

# Research on the Industrialization Path of Chinese Southern Medicine

Li Zhou<sup>1</sup>, Yanhong Ma<sup>2</sup>, Ling Shao<sup>3</sup>, and Wenhua Liu<sup>2</sup>

<sup>1</sup> School of Economics and Management, Zhaoqing University, Zhaoqing, China

<sup>2</sup> School of Life Science, Zhaoqing University, Zhaoqing, China

<sup>3</sup> School of Food Science and Pharmaceutical Engineering, Zhaoqing University, Zhaoqing, China

Email: 13322977@163.com, {Mayanhong, wenhualiu}@hotmail.com, 358593590@qq.com

**Abstract**—Chinese southern medicine has a long planting history. For small-scale peasant economy and decentralized management have existed for a long time, medicinal materials vary differently and representative varieties and leading enterprises are short of influence, which has not formed industrialized development of southern medicine. This paper, through deep analysis on southern medicine, teases out problems existing in its industrialized development and puts forward the industrialized development path for southern medicine under the perspective of rural revitalization by constructing a panoramic industry chain. In upstream, realize large-scale planting with the mode of planting base (association) + small farmers. In midstream, strengthen the quality monitoring of medicinal materials and solve problems about quality intractable to control. In downstream, extend the industry chain and value chain of southern medicine through the mode of branded pharmaceutical company + planting base (association) + park. Promote the interest linkage network of counties, towns and villages, and combine the construction of “two parks” (industrial park and science park) of southern medicine with the implementation of rural revitalization strategy so as to integrate southern medicine industry with technology and market as well as increasing farmers' income.

**Index Terms**—rural revitalization, southern medicine, industrialization, path choice

## I. INTRODUCTION

Traditional Chinese medicine, according to growth area, is divided into northern and southern medicines. Marketization of northern medicine is relatively mature with a batch of famous varieties and representative enterprises like Tongrentang. By contrast, southern medicine exists with small-scale peasant economy and decentralized management. In traditional Chinese herbal medicine market, the good and bad are intermingled. Impure variety and excessive heavy metals also exist. Although southern medicine is normatively produced via GAP, problems above make it devoid of price advantage.

Farmers in southern China, making use of regional resource advantage, actively develop southern medicine industry with *Morinda officinalis*, *Fructus Citri*

*Sarcodactylis*, cinnamon and *Polygonum multiflorum* as the representatives, which has become one of the leading industries of local new agriculture. However, southern medicine has been under small-scale peasant economy and decentralized management for long, so the good and bad are intermingled and representative varieties and leading enterprises are devoid of influence, for which southern medicinal economy could not move towards standardization and industrialization. Difficult problems such as how to insist quality first and benefit prior in the light of high-quality development requirement, how to build up agricultural industrial, manufacturing and management systems and how to promote the large-scale, intensive, optimized, characterized and branding development of southern medicine industry, are waiting to be solved. This paper analyzes the development situation of southern medicine as well as the problems existed, and puts forward the direction and path for its development, which has positive significance for optimizing agricultural industrial structure and boosting rural industrial revitalization.

## II. INDUSTRIALIZED DEVELOPMENT SITUATION OF CHINESE SOUTHERN MEDICINE

In rural area along the Xijiang River drainage area, for regional advantage, resource superiority and unique ecological environment, there are abundant traditional Chinese herbal medicines of high quality, including large-scale cultivation of authentic Chinese herbal medicines such as *Morinda officinalis*, *Polygonum multiflorum*, *Fructus Citri*, *Sarcodactylis* and cinnamon as well as small and medium-sized cultivation of characteristic varieties like Gorgon fruit, *hylocereus undatus*, *pachyrhizua angulatus*, *gardenia jasminoides*, *Dendrobium officinale*, *Moringa oleifera*, *Anoectochilus roxburghii* and *Begonia fimbristipula* Hance [1]-[3]. At present, there are two main planting patterns of southern medicine: peasant retailing farming and planting production led by local agricultural cooperative and representative enterprises. Planting industry of southern medicine has developed originally from peasant retailing operation to the two-level cooperation mode of “cooperative + grower”, and then to the multi-level cooperation mode of “company + cooperative + base + farmer”. Meanwhile, a new cooperation mode of

Manuscript received September 11, 2019; revised December 13, 2019.

