an integration of the ancient and modern agriculture, is a theoretical innovation and realistic choice for the development of international and China characteristic ecological agriculture under the pressure from resources, environment and the quality, safety and sustainability of agriculture.

### Consistency analysis on connotation of "TCM agriculture" and Ecological Agriculture

- In the history of agriculture, it is generally divided into four stages, including original agriculture, traditional agriculture, oil agriculture (contemporary agriculture) and ecological agriculture. Now, it is being in the critical stage from oil agriculture and ecological agriculture. In the oil agriculture, there is large increase in agricultural production and labour productivity. However, there are some badly adverse effects, such as, soil erosion and crust, overdose fertilizer and pesticide, environmental pollution and other problems. Therefore, the concept of "ecological agriculture", different from organic agriculture, was carried out in the 1930s and 40s in the United Kingdom and the United States. With the global common response to the strategy of sustainable development in 90s, the sustainable agriculture has also received general attention and recognition. Ecological agriculture, as an integral part of sustainable agricultural development, has been into a thriving period and realized the qualitative leap from the accumulation of the amount. [1-4]
- At present, traditional Chinese medicine (TCM) industry has entered a period of great development. In recent years, the "Traditional Chinese Medicine" has been constantly embarking on a wave of enthusiasm – Tu Youyou won the Nobel Prize for his invention of "Artemisinin", an anti-malarial drug that saved the lives of millions of people around the world. As an important force in the construction of "healthy China",

- Chinese medicine has increasingly shown its unique value and is increasingly recognized and concerned by the international community. [5-7] At present, Chinese medicine has spread to 183 countries and regions, and the worldwide "Chinese medicine fever" has already formed. As a gem of traditional Chinese culture, TCM has made great contributions to the health and well-being of our people for thousands of years. At the same time, Chinese medicine and agriculture that affects people's lives and prosperity close contact.
- TCM agriculture is an innovative application of traditional Chinese medicine thought and traditional Chinese medicine technology, products and solutions, combined with modern science and technology, industrial production of production materials and modern management ideas and methods to promote modern agriculture "quality, increase production, increase "Transformation and upgrading", developed into "quality, high yield, high efficiency" sustainable development and innovative modern ecological health agriculture with Chinese characteristics. [7]
- TCM agriculture can comprehensively prevent and control the three-dimensional pollution of water, soil and gas in agricultural products, improve the environment of production, promote the healthy growth of animals and plants, ensure the effective supply and quality of agricultural products, and explore a new way for sustainable development of agriculture in China and the world. TCM agriculture will become an important part of ecological agriculture with Chinese characteristics.

#### **TCM Agriculture has three characteristics [4-7]**

First, systematicness, that is, focusing on agricultural ecosystems and the internal relationship and between the various parts of the organism, which is the essential requirements to maintain the relative stability and harmony in the internal components of agriculture; Second, comprehensiveness, that is, the achievement of multi-faceted, multi-level composite effect - achieve a comprehensive effect through comprehensive approach; Third, wholeness, that is, acting on the whole system and emphasizing all production units and the planting and raising cycle chain.

#### **Ecological agriculture has four major characteristics**

##### **Comprehensiveness**

Ecological agriculture emphasizes the overall function of the agro-ecosystem, takes the big agriculture as the starting point, comprehensively plans, adjusts and optimizes the agricultural structure according to the principle of "integration, coordination, recycling and regeneration", so that agriculture, forestry, animal husbandry, deputy and fishery The industry and the rural first, second and third industries will develop in an integrated manner, and the industries will support each other and complement each other to improve their comprehensive production capacity.

##### **Diversity**

Eco-agriculture is aimed at China's vast territory, with different natural conditions, resource bases, and economic and social development levels. It fully absorbs the essence of traditional Chinese agriculture, combines modern science and technology, and adopts multiple ecological models, ecological projects and rich and colorful technologies. Types of equipment for agricultural production enable all regions to develop their strengths and avoid weaknesses, and give full

play to regional advantages. All industries are coordinated with local realities according to social needs.

##### **Efficiency**

Ecological agriculture realizes economic value-added through material recycling and energy multi-level comprehensive utilization and serialized deep processing, implements waste resource utilization, reduces agricultural costs, improves efficiency, creates internal employment opportunities for rural surplus labor, and protects farmers from agriculture. Enthusiasm.

