Problems of New Plant Variety Protection System in China and Countermeasures

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Abstract Protection of new plant varieties has been long neglected in China, which has already restricted agricultural technological renovation, and influenced export of Chinese agricultural products. The current scientific and technological management system is not favorable for the output of right of new plant variety, and high cost of protecting new plant varieties directly results in agricultural researchers' ignorance of right of new plant variety. Major causes were concluded as poor intellectual property awareness of peasants and agricultural researchers, government-arranged system for agricultural scientific and technological management, and hardship in safeguarding intellectual property due to the particularity of agricultural technology. In view of these problems, Chinese agricultural scientific and technological management system should be reformed, protection system of new plant varieties improved, more efforts devoted in protecting the right of new plant variety and also the owners' interest.

Key words Agriculture, New plant varieties, Intellectual property

New plant varieties are fruits of agricultural scientists' hard work, and protection of these new varieties is a manifestation of respecting knowledge and talents, and an important incentive mechanism for agricultural technological innovation, so it is significant for Chinese agricultural products participating in international competition.

1 Intensifying international competition for the right of agricultural plant varieties

Agricultural is a fundamental industry of China bearing important responsibilities in safeguarding national food security. Modern agricultural development depends on research and development and application of agricultural technology, and the agricultural technological innovation system must be established. However, current agricultural intellectual property, especially the right of new plant variety, has become a bottleneck restraining the innovation and development of agricultural technology.

1.1 Right of new plant variety becoming a barrier in export of agricultural products Japan has implemented *Amendment of Seedling Laws* since 2003, it was specified that any individual violating the rights of others would be sentenced to less than three years' of imprisonment or imposed a fine less than 3 million yen, and any business entity violating the right of others would be imposed a fine less than 100 million yen. The scope and intensity of punishment has been greatly broadened and enhanced, which marks Japanese government's dedication in the war of protecting intellectual property. And intellectual property has shown new forms in the international agricultural trade war, and the competition has grown more serious and influential. In addition, Japan has already taken substantive actions.

In recent years, China has gradually become a major flower export country for its comparative advantages in climate, geography and labor force, and Japan is the largest import country. However, shortage of intellectual property has limited the further expansion of Chinese flower export market[1]. In 2004, agricultural department of Japan cooperated with the global carnation breeding enterprises and conducted a selection examination over carnation from China in Japanese flower market, to figure out whether carnation from China comply with intellectual property or not, and whether traders of the protected carnation varieties buy EAC (export approve certificate) or not[2].

In 2009, The Ministry of Agriculture, Forestry and Fisheries of Japan issued a notice to the customs to forbid the import of mat rush woven products from China and other countries as of that date for safeguarding Japanese intellectual property. If any mat rush woven product is found in other imported products, individual or business entity importing this batch of products will be punished severely. Japan is a major import country of Chinese agricultural products such as vegetables, flowers and fruits, but as Japan has devoted more in protecting rights of breeders, export of Chinese agricultural products will be faced with more and more serious crises[3].

Despite the implementation of *Amendment of Seedling Laws* in 2004, export of Chinese agricultural products has not been shocked directly because of the protection duration of right of new plant variety, and also hysteretic effects of law enforcement[4]. However, in a long run, the amendment will influence export of Chinese agricultural products, so agricultural departments and enterprises should pay close attention to its potential influence to prepare for possible results and evade the future legal risks.

1.2 Shortage of right of new plant variety threatening agricultural security of China International agricultural competi-

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tion involves not only agricultural products and agricultural technology, but also agricultural intellectual property, especially right of new plant variety and agricultural patents. Developed countries have applied for numerous patents in China, even monopolized the industrial intellectual property, and tried to have a hand in agricultural intellectual property.

As early as 2000, Monsanto Company attempted to apply for patents to monopolize wild and cultivated soybeans from China. According to statistics from cnyouzhi. com, China imported soybeans about 37. 43 million ton in 2008, 41% from the U. S. (mainly from Monsanto Company)[5]. Monsanto has controlled soybean supply market of China and also its soybean price system, and obtained tremendous benefits out of Chinese strong demands for soybeans. With the globalization of economy and technology, developed countries "rob" developing countries by "technological" and "legal" means, so other grains in China such as wheat, rice or corn will possibly face up to the same crisis.

In international agricultural competition, quantity and quality of agricultural intellectual property determine the international competitiveness of agriculture of a country. Developed countries have a monopoly on such agricultural intellectual property as patent, geographical indication and new plant variety, so their agricultural products enjoy technological advantages in the world market. According to statistics of International Union for the Protection of New Varieties of Plants, there were more than 67 000 effective new plant varieties in its 57 member countries by the end of 2005, 53 000 of which belonged to 22 developed members (79% of the total)[6].

China is endowed with abundant biological resources, but the resource advantages have not been transferred to advantages in intellectual property due to lack of legal awareness and awareness of safeguarding legal rights. As a result, China will be left at a disadvantage in the new round of knowledge economy competition. As soon as developed countries start war of patent or right of new plant variety by using their advantages in intellectual property, agricultural security of China will be seriously threatened.