“company + scientific research institution + cooperative + base + grower + planting risk funds” has been created by a large cooperative represented by some branded enterprises and cooperatives specialized in technology promotion.

Traditional Chinese herbal medicines usually can be sold and used after a series of roughing and processing while most peasant households are not equipped with relevant processing field and facility. Therefore, there are two main urban trading modes of raw herbal medicinal materials. One is farmers' independent production instead of fixed sale to local cooperatives, Chinese medicinal herb processing enterprises and other pharmacopologists, the other is that they sign up to participate in the cooperative, that is to say, their products are exclusively purchased by the cooperative and are sold to all major traditional Chinese herbal medicine markets, pharmaceutical companies, healthcare enterprises and chain pharmacy stores after preliminary processing by enterprise or cooperative. A traditional Chinese medicine market specialized in fresh product transaction is on the rise, ranging from the fresh southern medicinal materials which are planted and sold independently by peasants before small retailers' door-to-door purchase and transaction in the market later, to the products preliminarily processed by local cooperatives.

### III. PROBLEMS FACING THE INDUSTRIALIZED DEVELOPMENT OF CHINESE SOUTHERN MEDICINE

#### A. Lack of Large-scale Planting and Quality Control

Business subject of new southern medicine has not fully developed, which has an impact on the scale and efficiency of land circulation for cultivation of southern medicine. Although the government actively advocates setting up professional agricultural cooperatives, lots of cooperatives are difficult to keep running because of poor management or system problems. Planting pattern still takes peasant independent production as priority and a large proportion of peasants have not participated in cooperatives yet. Therefore, their GAP standardized planting level remains low and they are short of systematical and professional technical guidance and training. Farmers usually reclaim part of mountain land for planting, which, to some extent, results in production-supply-marketing dissociation and wasting of resources owing to low efficiency, poor controllability, primitive farming methods, great blindness as well as the lack of normative management and reasonable planting plan. Moreover, several kinds of medicinal materials are perennial plant which has long growth cycle and requires riskier investment, causing that annual planting area and output of medicinal materials easily affected by the price, may have relatively big fluctuation. Meanwhile, growers do not pay enough attention to normative planting of medicinal materials. Their cultivation is short of scientization, industrialization and standardization and several links included such as seed breeding, planting, fertilization, harvest, processing, storage and circulation are carried out without strict rules and normalization.

Besides, in large-scale planting area outside the base, germplasm resources are different in source, the quality of medicinal material is on various levels and intraspecific variation and degeneration exist concurrently. Therefore, for the quality of medicinal materials, the good and bad are intermingled, which has become the “bottleneck” in the innovative development of local southern medicine industry.

In addition, soil erosion and soil fertility decline brought about by planting of herbal medicine also deserve serious attention. As for four main medicinal materials, cinnamon *Polygonum multiflorum* and *Fructus Citri Sarcodactylis* have loose requirements for planted land and environment while *Morinda officinalis* demands higher environmental elements such as the degree of loose soil, temperature and light, leading to more serious environmental and soil problems after cultivation. To take *Morinda officinalis* as an example, it is usually on the mountain land with a certain gradient. Its cultivation and excavation must go through the process of full reclamation. After excavation, it can be continuously grown after a period of naturally purifying. Slope planting is difficult to manage in detail, and production is often difficult to guarantee. Meanwhile, soil erosion brought about by planting *Morinda officinalis*, has become severe. Although the government actively guides farmers to trench drainage channels and to interplant other crops such as cinnamon, pine trees and chestnut trees so as to mitigate soil erosion, it still has not been improved significantly. *Morinda officinalis* has fluctuations in market price. Its cultivation and excavation easily cause soil erosion and land fertility decline, destroy surrounding rivers, irrigation and water conservancy and weaken farmers' positivity. These factors all affect the planting area of *Morinda officinalis* directly and indirectly. Moreover, water and soil pollution in Xijiang River drainage area leads to excessive heavy metals in medicinal materials and pesticide residue after abuse, which is waiting to be solved in southern medicine plantation and production.

