Hierarchical Training Mode for Market Demand Oriented Outstanding Seed Industry Talents

Xuechun WANG[1]*, Hongni WANG[2], Shishun TAO[1]

1. School of Life Science and Engineering, Southwest University of Science and Technology, Mianyang 621010, China; 2. School of Adult Education, Southwest University of Science and Technology, Mianyang 621010, China

Abstract This paper analyzed the trend of seed industry development in-depth and studied changes in quantity and quality of demands for seed industry talents. To adapt to "breeding, propagating and selling" integration and internationalized trend of seed industry, it stated that hierarchical training mode is an ideal mode for training outstanding seed industry talents. Finally, it elaborated specific objectives and requirements of the hierarchical training mode, *i. e.* undergraduate - master - doctor.

Key words Outstanding talents, Market, Seed industry

China is a large country of agricultural production and also a large seed user. The seed industry of agricultural crops is a national strategic and fundamental core industry, and also a foundation for promoting long-term stable development of agriculture and guaranteeing national grain security. With acceleration of globalization process, development of biological technology and constant deepening of the reform and opening-up, enterprises have higher and higher demands for outstanding seed industry talents. Single technology talents have become difficult to adapt to demand of seed industry enterprises. On November 13, 2011, Zhang Daliang stated, in the report *Implementing Spirit of Key Speech of President Hu Jintao and Energetically Improving Talent Cultivation Level*, that the objective of outstanding agricultural and forestry talent training plan is to cultivate a good many high level applied talent, to make them have social responsibility of serving the state and people, and aspiration of devoting to national agricultural and forestry undertaking, and have ability of solving practical problem of agriculture and forestry[1]. At present, China's seed industry enterprises are carrying out industrial reform oriented towards "breeding, propagating and selling". With gradual advance of the reform, merge and reorganization of enterprises become more intense. This will bring significant change in quantity and quality of demands for outstanding talents. In-depth analysis of the development trend of seed industry, study on changes in quantity and quality of demands for seed industry talents, and discussion of new training mode will be favorable for training high quality inter-disciplinary seed industry talents suitable for market demands and also favorable for heightening development stamina of China's seed industry.

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* Corresponding author. E-mail: xuechunwang@swust.edu.cn

1 Development trend of the seed industry

1.1 Development trend of the world seed industry

1.1.1 In the situation of oligopoly, the seed industry continues to be centralized towards few enterprises. In developed countries, long time of competition leads to constant merge or reorganization of enterprises. As a result, the oligopoly situation appeared in the seed industry, and few large seed groups monopolized larger part of the seed market. According to statistics of International Seed Trade Federation in 1988, 22 seed enterprises (8 from the USA and 5 from France) with annual seed turnover above 100 million USD had total annual turnover greater than 7.5 billion USD, approximately accounting for 50% of the world seed market share[2]. In 2010, the top 10 seed companies in the world had sales amount up to 7.25 billion USD, accounting for 24% of the global commercial seed. Now, the total global seed value is about 50 billion USD, 60% (about 30 million USD) is commercial seed[2]. To adapt to global development trend of the seed industry, many countries are integrating domestic resources to obtain maximum economic benefits. In this situation, the seed industry will inevitably be centralized to few oligopolistic enterprises.

1.1.2 The biological technology and talents become competition point of seed enterprises. The biological technology has become one of competitive points of seed enterprises. Among various biological technologies, genetic engineering and cell engineering will become core technologies in the future. Despite some boycott and opposition, genetically modified seed reduces environmental pollution, cuts down agricultural cost, and increases farmers' income. According to statistics of International Service for the Acquisition of Agri-biotech Applications (ISAAA) in 2009, the planting area of genetically modified crop reached 134 million hectare, increasing 80 times of 1996[4]; global market value of genetically modified seed in 2010 was 11.2 billion USD, and the value of commercial genetically modified corn, soybean and cotton was 150 billion USD[5]. Huge market profit promotes seed tycoons to constantly increase input in biological technology and new variety research

and development. The ratio of scientific research input to sales amount of seed constantly rises. In 1990 – 2010, this ratio has increased 6 percentage points.

