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# Research on Development Strategy of Industry of Edible Beans in West China

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**Abstract** The West China is main producing region and advantageous producing region of edible beans. Developing industry of edible beans in West China has prominent regional advantage, production advantage, quality advantage, market advantage, and price advantage. We analyze the problems existing in the process of development of industry of edible beans in West China as follows: the cognition is insufficient; fund for scientific research is short; the basic research is weak; the planting is sparse; the industrialization is not sound; the information is restricted. Corresponding suggestions are put forward in this paper as follows, in order to ensure the healthy development of industry of edible beans in China: formulate preferential policies; establish high-quality edible producing bases; promote the brand effect; pay attention to post – production development; develop the idea of new agricultural planting and cultivation.

**Key words** Edible beans, Industry, Brand effect, China

Edible beans include green beans, black beans, cowpeas, beans, kidney beans, peas, red beans, rice beans, climbing beans, lentils, chickpeas, grass peas and other small beans<sup>[1]</sup>, which are mainly in China's Inner Mongolia, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, Tibet, Yunnan, Sichuan, Chongqing, Guizhou, Guangxi and other western provinces. The cultivation of edible beans in western regions has a long history, with multifarious varieties, high-quality product resources and traditional production advantages. In the process of long-term production, most of the main producing areas have formed the independent production system of crop rotation, therefore, they can answer the requirements of organic products in general in terms of environment in the origin, production technology, and so on, with the potential and advantages of developing edible beans<sup>[2-3]</sup>. Meanwhile, as people's consciousness of health care intensify, due to the unique protein content and medicinal value, edible beans are popular with people. In recent years, by virtue of the good opportunity of talent, technology, and capital brought by Development of the West Regions, the western provinces take advantage of the unique local agricultural resources (natural resources, economic resources and social resources), actively introduce high technology, tap the potential of nutrition and health protection of edible beans, focus on the market demand, vigorously develop production of organic edible beans, use unique non-pollution and organic products to participate in market competition, and win a broad market, thus the industry of edible beans now has become the characteristic industry with the greatest competitive advantage and developmental potential in the process of agricultural and rural economic devel-

opment in western regions<sup>[5-7]</sup>.

At present, China's agriculture has entered a new historical stage of development. Adjusting and optimizing the structure, promoting industrial upgrading, improving agricultural benefit, increasing the farmers' income and improving the ecological environment have become an important task of developing agriculture and rural economy in the new stage. With the acceleration of internationalization process of agricultural product markets, the problems of adjustment of agricultural industrial structure also become increasingly prominent. In the process of adjustment of agricultural industrial structure, the production of edible bean crops captures prominent attention, and the competitiveness of such industry begins to loom. Therefore, in the process of implementing adjustment of structure of planting industry and the strategy of Development of the West Regions, the western provinces should actively conduct profound research on the cropping system in rural areas, take advantage of zoning results of agricultural resources, take actions that suit local circumstances to develop the production of edible bean crops, and take production of edible bean crops as the breakthrough point of invigorating the rural economy and accelerating the pace of casting off poverty and setting out on a road to prosperity for farmers in rural areas.

## 1 Resources advantage of developing edible beans in West China

**1.1 Regional advantage** North China, Northwest China and other places, surrounded by mountains, are far away from the sea, with special geographical location. It is with long-term drought, scarce rain, frequent drought, severe soil erosion, and harsh environmental conditions. However, the edible bean can withstand drought and barrenness, with strong resistance, which adapts to the autumn climate characteristic that in the ar-

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id areas, the heat and the rain is in the same season. These areas can fully take advantage of the resources of light, heat, water, and soil in the arid areas, with small variation of inter-annual yield and stable productivity<sup>[8]</sup>. In addition, the population density in these areas is small, with relatively more arable land. According to the survey, the farmland area per capita in northwest Loess Plateau is 0.24 hm<sup>2</sup>, three times the national average; the grassland area per capita in northwest Loess Plateau is 0.34 hm<sup>2</sup>, higher than the national average; in Loess Plateau, the loess is deep, and rainfall infiltration and storage capability is strong, that is, 2 m soil can store water as high as 450–500 mm, and the infiltration capacity is three times higher than that of the red soil, which creates favorable conditions for growth and development of plants, suitable for the cultivation of edible beans.

**1.2 Production advantage** The edible beans have long played an important part in China's food composition and people's life, and especially in poor arid areas, beans are the main source of protein. Edible beans have short growth period and wide range of suitability, and they form special adaptation to western ecological environment in the process of long-term cultivation and evolution. Edible beans can also effectively reduce soil erosion. In terms of reducing soil erosion, the land grown with black beans has the most significant benefits of reducing sand, with the average erosion of only 619 t/km<sup>2</sup>, 90.2% less than that of the bare land<sup>[9]</sup>. Edible bean root system also has the nodule, the good crop prior to other crops, which can fixate the free nitrogen in the air. Meanwhile, the content of seed, crushed seed, pod shuck, and leaf protein in edible beans is relatively high. The fat is rich, and the stems and leaves are soft, that is, the edible beans are easy to digest, with high return rate of feed, which provide high-quality feed for developing the western animal husbandry industry; as the traditional food crop in western regions, these characteristics of edible bean determine its important status in the structural adjustment of planting industry, namely the primary crop.