#### B. Deficiency of Large Circulation Market

In most of cooperative's trading modes, pharmaceutical and health care companies submit orders in which acceptance criteria of medicinal materials is customized by purchasing agent, usually equal or higher than Chinese pharmacopoeia standard. When harvest time comes, companies will come to inspect and purchase in person according to orders and commercial tenants from major herbal medicine markets also come to buy. By contrast, medicinal materials from farmers' decentralized plantation are sold and circulated without quality inspection and detection of heavy metals and pesticide residue [4]-[7]. For example, in trading market of Deqing County, supplies of *Morinda officinalis* are mainly from Deqing County and nearby cities and counties. For farmers market their own products, source and quality of *Morinda officinalis* is hard to unify. Purchasing agents all over the country usually decide the price based on their experience and growing year of medicinal materials. For the lack of third-party variety identification and

inspection organization, problems such as whether the content of active ingredients of medicinal materials meets the standards of pharmacopoeia and whether the content of aspergillus flavus and heavy metals exceeds the standard are difficult to deal with. Besides, both peasants' retail and small cooperatives are short of refrigerated storage facility for corresponding medicinal materials. During the course of processing, storage and transaction, materials tend to mold and deteriorate in rainy days, which, in addition to bringing economic losses, also directly affect the safety of the use of medicinal materials.

### C. Low Added Value

Traditional Chinese medicine enterprises and agricultural cooperatives focus on the management of Chinese herbal medicine cultivation and simple processing. The existing processing methods are limited to the preliminary processing such as washing, grading, drying, and slicing. Owing to few intensive processing, large scale and single product structure, most of their products are Chinese herbal pieces, food and health care products. The direct sale of such preliminary products has low added value and short industrial chain, which, to a certain extent, has affected the further development of southern medicine industry [8]-[10]. In addition, although traditional Chinese medicine enterprises and agricultural cooperatives have certain ability to cultivate and produce herbal medicine, their research and development is still at a lower level and their technological innovation and product development capabilities are relatively weak. Disconnection between planting production and R&D is also one of the reasons for the lack of intensive processing products. Rough processed food and health care product take up a large part of the market and people usually use and consume in the form of Morinda wine, Polygonum multiflorum wine, soup, Fructus Citri Sarcodactylis preserved fruit and cinnamon oil, to some extent, leading to the waste of local southern medicine resources.

## IV. INDUSTRIALIZED DEVELOPMENT PATH OF CHINESE SOUTHERN MEDICINE

### A. *Revitalization of Southern Medicine Industry Needs to Change the Original Development Mode, Enrich the Development Momentum of Southern Medicine Industry and Tap the Potential of Industrialization to Realize the Effective Connection between Production and Market, and to Realize the Coordinated and Innovative Development of Southern Medicine Panoramic Industrial Chain*

In upstream of industrial chain, tackle the problem about selling hard for peasants by the mode of planting base (association) + small farmers so as to realize large-scale planting. Due to scattered land, insufficient scientific and technological support and lack of funds, the market competitiveness of southern medicine has been relatively weak. In order to promote the modernization of southern medicine, operation system and mechanism must be innovated, that is to say, business subjects like

southern medicine cooperatives and leading enterprises should be regarded as the significant platform which provides all-around mutual cooperation of production, supply and marketing as well as credit for the organic connection between growers and industrialized development of southern medicine. Encourage new agricultural operative subjects to hand in hand with small farmers, link the policy support to the number of small farmers driven by business subjects and incline towards financial funds, special funds and financial credit. Fully implement tax preference policy and preferential water and electricity policy and strengthen the support of new agricultural operative subjects. Foster and develop key agricultural leading enterprises, farmers' professional cooperatives and family farms.

In midstream of industrial chain, set up a third-party professional institution, strengthen the quality monitoring of medicinal materials and solve problems about quality intractable to control, in order to maximize the safety in the medicinal material quality and circulation. Specialized institutions or enterprises for medicine analysis, inspection and quarantine enter the medicinal material trading market, participate in the quality control and rating of medicinal materials, and help the sustainable and healthy development of southern medicine. In addition, the controlled atmosphere storage facilities and sites of the corresponding medicinal materials should be added to the cooperatives and the trading market so as to ensure the quality of the medicinal materials during storage, transaction and circulation, to reduce losses, and to ensure the quality and safety while using medicinal materials to the utmost extent [11], [12].