In the times of knowledge economy, talent has taken the place of capital and become major factor for enterprise operation. This is no exception for seed enterprises. On the one hand, seed enterprises need a lot of scientific research talents, such as specialized seed breeding talents, to raise their scientific and technological innovation ability and strengthen development stamina. On the other hand, enterprises need outstanding enterprise management talent, *i. e.* seed entrepreneurs, to promote enterprises to make innovation in operation and management, organization and management system.

1.2 Current development situation and trend of the seed industry in China

1.2.1 Current situation of China's seed enterprises is large market but small enterprises. Currently, the fine seed coverage of staple food grain has reached 90%, and the contribution of seed to increase of grain yield rises from 36% to 40%[6]. In future 10 years, China's fine seed coverage will rise to 95%; the contribution rate of seed industry to increase of grain yield will reach 50%; total market amount of China's seed industry will exceed 90 billion yuan, making China the largest seed market in the world. At present, there are about 8 000 seed enterprises with license, but the annual average sales amount of seed production, processing and sales is only 4.5 million yuan, less than 100 seed enterprises with sales amount exceeding 20 million yuan, and only 7 seed enterprises with sales amount exceeding 100 billion yuan[7]. The seed industry is an industry highly dependent on scientific and technology innovation. Compared with developed countries, China is relatively backward in seed innovation. Due to limitation of economic system, China's seed enterprises have no scientific research personnel or institutions. Besides, seed enterprises are mainly engaged in seed varieties developed by other scientific research institutions. In addition, their specialized cooperation level is low. They lack inter-disciplinary seed talents who have command of technology and are good at operation and management.

1.2.2 Merge and reorganization are inevitable trend of China's seed industry. On September 6, 2010, the State Council issued *Opinion about Promoting Merge and Reorganization of Enterprises* (No. [2010] 27) to all provinces, autonomous region, municipality directly under the Central Government, and ministries and commissions and directly subordinate organizations; as implementation of this opinion, the Ministry of Agriculture made effort to recommend merge and reorganization of seed enterprises and cultivate integrated leading enterprises[8]. With gradual advance in industrial reform of the seed industry, merge and reorganization of enterprises become more intense, the successful mode of integrated "breeding, propagating and selling" in foreign seed industry will become inevitable trend of China's seed industry. Establishing transnational breeding and propagating bases will also become mainstream operation mode of China's seed industry.

1.2.3 Private companies (organizations) gradually become main entities of the seed industry. New plant varieties are legally protected as intellectual property right. Private investment in seed industry is profitable. This greatly promotes rise and development of private seed companies. At present, new seed selection, production and operation and R&D of biological technologies in developed countries are mainly undertaken by private seed companies (organizations). Intermediary business, such as seed quality inspection and dispute, is also undertaken by private organizations. As nongovernmental organization, seed industrial associations play a more and more important role in promoting formulation and implementation of international seed trade, industrial exchange and seed standards. With constant advance of the market, China's private seed companies and organizations are rapidly rising and developing. We surveyed 568 seed enterprises in Sichuan (key area), Chongqing, Shandong, Shaanxi, Henan, and Hebei in the end of 2011. Survey results show that private enterprises and joint ventures account for 87.7% and state-run enterprises take up less than 5%.

1.2.4 Enterprises will become major entities of research and development of commercial seed. With reference to successful experience of foreign seed companies, China's seed industry is walking to an integrated "breeding, propagating and selling" development road. Development experience of foreign seed enterprises indicates that with the aid of R&D, production and sales service system, seed enterprises will put in more effort in seed research and development. At present, transnational seed companies generally take out 10% of their sales amount in seed research and development. This figure is up to 15% – 20% in some companies. In 2008, Monsanto Company and Syngenta input 980 million USD and 969 million USD in research and development, accounting for 8.6% and 8.3% of their sales amount respectively[9]. With constant deepening of reform of China's seed enterprises, they will inevitably increase investment in scientific research, and research entities of commercial seeds are also changing from scientific research institutions to large seed enterprises.

2 Talent demand of the seed industry

To further know current demands of seed market for talents, we made a questionnaire survey of 568 seed enterprises in Sichuan (key area), Chongqing, Shandong, Shaanxi, Henan, Hebei, Hubei and Hunan in the end of 2011. This survey covers a wide area, so its results are representative. We obtained precious first-hand data, which are helpful for knowing characteristics of current talent demands of seed enterprises.