1.3 Poor driving force for agricultural technological innovation because of ignorance of the right of new plant variety Technological innovation capacity of a country largely depends on four factors, namely property right system, market structure, government policy, and enterprise innovation capacity, according to the worldwide experience. "Clear property right" is also a major demand for the reform of state-owned enterprises in China, thus property right of scientific and technological fruits is a main incentive to promote agricultural science and technology.

In planned economy period, agricultural scientific and technological achievements were provided free to peasants, and researchers were awarded according to the quantity of achievements. In this way, market laws are neglected, and scientific researches are separated from market needs. Agricultural scientific and technological management system fails to combine agro-technological innovation achievements and benefits of research specialists and promotion staff, so there is no effective competitive mechanism in agricultural research institutes.

Intellectual property system protects agricultural technological innovation achievements by legal means, so achievements of agricultural researchers' labor will be protected, and any individual or entity using the fruits without authorization will be punished. Evaluation of and award for scientific and technological fruits is determined by the market, the relevant researchers obtain due economic benefits via market. With authorization for the cultivated species, if application fees for the protection of new variety and annual fees for the authorized protection of new variety, breeding department of protected hybrid and conventional rice will obtain profits about 343 000 yuan and 164 000 yuan every year for the variety protection[7]. Furthermore, when the new variety is protected, the owner will have a monopoly on the seed market, and considering the profits made from the monopoly, new variety protection system has significant incentive effect on seed department.

2 Deficiencies of Chinese new plant variety protection system

China is a great agricultural power, and agricultural industry accounts for a high ratio of GDP, but agricultural technological development lags far behind that in developed countries, and China owns an extremely small amount of right of new plant variety, which seriously hinders the agricultural technological innovation.

2.1 Scientific and technological management system is not favorable for the output of right of new plant variety There are mainly two types of agricultural scientific and technological agencies in China, namely agricultural technological promotion agencies dominated by common promotion staff, and scientific research institutes dominated by research specialists.

The former is to promote technological research achievements to peasants, and accomplish the tasks assigned by the higher authorities[8], but is indifferent to the right of new plant variety. The latter has a scientific research management system unfavorable for the output of the right of new plant variety. Performance evaluation of research specialists involves only quantity of scientific research program, paper, and government award, but not market value of scientific research achievements. As a result, research specialists in China have paid more attention to program and paper, but not to the right of new plant variety or transfer of the research achievements to marketable products. So despite China leads the world in agricultural research achievements, quality of these achievements is unsatisfactory.

In terms of research program management, traditional project establishment model becomes a mere formality. Judges for the project demonstration prefer voting for technical routes and expected results, but seldom consider about market needs. Moreover, research management department has poor awareness of intellectual property, application and authorization of new plant varieties are always excluded in the project examination, and only if the varieties pass the examination, research specialists will fulfill their

tasks, so they are not enthusiastic about obtaining the right of new plant variety.

2.2 Protection of new plant varieties cost too much In terms of time cost, applicants have to carry out observation test of the new plant varieties in the field according to *Distinctness, Uniformity and Stability Test Guidance of the Ministry of Agriculture*. And only these varieties pass the distinctness, uniformity and stability test, applicants can apply for the right of new plant variety. DUS test of the applied varieties cost too much time and labor, management departments of new plant varieties in China are mostly in need of fund, and the technical support system for the examination of the right of new plant variety is poor, especially DUS test technical system and guidance system. The database of new plant varieties has not been established, and the examination is too slow because of the written application materials and manual retrieval, which influence the timely application for intellectual property. Generally speaking, from application to examination and authorization, it takes two or three years, and such a long duration is also a bottleneck for increasing number of right of new plant variety in China.

In terms of financing cost, to obtain the right of new plant variety, applicants have to pay application fee, examination fee, and also annual fee if approved. In addition, to ensure the novelty of right of new plant variety, the variety must not be sold for making profits before application, but examination of the new variety has no such specification. Therefore, more research specialists prefer examination of new varieties, but not application for the right of new plant variety.

In terms of labor cost, application for the right of new plant variety costs a great deal of time and labor. Specifically, applicants submit the written application, pay the application fee, and when the application passes the preliminary examination, applicants have to pay examination fee and submit breeding data about the new variety; the department in charge start the examination, when the application passes the examination, applicants have to pay annual fee and get the certificate of right of new plant variety. During this process, if the application materials or breeding data are unconformable to the requirements, they will have to be supplemented or modified, usually for several times.

2.3 The right of new plant variety is not valued by agricultural research specialists Intellectual property is a brand-new term for Chinese enterprises and researchers, and most Chinese enterprises have no intellectual property. According to statistics of State Intellectual Property Office, there are only thousands of enterprises owning independent intellectual property, accounting for 0.003% of the total; 99% of Chinese enterprises never apply for a patent; only 40% have their own trademarks[9]. Due to the peculiarity of agricultural technology, agricultural research specialists have even poorer awareness of intellectual property.