In downstream of industrial chain, through the mode of branded pharmaceutical company + planting base (association) + park, extend industrial chain and value chain of southern medicine and improve the technological content of the industrial chain. Deepen the cultivation of southern medicine brand and avoid hurting farmers with products of lower price in quantity. Accelerate the pace of brand creation and increase the added value of characteristic agricultural products by guiding new agricultural operative subjects to improve the quality of products. Actively create national geographical indicative agricultural products. Combine the construction of southern medicine industrial park and the implementation of rural revitalization strategy to build a provincial-level modern agricultural industrial park. Establish the international southern medicine health product research and development center as well as the quality standards and planting standards of southern medicine, and promote the intensive processing of southern medicine, in order to make the advantageous southern medicine industry better and stronger. Southern medicine which is regarded as new characteristic agriculture will develop into a new growth point of southern medicine economy. Well-known pharmaceutical companies should be introduced to participate in the construction of the southern medicinal demonstration zone, and a Chinese medicine extraction base is ought to be built. On this basis, the construction plan of the modern southern medicine experimental zone

should be improved gradually, and the investment attraction of well-known pharmaceutical companies as a breakthrough, should be continuously strengthened, which is aimed at focusing on tapping potential and filling shortcomings in planting, processing and circulation.

*B. Build a Three-level Interest Linkage Network of Counties, Towns and Villages, and Combine the Construction of "Two Parks" of Southern Medicine with the Implementation of Rural Revitalization Strategy to Increase Farmers' Income*

Establish operation system and mechanism jointly such as "company + board of directors + peasant", "company + cooperative + peasant" and "company + planting base + peasant" with the thought of industrial drive, land transfer and financial support, relying on the southern medicine cooperatives and leading enterprises to drive small growers. New type of enterprise-bank relationship and enterprise-agriculture relationship based on win-win cooperation should be established by improving interest linkage mechanisms for companies and peasants such as order drive, profit return and shareholding cooperation, with bases, cooperatives and southern medicine leading enterprises as orientation. Under the operation of the new mechanism, a group of leading enterprises specialized in southern medicine will be developed rapidly to promote agricultural efficiency and increase farmers' income.

Through the three-level interest linkage network of counties, towns and villages, accelerate the planning and construction progress of all projects and bases in the southern medicine industry. Focusing on the cultivation, processing, warehousing logistics and eco-tourism of southern medicine, create a "Southern Medicine Experimental Zone Planting Belt" and by demonstration, speed up the development of southern medicine industry in the whole city. Investment attraction should be continuously strengthened and high-quality southern medicine industrial projects should be introduced positively. Enhance the connection and cooperation with large pharmaceutical companies and extend the industrial chain and value chain of southern medicine industry so as to promote the development of the southern medicine industry as well as the rapid development of various economic and social undertakings.

*C. Support Leading Enterprises and Create Famous Brands. Focus on Supporting a Group of Leading Enterprises with Good Economic Returns, Excellent Product Quality and Strong Sense of Social Responsibility to Drive the Development of Southern Medicine Industrialization in Surrounding Areas*

Take large-scale and branding production and management as the development strategy. Large-scale production is the inherent requirement of southern medicine industrialization. Decentralized operation of farmer household and the independent handling of southern medicine enterprises have not adapted to the requirements of the new stage of agricultural development. To develop southern medicine industry, the regional boundaries must be broken, the scale advantage

must be broken through, and a way of cross-regional distribution, integrated operation and cooperative production must be paved. Professional cooperatives can provide farmers with high-quality germplasm resources and professional training services. They can strictly control all aspects from medicinal planting to harvesting and processing, continuously improve the quality of medicinal materials as well as scientific and technological content of products, and promote the industrialization of southern medicine. Moreover, enthusiasm of farmers to carry out planting and producing activities should be improved through strategies introduced by enterprises (cooperatives) or self-organized like insurance and contracted guaranteed purchase to deal with natural disasters such as typhoons, pests and diseases.