2.1 Demands of seed market for different types of seed talents We obtained following survey results. (i) Seed market still has high demand for marketing talents, general demand accounts for 45.1% and high demand accounts for 25.1%, as shown in Fig. 1a. (ii) At present, most seed enterprises lack those talents who have real skills and technology. Enterprises have high demand (35.4% and 22.3%) for technical talents, as shown in

Fig. 1b. (iii) The demand of enterprises for management talents is general (41.3%) and little (24.0%), indicating that the market demand for management talents is relatively stable, as shown in Fig. 1c.

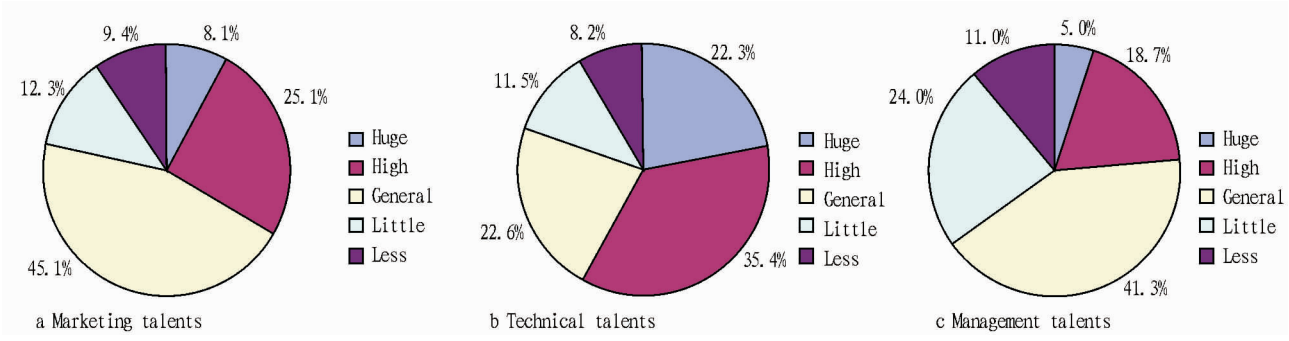

Fig. 1 Demands of the seed market for different types of talents

2.2 Requirement of seed enterprises for education degree of seed talents From Table 1, we get following results. (i) Seed enterprises have different requirement for education degree of different types of talents. Their demands for marketing talents are mainly undergraduates and high vocational school graduates, the demand for masters and doctors is less; their demands for technical talents are mainly undergraduates and masters, the demand for doctor level talents is less; their demands for management talents are mainly masters and doctors, and the demand for undergraduates is relatively little. (ii) Generally, market demands for undergraduates and masters are high; there are certain demands for marketing, technical and management talents; the demands for masters and doctors are mainly technical talents and management talents.

Table 1 Education requirement of seed enterprises for seed talents

	Marketing talents	Technical talents	Management talents
Secondary vocational school	19.3%	4.3%	1.3%
High vocational school or specialized school	56.1%	5.1%	2.1%
Undergraduate	52.6%	57.6%	22.6%
Master	8.8%	54.8%	54.8%
Doctor	5.1%	35.1%	55.1%
Others	1.9%	5.9%	11.9%

Note: education degree in the questionnaire is a multiple-choice.

2.3 Requirement of seed enterprises for quality of seed talents From Table 2, we get following results. (i) Sincerity, diligence and unity are basic requirement of seed enterprises for talents. About 88.8% enterprises demand seed talents have basic quality of sincerity, diligence and unity. (ii) There are enormous differences in basic ability requirement of talents in different seed enterprises. Compared with other types of talents, seed enterprises have higher requirements for communication ability and adaptability to changes of marketing talents, higher requirements for specialized skills of technical talents, and higher requirements for communication ability, adaptability to changes and foreign language ability of management talents.

Table 2 Quality requirement of seed enterprises for seed talents

	Marketing talents	Technical talents	Management talents
Sincerity and loyalty	86.1%	85.3%	95.3%
Diligence	72.6%	79.1%	77.1%
Team awareness	68.8%	62.6%	82.6%
Appearance	46.1%	41.9%	51.9%
Communication ability	95.1%	44.8%	74.8%
Adaptability to changes	91.9%	35.1%	85.1%
Specialized skills	42.6%	87.9%	76.0%
Foreign language ability	28.8%	36.9%	65.5%
Computer ability	25.1%	23.9%	59.6%

Note: quality in the questionnaire is a multiple-choice.