##### **Stability**

- The development of ecological agriculture can protect and improve the ecological environment, prevent pollution, maintain ecological balance, reduce carbon emissions, improve the safety of agricultural products, change the conventional development of agriculture and rural economy into sustainable development, and closely integrate environmental construction with economic development. While maximizing people's growing demand for agricultural products, it will improve the stability and sustainability of the ecosystem and enhance the stamina of agricultural development.
- From the basic meaning of ecological agriculture and TCM agriculture, the two are essentially consistent, their principles are connected, their methods are mutually referential and their techniques are shared with each other. From their connotation and extension, in a narrow sense, the two connotations are different, because TCM agriculture emphasizes on the application of traditional Chinese medicine into modern agriculture, which is the integration of ancient and modern; While, ecological agriculture emphasizes the specific application of modern scientific and technological achievements and modern management means into the traditional agriculture transformation, which is the learning and utilization of western strengths. But in a broad sense, the two basically have the same extension.
- TCM agriculture respects the concept of ecological agriculture. Under the premise of protecting and improving the agricultural ecological environment, it follows the laws of ecology and ecological economics, uses systematic engineering methods, effective experience of traditional agriculture and modern science and technology to maximize resources. Recycling and intensive agricultural management development, in order to obtain modern agriculture with high economic, ecological and social benefits.
- TCM agriculture is based on the functional agriculture of plant sources, zoos and mineral sources. It is an agriculture that utilizes the principles and methods of TCM treatment, combines modern science and technology and industrial production mode to carry out modern agricultural production and management, and promote the multifunctionalization of agricultural products. The purpose is to transform and upgrade agricultural production to "green quality improvement, increase production and increase efficiency", and become "high-quality, high-yield, high-efficiency" sustainable development and innovative modern ecological health agriculture with Chinese characteristics.
- TCM agriculture comes from ecology, integrates ecology, and develops and upgrades to ecological agriculture. Traditional Chinese medicine agriculture

mainly explores the versatility of ecological agriculture and is used for the multifunctional development of ecological agriculture. Because traditional Chinese medicine is characterized by the original ecology, it not only solves the problem of increasing agricultural production and increasing efficiency, but also provides a series of key technologies and approaches for the comprehensive prevention and control of agricultural source three-dimensional pollution and the improvement of agricultural product quality. In other words, TCM agriculture not only has the functions of ecological agriculture and organic agriculture, but also adds more functions and functions to ecological agricultural products. It has the function of multi-functional agriculture and agricultural source three-dimensional pollution prevention and control of agriculture.

**Table 1:** The similar characteristics of ecological agriculture and TCM agriculture.

The characteristics of ecological agriculture	The characteristics of TCM agriculture
Comprehensiveness	Comprehensiveness
Diversity	Systematicness
Efficiency	Wholeness
Stability	