*D. University-enterprise Scientific Research Linkage Assists in Technical Research on Intensive Processing*

Put science and technology innovation and technology services in a prominent position, give full play to the innovation initiative of universities and research institutes, and jointly study intensive processing projects for products so as to promote the innovative industry development of traditional Chinese medicine. Accelerate the construction of a scientific and technological innovation system for the entire industrial chain of southern medicine, and deepen the transformation of relevant scientific research achievements and promote the application reform, in order to form standard governance, pricing power as well as product supervision and testing. Organize universities, research institutes and famous enterprises to establish a collaborative innovation center for research and development of southern medicine for solving the problem of intensive processing of products, fully tapping the local favorable medicinal resources, and expanding the development and application of southern medicine products in various fields such as medical and health, food additives, flavors and fragrances, cosmetics and chemicals, which improve the added value of medicinal materials and boost the comprehensive development of the high-level, high-quality and high-yield industries southern medicine industry.

*E. Construct an Integrated Development System of the First, Second and Third Industries to Increase the Revenue of the Entire Industrial Chain of Southern Medicine*

Combining the comparative advantages of natural endowments such as climate and soil, supply-side structural reform of the southern medicine industry should be further promoted to better adapt to the changing consumption structure, to improve the quality and efficiency of the southern medicine supply system, to expand the high-quality incremental supply and create new demand. While expanding the planting and producing capacity of southern medicine, an integrated development system of the first, second and third industries should be built up to form a development mode of "planting + processing + leisure and health care tourism", which, on the one hand, promotes the full

coverage of southern medicine industry from the field to the Chinese medicine market, realizing the vertical extension of industry chain and broadening the value-added space, on the other hand, under the premise of ensuring southern medicine production, realizes horizontal extension of leisure sightseeing, planting and harvesting experience, and health care tourism, enriching the non-production function and increasing the revenue of entire industrial chain of southern medicine.

With promoting the integrated development of the first, second and third industries as the development concept, starting from leisure agriculture projects, integrate resources such as housing, land and manpower and reasonably distribute functions produced by the combination of “two parks” of southern medicine and three industries above including science popularization, culture, recreation, leisure, sightseeing, health care, care for the aged as well as massive health so as to actively promote the integration of ecology, agriculture, culture and tourism. Take “two parks” of southern medicine as the significant medium and starting point and by depending on this medium, encourage factors of production and advantageous industries to concentrate on the parks and propel the industrialized and multi-functionalized operation of southern medicine.

## V. SUMMARY

First and foremost, for the industrialized development of southern medicine under the perspective of rural revitalization, scientific planning, reasonable distribution and characteristic features are required. According to local environment characteristics and resource types, highlight regional characteristics and decide key development areas with scientific planning, following rules of regionalized distribution, large-scale planting and specialized production. Second, leading enterprises should be developed. To enhance the overall efficiency of southern medicine, its industrial chain should be extended, intensive processing should be developed and added value should be increased. By fully stimulating its endogenous power, and activating the subjects, elements and the market, enhance the ability of industrial innovation and accelerate the development of modern southern medicine industry, in order to improve the creativity, competitiveness and the full industrial chain productivity of southern medicine. At the same time, through establishing the interest linkage mechanism of benefit and risk sharing, three links of production, processing and marketing of southern medicine are organically connected, which enables farmers to share profits in processing, circulation and other links, and increases their employment and income.

## REFERENCES

- [1] Y. Ma, L. Zhou, L. Shao, and W. Liu, “Problems and countermeasures of innovative development of Zhaoqing southern medicine industry,” *Chinese Journal of Experimental Medical Formulae*, no. 8, pp. 164-171, Apr. 2019.
- [2] Y. Tan and Z. Chen, “Study on distributive areas of medicinal resources in south China,” *Journal of Anhui Agricultural Sciences*, vol. 35, no. 25, pp. 7869-7870, Sept. 2007.