3 Cultivation of outstanding seed talents

With reference to current development situation of seed enterprises both at home and abroad, we hold that cultivation of outstanding seed talents should be divided into following three levels.

3.1 Making "blanks" at the undergraduate stage At the undergraduate stage, it is recommended to make "blanks" of talents to cultivate potential of undergraduates to become outstanding seed talents. For example, dual tutorial system through cooperation of schools and enterprises may be applied to carry out overall cultivation of students. Through in-school learning, it is expected that students can acquire excellent social quality "sincerity, diligence and unity", have certain communication skills, and grasp basic skills of their disciplines, have good command of a foreign language and can follow international leading knowledge, and understand certain knowledge of management and laws related to seed production and operation. Through practice in seed enterprises (accumulative one year), students should grasp various skills required in the seed production, have certain innovation awareness, and have strong cooperative awareness. After working 2 – 3 years in seed enterprises, undergraduates should be able to undertake marketing or technical work of seed enterprises. Through certain training or further study, they should be able to become outstanding seed talents good at management and technologies.

3.2 Cultivating "semi-finished products" at the master stage At the master stage, it is recommended to cultivate "semi-finished products", to make them have professional quality of excellent seed talents. According to market demands, outstanding

seed talents at the master level are mainly engaged in technical or management work. Since masters have excellent theoretical foundation, they should focus on deepening theories, strengthening skills and attaching importance to innovation. Through more than one year of learning, they should have a great leap in specialized theories and grasp current theories and technologies, strengthen learning of social science knowledge, and study industrial rules and laws and regulations related to the seed industry. Under the guidance of enterprise tutors and school tutors, with 1 – 2 years of technical practice in enterprises, they should well grasp various industrial skills. Besides, they should participate in certain product design and research and development to cultivate their innovation ability. Also, they should participate in enterprise management to learn certain management experience. Students completing learning tasks at the master level can undertake technical work in seed enterprises. With 2 – 3 years of practice and exercise, they can participate in product research and development and enterprise management, and become outstanding seed talents good at technologies and innovation.

3.3 Cultivating "fine products" at the doctor stage In line with market demands, outstanding seed talents at the doctor level should be those talents with well command of technologies, good at innovation and management. Considering continuity of the talent cultivation, it is required to pay attention to exercise, improving innovation ability and management ability at the doctor level. On the basis of the master level, it is recommended to focus on cultivation of their innovation ability. They should participate in product design and research and development and work in enterprise for at least two years. Besides, they should participate in enterprise management and decision making, so that they can implement decisions and management according to market and enterprise situation, and become outstanding seed talents with well command of technologies, good at innovation and management after working 2 – 3 years in seed enterprises.

4 Conclusions

With the drive of national policies and market development, large-scale, group and internationalization are inevitable results and development direction of merge and reorganization of China's seed enterprises, and integrated "breeding, propagating and selling" mode will become mainstream operation mode of the seed industry. To adapt to integration and internationalized trend of "breeding, propagating and selling", China's seed enterprises have different demands for different levels of seed talents. Their demands for undergraduates are mainly marketing and technical; for masters, their demands are mainly technical talents; their demands for doctors are mainly interdisciplinary talents. In line with market demands and existing talent training mechanism of China, the hierarchical training mode is an ideal mode for training outstanding seed industry talents. Specifically, it is recommended to lay solid foundation at the undergraduate stage, enhance innovation and skills at the master stage, and reinforce innovation and management at the doctor stage.

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5.3 Research limitations and future direction Since our study is only a start, there will be some weak points. Firstly, our study only takes Lin'an *Carya Cathayensis Sarg* as sample. The quantity has space for increase. In future, research can be expanded, to study consumption groups of *Carya Cathayensis Sarg*. Secondly, our study focuses on member groups of *Carya Cathayensis Sarg*. Thus, in future, researches can be carried out for ordinary consumers, to obtain overall cognition of consumer value in pursuing healthy life. Finally, this research has certain lagging feature. It starts from value connotation after consumption. Therefore, future researches can be carried out from expected value before consumption and make comparison of differences.

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