#### Basic Role of TCM agriculture in sustainable agricultural development

- TCM can not only treat patients, ensure human health, but also be responsible for settling diseases and killing pests, promoting healthy growth according its principles and methods, so as to effectively improve the environment and quality of farmland. In recent years, much efforts have been made by Chinese scientists of agriculture in relevant research and practice, and many achievements have been received. TCM has a long history of 5000 years, and we believe the application of its principles and methods is the source of sustainable development of agriculture.<sup>[1]</sup>
- TCM agricultural technology system and application model can be widely used in four aspects, including pesticides, veterinary drugs, fertilizers and forage. According to TCM principles and methods, animal and plant and other biological elements and natural mineral elements are made into nutrients and pharmaceutical formulations to promote the growth and prevent and control the diseases of animals and plants, which can effectively achieve organic production, reduce drug residues. At present, in many places, the use of chemical agents has caused a great damage to the agricultural ecosystem. Thus, it is very necessary to apply TCM pesticides into agriculture.
- The traditional Chinese medicine pesticides used in "Chinese medicine agriculture" come from natural organisms. These organisms have gradually evolved into a self-defense system after thousands of years. Therefore, Chinese medicine pesticides are complex in composition and various ways of action, and are not easy to produce drug resistance. Moreover, Chinese medicine pesticides are also characterized by a wide spectrum of insecticides and long duration of action. In addition, since Chinese medicine pesticides are natural products, they will naturally metabolize in the environment, participate in energy and material circulation, and will not cause pesticide enrichment, and be safe to the environment, humans and animals, and natural enemies; Chinese medicine pesticides are derived from organisms themselves, including A large number of trace elements and natural growth regulators help to improve the disease resistance of animals and plants, promote the growth of animals and plants, and increase the prevention of pests and diseases<sup>[5]</sup>.
- Experiments have shown that using this principle overcomes the bottleneck that organic agriculture cannot resist pests and diseases and cannot produce high yields in planting organic vegetables. The main features are four aspects: First, increase the minerals rich in various medium and trace elements, promote the secondary metabolism of crops to produce allelochemicals, increase plant stress resistance, disease resistance and product nutrition level and taste. The second is to give full play to the important role of organic carbon in crop high yield, focusing on the input of a large amount of carbon organic fertilizer from agricultural organic residues; the third is to put in the microbial complex bacteria to provide nitrogen for crops by microbial decomposition of organic nitrogen in the soil. The nitrogen-fixing bacteria can effectively ensure the large demand for nitrogen in the crops; the fourth is to adjust the physical properties of the soil and form a good soil structure. Through the above-mentioned special organic cultivation methods, the facilities such as heavy rickets and the agriculture are prone to occur.
- In addition, the experiment also proves that the tea garden adopts three-dimensional planting of arbor and shrub, which can use insects, insects, insects, insects and insects in the biological communities such as animals, plants and microorganisms. The herbaceous plants planted in the tea garden have strong vitality and can inhibit weeds. Growth, no need to use herbicides; use the adsorption of tea and like the characteristics of moderate shading, planting floral, grassy, fruity plants to enhance the fragrance of tea, but also moderately shade the tea trees, creating a suitable healthy ecological environment for tea trees.
- At present, in many places, the use of chemical agents has caused great damage to the agro-ecosystem, and it has also created a rare opportunity for the application of Chinese medicine pesticides in agriculture. For example, due to the continuous expansion of the area of continuous cropping vegetables, the intensification of vegetable production is becoming more and higher. The pests and diseases that endanger the production of vegetables are becoming more and more serious, and the resistance of pests and diseases is becoming stronger and stronger, coupled with unreasonable use. Chemical pesticides and even highly toxic pesticides not only destroy the root system of crops, but also destroy the living environment of beneficial microorganisms in the soil, break the soil balance, cause a vicious circle, and make pest control more and more difficult. In these places, it is urgent to apply Chinese medicine pesticides for green prevention and control.
- Many studies and experiments have proved that the use of fertilizers, pesticides and feeds made from Chinese herbal medicines, microorganisms, etc. not only improves the environment in which the agricultural products are produced, but also guarantees the high quality and high yield of agricultural products. The biological preparations extracted from the multi-flavored Chinese herbal medicines can not only supplement the growth of plants.

Nutritional ingredients and active substances, and can provide plants with comprehensive health care and pest control, can replace the use of chemical pesticides and fertilizers, and gradually improve soil quality, water quality and ecological environment; use fermentation extraction technology to extract Chinese herbal medicines as fertilizer elements. It can not only increase the yield of corn, soybean, rice and wheat, but also effectively improve the quality of food.

- TCM has a long history, and its principles and methods has always influenced the agricultural production and practice in China, and also there have been a lot of typical and good examples. Scientific research shows that the use of fertilizer, pesticides and feed made from Chinese herbal medicine and microorganisms improves the environment of agricultural products, and guarantees their quality and high yield.
- The wide application of TCM agricultural technology system can reduce the use of pesticides, fertilizers, veterinary medicine so as to prevent environmental pollution, improve the efficiency of resource recycling. It also promotes the quality and safety of agricultural products and the development of functional agricultural products, optimizing "big food" pattern of drug and diet.
- Based on the existing ecological environment, production conditions and production experience, TCM agriculture is based on the premise of not changing production methods, increasing production costs and farmers'

burdens, innovating ideas and integrating and applying modern technology, and getting rid of the excessive dependence of modern agriculture on chemical pesticides and fertilizers. The dilemma leads the transformation and development of modern agriculture to improve quality, increase production and increase efficiency, and achieve the goal of "high quality, high yield and high efficiency" in modern agriculture.

- The core technology of TCM agriculture is to solve the healthy growth of plants (animals and humans) by applying traditional Chinese medicine ideas and traditional Chinese medicine techniques and products according to the needs of biological health growth (ecological environment, balanced nutrition and bioenergy). Emphasis on maintaining the healthy growth of organisms, it is necessary to follow the principle of "preventing prevention, combining prevention and treatment, treating both the symptoms and the root causes, and whole-course health care"; at the same time, it is necessary to grow healthy plants (animals, human bodies) and create a suitable ecological environment (water, soil, gas, Sunlight, magnetic field), to ensure the healthy growth of biological growth and balanced nutrient supply; in addition to follow the rules of natural life, "harmony, harmonious symbiosis", to solve the pests and diseases in the process of biological health, to ensure the healthy growth of the organism and the balance of natural ecological cycle [4-7].