- [3] Chinese Pharmacopoeia Commission, *Pharmacopoeia of the People's Republic of China*, Beijing, CN: China Medical Science Press, 2015, pp. 175-177.
- [4] H. He, Z. C. Deng, and H. Jin, “An efficient micropropagation system for *Morinda officinalis* how. (Rubiaceae), an endangered medicinal plant,” *Journal of Agricultural Science & Technology*, vol. 17, no. 6, pp. 1609-1618, Nov. 2015.
- [5] Q. Hao, L. Kang, S. Zhu, Y. Yu, M. Hu, and F. Ma, “Rapidly identify oligosaccharides in *Morinda officinalis* by UPLC-Q-TOF-MS-E,” *China Journal of Chinese Materia Medica*, vol. 43, no. 6, pp. 1201-1208, Mar. 2018.
- [6] L. Chen, Y. Zhang, L. Jin, R. Gao, J. Bao, and B. Cui, “Preparation, characterization and antioxidant activity of polysaccharide from *Fallopia multiflora* (Thunb.) Harald,” *International Journal of Biological Macromolecules*, vol. 108, pp. 259-262, Dec. 2017.
- [7] S. Song, Y. Tong, T. Feng, J. Zhu, Y. Wang, and M. Sun, “Multi-analysis of odorous compounds in finger Citron (*Citrus medica* L. var. *sarcodactylis* swingle) and certification of key compounds,” *Food Science*, vol. 38, no. 24, pp. 94-100, Dec. 2017.
- [8] Z. Lou, J. Chen, F. Yu, H. Wang, X. Kou, and C. Ma, “The antioxidant, antibacterial, antibiofilm activity of essential oil from *Citrus medica* L. var. *sarcodactylis* and its nanoemulsion,” *Food Science and Technology*, vol. 80, pp. 371-377, Feb. 2017.
- [9] M. Y. Song, S. Y. Kang, A. Kang, J. H. Hwang, Y. K. Park, and H. W. Jung, “*Cinnamomum cassia* prevents high-fat diet-induced obesity in mice through the increase of muscle energy,” *American Journal of Chinese Medicine*, vol. 45, no. 5, pp. 1-15, June 2017.
- [10] W. Chang, F. Cheng, S. Wang, S. Chou, and Y. Shih, “*Cinnamomum cassia* essential oil and its major constituent cinnamaldehyde induced cell cycle arrest and apoptosis in human oral squamous cell carcinoma HSC-3 cells,” *Environmental Toxicology*, vol. 32, no. 2, pp. 456-468, Feb. 2007.
- [11] B. Lou and H. Xu, “Research and development strategy of standardized planting of southern medicine,” *Lishizhen Medicine and Materia Medica Research*, vol. 22, no. 8, pp. 1999-2000, Aug. 2011.
- [12] M. Huang, Y. Pang, Q. Yang, F. Yu, and Z. Chen, “Study on the GAP base construction situation and industry analysis of Chinese medicine in southern China,” *Research and Practice on Chinese Medicines*, vol. 28, no. 5, pp. 8-12, Dec. 2014.



**Li Zhou** was born in Hunan Province, China on Dec. 19th, 1968, got the Doctor degree in Business Administration from City University of Macao in 2009, Professor Zhou is in School of Economics and Management of Zhaoqing University. Her research interests are in the theoretical and experimental study of teaching methodology, and entrepreneurship education etc.



**Yan-hong Ma** was born on November 20th, 1989. She received her master's degree in pharmacy from School of Pharmaceutical Sciences, Sun Yat-sen University in 2016. Her main research area is natural pharmaceutical chemistry. She is now working in School of Life Sciences, Zhaoqing University, Junior research fellow. She has published six papers as the first author.



**Ling Shao** was born in Zhaoqing, Guangdong Province, China on Sep. 10th, 1973. She got the master degree of Botany in South China Normal University in Jul. 2001. Professor Shao is in School of Food Science and Pharmaceutical Engineering of Zhaoqing University. Shao is Professor of biology, Guangdong Province, China, from Mar. 2011 till now. Prof Shao studies on the protection and utilization of South China germplasm

resources. She published more than 30 papers on Functional Plant Biology, Journal of Integrative Plant Biology, Pakistan Journal of Botany, and so on. Prof Shao is executive director of the Guangdong Institute of Plant Physiology.



**Wenhua Liu** was born in Hunan Province, China on Jan. 25th, 1967, and he earned his doctoral degree in biochemistry and molecular biology from Sun Yat-Sen University of China in 2002. He did postdoctoral research in neuroscience in the State University of New York at Buffalo between 2002 to 2011. Dr. Liu was employed as a professor in Zhaoqing University of China since 2011. Dr. Liu is a member of the academic committee of

Zhaoqing University. Dr. Liu has published more than 40 papers in famous journals, and he earned the title of excellent teacher of Zhaoqing city in 2015.