**1.3 Quality advantage** The nutrition of edible beans is rich, not only the traditional food for the western people, but also the treasure with value of health care. As people's health needs and diet structure are improved, as the new food resources for medical care and eating, edible beans play an important role in the modern healthy food. The protein content of edible bean is 1 to 2 times higher than that of the cereal, and it is rich in amino acids, with "high score of chemistry". More over, the edible beans, rich in nucleic acid, carotenoids, dietary fiber, vitamins B, C, E, and so on, can be widely used as the milk substitutes and additives in food industry.

**1.4 Market advantage** China plays an important role in the international trade of edible beans. According to statistics, from 1950 to 2001, nearly 50 years, China's total export volume of beans was 1 599.97 × 10<sup>4</sup> t, the export volume increasing year by year. The export volume in the year 1994 was the highest, namely 167.55 × 10<sup>4</sup> t. The export volume in the 1950s, 1960s and 1970s was below 100 × 10<sup>4</sup> t (89.27 × 10<sup>4</sup>, 94.84 × 10<sup>4</sup>, and 89.48 × 10<sup>4</sup> t respectively). In the 1980s, the export vol-

ume increased to 221.21 × 10<sup>4</sup> t, and in the 1990s, the export volume increased to 1 105.07 × 10<sup>4</sup> t. In the year 2001, the export volume of edible beans in China was 73.01 × 10<sup>4</sup> t, with earning of foreign exchange of 285.93 million dollars<sup>[2]</sup>.

**1.5 Price advantage** The average export price of lentils, fava beans, red beans, green beans, peas, kidney beans and so on, was 568.5 USD/t, while the average export price of bulk crops, such as soybeans, rice, wheat, corn and so on, was 293.4 USD/t (Table 1). In other words, exporting 1 tons of edible beans is equivalent to exporting 2 tons of bulk crops. With the social development and scientific progress, people's overall living standards are improved significantly, and people begin to pay attention to nutrition of food consumption. On one hand, a food consumption structure taking beans as vogue has sprung up, thereby increasing the consumption of edible beans; on the other hand, the planting area of edible beans in the world is relatively small, the total output is limited, and there are regional and labor-intensive characteristics of production of edible beans, the edible beans with the advantage of price will in short supply in a very long time.

**Table 1 The grain export price of China in 2007** USD/t

Edible beans		Staple crop	
Varieties	Export unit price	Varieties	Export unit price
Lentil	474.7	Soy bean	430.5
Fava	434.6	Rice	359.5
Small red bean	603.0	Wheat	205.8
Mung bean	732.0	Maize	177.8
Pea	545.8		
Kidney bean	620.8		

## 2 The problems existing in the process of development of industry of edible beans in West China

**2.1 The cognition is insufficient** In terms of formulating the policies of crop production, the state pays one-sided attention to the production of grain crops, such as wheat, rice, corn and so on, and regardless of ecological and economic laws for a period of time, fails to act according to circumstances to guide various kinds of grains, and edible beans, and restricts the production area, thereby making the majority of grassroots-cadres in rural areas, agricultural technicians and farmers take edible beans dispensable minor crops, planted in sporadic land. In addition, the management is extensive, the yield is not high, and the commodity rate is relatively low. To change this "traditional" concept, eliminating the bias toward edible beans still needs a long time.

**2.2 Fund for scientific research is short** The conditions in the western regions are backward, and the improvement of varieties of edible beans is devoid of funds. In addition, the research is spontaneous and sporadic, lacking organizing and planning, and the research team has not yet taken shape. There are few scientists, and agronomists who are engaged in the research on the system of edible beans. As against the cereal crops, and crops used as the raw materials for industry, in

terms of basic research, the state and the region offer insufficient funds for scientific research on edible beans.

### 2.3 The basic research is weak and the planting is sparse

The basic research of edible beans is weak, and the hereditary law of main economic property of most of the varieties of edible beans is not clear. The potential of resources cannot be fully tapped, therefore, the improvement work of varieties is quite limited. Although the regional characteristic of China's edible beans is prominent, conducive to the formation of industrial belt of edible beans, but the scale is limited. Farmers' planting area of edible beans in all regions is scattered, and the amount of goods is not so centralized, difficult to form the pattern of regional cultivation, and large-scale production, not conducive to the industrialized production of edible beans.