**Table 2:** Applications of TCM agriculture

Roles of TCM agriculture	Applications
agricultural medicine	solve the pests and diseases, prevent environmental pollution
Feed and fertilizer	Provide nutrients including trace elements and protect the health of animals and plants



**Fig 1:** The International TCM Agriculture Union was found in 2018.

### Suggestion

- TCM agriculture requires the integration of traditional science and modern technology.
- First of all, we need to speed up the formulation of industrial development programs and industrial support policies. And, efforts are made to implement strategic programs and measures in response to the challenges and problems in the development of TCM agriculture.
- Second, we will do more researches on key areas and action mechanisms. Multi-subject should be integrated in the development of TCM agriculture.
- Third, we will promote the research and development of products to meet the market demands and the full industry chain. For example, we need to carry out TCM fertilizers instead of chemical fertilizers, and vigorously develop Chinese herbal medicines under the forest. In the absence of occupation of cultivated land, the supply of

Chinese herbal medicines will be greatly increased, TCM fertilizers will be produced according to specific formulas, and facilities and vegetables and fruits will be widely used for large-scale application. We must promote the clean production of agriculture through the effective transformation of agro-ecological transformation of "Traditional Chinese Medicine Agriculture", replace chemical fertilizers and pesticides with new fertilizers and agricultural veterinary drugs, promote the zero growth of chemical fertilizers and pesticides, and promote the efficiency of agricultural savings; TCM agriculture "a high-efficiency ecological cycle breeding model to accelerate the utilization of livestock manure, straw and other agricultural waste resources.

- Fourth, efforts are made to meet the social needs of health care. We need to extend the "TCM agriculture" industrial chain, form an industrial cluster, and establish a TCM agriculture national pilot zone to form a variety of typical models that can be replicated and promoted. Establish an international cooperation platform and establish an international alliance of Chinese medicine agricultural science and technology innovation and industrial development as soon as possible. A good example is shown in Figure 1, the photo taken when The International TCM Agriculture Union was found in 2018.
- Fifth, attention should be paid to the coordination and development of science popularization, science and education and scientific research so as to improve the social cognition of TCM agriculture and create a good development atmosphere. we need to cooperate with Chinese and international medical institutions to establish

a medical industry fund to introduce suitable medical technology into China and introduce Chinese medicine technology and Chinese medicine agricultural methods into the whole world.

- Sixth, practitioners of TCM agriculture need to establish a union to achieve resource sharing, complement each other's advantages, and reduce costs and share risks.

## References

1. Li X, Chen Y, Lai Y, Yang Q, Hu H, Wang Y. Sustainable Utilization of Traditional Chinese Medicine Resources: Systematic Evaluation on Different Production Modes. *Evidence-based Complementary and Alternative Medicine: eCAM*. 2015; 218901.
2. Chen SL, Yu H, Luo HM, Wu Q, Li CF, Steinmetz A. Conservation and sustainable use of medicinal plants: problems, progress, and prospects. *Chinese Medicine*. 2016; 11:37.
3. SL Chen, GQ Su, JQ Zou, LF Huang, BL Guo, PG Xiao. The sustainable development framework of national Chinese medicine resources, *Zhongguo Zhongyao Zazhi*. 2005; 30(15):1141-1146.
4. X Li, J Song, J Wei, Z Hu, C Xie, G Luo. Natural Fostering in *Fritillaria cirrhosa*: integrating herbal medicine production with biodiversity conservation, *Acta Pharmaceutica Sinica B*. 2012; 2(1):77–82.
5. WY Wu, JJ Hou, HL Long, WZ Yang, J Liang, DA Guo. TCM-based new drug discovery and development in China, *Chinese Journal of Natural Medicines*. 2014; 12(4):241–250.
6. M HWu, W Zhang, P Guo, ZZ Zhao. Identification of seven Zingiberaceous species based on comparative anatomy of microscopic characteristics of seeds, *Chinese Medicine*. 2014; 9(1):10-16.
7. N Zhao-Seiler. Sustainability of Chinese medicinal herbs: a discussion, *Journal of Chinese Medicine*. 2013; 101:52-56.