**2.4 The industrialization system is not sound** The edible bean industry is an emerging industry, with imperfect market system and insufficient publicity. It lacks information exchange among research, production, and sales. The production is separate from sales, with great blindness of production, instable market price, and slow process of industrialization, limiting the exertion of economic benefit. In the context of internationalization and marketization with drastic competition, this situation will make the industry vulnerable to attack, hard to counterattack.

**2.5 The information is restricted** The promotion of new varieties of edible beans is slow, and the production varieties focus on farming varieties. The varieties are multifarious, degrading critically, with different size of seeds, skin color, and seed type; at the same time, in the process of production, the farmers focuses on quantity but neglects quality, making the quality of products poor and commodity rate low. According to estimate, currently the commodity rate of cereals in western agricultural arid areas is only 30%, seriously hampering the development of edible beans industry<sup>[9]</sup>.

## 3 Strategies of developing industry of edible beans in West China

**3.1 Formulate preferential policies** The edible bean industry in China is still in its infancy. To make it develop and expand, the government has to work out and implement reasonable industrial policies, such as the policies of industrial organization (providing financial aid for key technological developing projects of edible bean with low profit or high risk, and increasing public investment for education, scientific research and technological promotion), the policies of industrial structure (including the policy of protecting weak industry, the policy of supporting strategic industry, and so on), the policies of industrial layout (through direct national investment mode, to support transportation, energy, communication and other infrastructure in key developing regions of edible bean industry, until the direct investments get involved in local development of edible beans), the policies of industrial technology (formulating the related policies of technological introduction, technological diffusion, technological support and so on, on the basis of establishing the development objective, technological standards and development planning of industrial technology of edible

bean), and so on, in order to gain the advantage, realize dramatic economic development, and shorten the time of catching up with developed countries.

**3.2 Establish high-quality edible producing bases** According to the distribution of minor cereals in the western provinces and regions, we should establish the leading crops and the direction of industrial development; transform small-scale disorderly production of thousands of households into orderly planned scale production, according to the principle of moderate concentration and scale development; improve the yield and quality of minor cereals; reduce the cost and promote the scale merit. We should work hard for the new pattern of "one village one industry, one village one product" in main producing areas, and meet the market demand at home and abroad constantly. Although China has had a batch of famous-brand producing bases of edible bean and enjoyed reputation both in domestic and foreign market, it lacks clear producing areas, production conditions, quality standard of products, equipments of processing, storage and transportation, leading varieties and so on. Therefore, the government should specifically appoint someone for the task of surveying the status quo of production of the edible beans as quickly as possible, and actively support and develop cultivation of organic edible beans and bases of production and export for earning foreign exchange, taking the road of industrialization development; according to the principle of "moderate concentration, scale development", choose the traditional producing areas to establish producing bases of high-quality edible beans with characteristics of regional resources, forming scale production; unify the production standard of market-oriented base construction on the basis of protecting ecological environment, make use of local environmental advantage from the perspective of big agriculture, conduct scientific planning and comprehensively take into account production of edible bean, production of staple crops, horticultural production (diversified operation), animal husbandry production and the processing industry of agricultural products; increase inputs in science and technology, introduce fine varieties, improve the cultivation techniques, and ensure the holistic improvement of technological content in producing bases, so as to ensure high starting point, high standard, and high benefit of the base construction. In addition, the production of organic edible beans in bases should implement standardized production, standardized management, and characteristic operation, according to the requirements of the international market. We should develop edible bean products with local characteristics, and strengthen strict test on quality of beans, to guarantee the quality safety of the products<sup>[10-13]</sup>.

**3.3 Promote the brand effect** Edible bean is the traditional and competitive agricultural product for export in China. Many famous-brand products emerge, such as mungbean from Yulin, Shaanxi Province, mungbean from Zhang Jiakou, Hebei Province, mungbean from Baicheng, Jilin Province, big white kidney bean in Yunnan Province, black kidney bean in Gansu Province, small red bean from Tianjin City, small red bean from Baoqing, Heilongjiang Province, and so on. We should strength-

en the protection, innovation and management of famous-brand products of edible bean, so as to make famous-brand products promote the development of characteristic resources, and the development of characteristic resources in turn promote famous-brand products, thereby we can realize the continuous development of edible bean industry and convert the resource advantage of edible beans into market and economic advantage.

**3.4 Pay attention to post-production development** China is a large producing and exporting country of edible beans, but there is a shortage of processing enterprises, the equipments and technics are simple and backward, and high –end products that take edible beans as processing raw materials are critically short, which cannot meet the demand of market. Therefore, we should combine production, study and research, and promote the development and production of products through research; vigorously strengthen basic research and application research related with processing of edible bean products; pay attention to equipment transformation; research and apply advanced technique ( such as special grinding technique ), and technology ( such as additive technology, extraction technology of effective components, sandwich technique and so on ); develop high-quality products with high added value and high technological content. We should combine the initial and deep processing of edible beans with production closely; based on domestic consumption and international market, develop processed food of edible beans according to local conditions; realize on-the-spot production and processing, and step into the track of circular economy. Through these measures, we are to promote the industrial structure of the edible beans to develop from low added-value industry to high added-value industry, and develop from the industry with low-degree processing to the industry with high-degree processing; realize the intensification of industrial structure, turn high-quality edible bean products into multifarious high-quality food integrating convenience, nutrition, eating and health care, and further improve the economic benefits and international competitiveness of edible beans.

**3.5 Develop the idea of new agricultural planting and cultivation** First, we should conduct seed selection of new varieties, and research on supporting cultivation techniques, pest control technology, production technology of green food and so on. In terms of seed selection of new varieties, we should pay equal attention to high yield and high quality, strengthen introduction, screening and demonstration of new high-quality varieties from abroad, and solve the problems of variety degradation and disorder of varieties as soon as possible. In terms of cultivation technology, we should carry out key cultivation technology research on different varieties in different types of areas, focus on the research on the agricultural comprehensive technical measures of arid land, take continually increasing precipitation production potential as center, mainly use organic fertilizer to fertilize the soil, strengthen the development and promotion of new technologies and new materials, such as degradable mulching film, and reduce the consumption of nonrenewable resources. Second, we should gradually develop high technology

researches, such as basic physiology of edible beans, biochemical research, chromosome project, marking of excellent genes, genetically modification and so on. Third, we should develop intercropping mode of edible beans and main crops suitable for local planting and alleviate contradiction between edible beans and staple crops for water. Fourth, we should study the technology of pest control on edible bean, and improve the yield and quality of edible bean. Fifth, we should carry out the researches on environment-friendly technology, environment-friendly products and environment-friendly services concerning edible beans, so as to provide technological and environmental support for constructing pollution-free producing bases of edible beans, and producing pollution-free green edible bean food. In addition, we should vigorously develop the production of pollution-free green edible bean food, improve processing technology and packaging, and create multi-variety and multipurpose comprehensive utilization ways.

## References

- [1] LIN RF, CHAI Y, LIAO Q, *et al.* Chinese Minor Grain Crops[M]. Beijing: China Agricultural Science and Technology Press, 2002: 192–360. (in Chinese).
- [2] CHAI Y, FENG BL. Present situation and developing strategies of minor grain crops in China[J]. Agricultural Research in the Arid Areas, 2003, 21(3): 145–150. (in Chinese).
- [3] CHAI Y, FENG BL. Present situation and developing strategies of minor crop in China[J]. Review of China Agricultural Science and Technology, 2001, 3(5): 62–66. (in Chinese).
- [4] DONG LL. Present situation and developing strategies of coarse cereals industrialization in Shanxi[J]. Chinese Agricultural Science Bulletin, 2008, 24(10): 575–578. (in Chinese).
- [5] HE LX. Minor grain crops production profile and countermeasures in Lijiang[J]. Chinese Agricultural Science Bulletin, 2003, 19(6): 158–159. (in Chinese).
- [6] GAI JY, JIN WL. Production situations and development countermeasures of edible legume in China[J]. Crops, 1994(4): 3–4. (in Chinese).
- [7] CUI YW. Studies on the advantages and existing problems of minor cereal crops production in Midwest China and countermeasures[J]. Journal of Agricultural Science and Technology, 2008, 10(3): 54–57. (in Chinese).
- [8] DU HP. Technique system of the sustainable development of minor crops in the Loess Plateau[J]. Chinese Agricultural Science Bulletin, 2006, 22(7): 268–271. (in Chinese).
- [9] WANG GB, XIE XR. Study on the competitive advantage and industrial development of minor coarse cereals in Shanxi Province[J]. Chinese Agricultural Science Bulletin, 2006, 22(5): 485–488. (in Chinese).
- [10] FENG BL, DAI HP, CHAI Y, *et al.* Protective cultivation technology research and practice of minor grain crops[J]. Agricultural Research in the Arid Areas, 2007, 25(1): 206–211. (in Chinese).
- [11] ZHANG X, WANG LX, CHAI Y, *et al.* Sustainable Development of minor food crops in China[J]. Scientia Agricultura Sinica, 2003, 36(12): 1595–1598. (in Chinese).
- [12] LIAO Q. Grasp the opportunity to industrialize the coarse cereals – status quo of kidney bean and development measures[J]. Seed World, 2003(7): 1–4. (in Chinese).
- [13] CUI ZH, ZHOU Q, HU XQ, *et al.* The consumption of legumes in China[J]. Food and Nutrition in China, 2008(1): 41–43. (in Chinese).