According to the investigation results of State Rectification and Regulation Office and State Intellectual Property Office in Shaanxi Yangling Demonstration Zone in the middle June 2005, only 2 new rape varieties of the 200 newly-cultivated ones were applied for the right of new plant variety; by May 2005, more than 1 000 enterprises in the demonstration zone applied for only 12 new plant varieties, and got authorization for only 3 of them[10]. Fujian Agricultural University has achieved a dozen of world-class research fruits about grass- and log-cultivated edible mushrooms, and the fruits have been spread to 16 countries, but only 3 of them have been applied for national patent and 12 for foreign patent, and the rest has been used by foreigners without any compensation[11].

3 Cause analysis

3.1 Poor intellectual property right awareness of peasants The right of new plant variety ensures the right of cultivators, and also improves price of seeds, involves benefits of seed sellers and peasants. Agricultural staff and peasants in China is a group of low education level, most of them have poor cultural quality and legal awareness, they are not afraid of violating others' rights because they are not aware of the consequences. Therefore, cases of the right of new plant variety always involve many people and even groups.

The right of new plant variety is closely related to seeds, and the latter concerns agricultural and forestry production of peasants, the peasants are vulnerable groups. The protection of new plant varieties was never considered in the past, and peasants needed no authorization for breeding and selling seeds of new plant varieties. Law-abiding consciousness of peasants has not been established or enhanced, so in some regions there have been many group infringement acts, but such problems have not been properly handled because of regional protectionism, and cultivators lost confidence for protecting their own benefits.

3.2 Poor intellectual property awareness of agricultural research specialists Traditional Chinese concepts are contrary to intellectual property concepts in many aspects, "stealing book is not a kind of stealing" has been widely accepted among Chinese, and in Confucianism, such traditional ideas as "believing and favoring ancient stuff", "providing education for all people without discrimination" hide intellectual property needs of intellectuals. According to Marxism, intellectual achievements are alienation phenomena just like labor of salary earner[12]. Traditional Confucian cultures are combined with Marxism to form an ideological barrier repelling privatization of knowledge, so intellectual property concepts are ill-adapted to Chinese mainstream consciousness. Influenced by traditional Chinese cultures, using fine varieties without compensation has become a habit of Chinese, agriculture-related enterprises and peasants are not familiar with protection system of the new plant variety. The whole society has poor knowledge of intellectual property and even misunderstandings.

3.3 Government-arranged management system for agricultural science and technology Influenced by the planned economy system, most agricultural research fund originates from state finance, agricultural technology promotion system established by the

government is responsible for promoting research achievements to rural areas. In this process, research specialists cannot obtain profits, and also need not to take the investment risk. In this government-arranged system, all research specialists and seed sellers believe that labor fruits should be shared with all people, and the rights should not be privatized, otherwise, promotion of new varieties in agricultural production will be influenced. Research specialists are compensated by award, professional title or post, and higher salary, these compensations replace their needs for intellectual property. In this sense, agricultural research specialists pay more attention to government acceptance to their research achievements, but not intellectual property.

Seed selling agencies in China are mostly included by the trinity of government, enterprise and public institute, and in seed industry management, cultivation, breeding and promotion are divorced from each other. Such a segmented mechanism results in the "laziness" of research specialists, they prefer taking advantage of others' achievements because they would not like to bear the time and fund cost. Local governments show no enthusiasm for but even resist against protecting intellectual property and protect their own seed companies and seed management stations, which seriously hinders the protection of new plant varieties.

3.4 Peculiarity of agriculture leads to the difficulty in safeguarding legal rights First, agricultural researches have long periods and poor controllability. Agricultural production relies more on natural factors such as temperature, humidity and sunshine, and as soon as these factors change, characters of plants will change with it, and it is hard to identify the infringement act.

Second, it is difficult to keep agricultural technology secret. In the breeding of new plant varieties, "field demonstration" is a necessary procedure, and if cultivators have no sufficient land for the demonstration, they will have to cooperate with peasants, so the technology is easily discovered and even stolen by others. Only if someone steals plants of the new variety, and uses the "self-propagation" of crops, key technology of new variety cultivation will be controlled[13]. In addition, when research institutes transfer their research fruits to seed companies, the varieties have to pass local variety examination and production test, and key technology is also likely to be stolen in this procedure.

Finally, it takes high cost to safeguard legal rights of cultivators. Cultivation of crops and seed production show strong seasonal characteristics, and agricultural production is widely distributed all over the country, it is difficult to investigate and identify the infringement act. Regional protectionism also hinders the protection of new plant varieties, government agencies even collaborate with seed companies, they set obstacles for and even threaten research specialists during the investigation.

4 Recommendations

4.1 Reforming agricultural technological management system Firstly, intellectual property should be introduced to the agricultural promotion system. (1) Intellectual property education or training can be organized for peasants. During the agricultural promotion, not only technology, but also intellectual property awareness should be promoted among peasants, so the peasants will realize that it is illegal to use or sell the unauthorized new plant varieties, and hard work of research specialists deserve economic returns. (2) In agricultural research management system, the role of market economy in resource allocation should be fully developed, government should not be expected to take on all things, and independent accounting system should be gradually established among agricultural research institutes and individuals, so they will be responsible for their own profits and losses. In this way, blindness of agricultural researches will be greatly reduced, enthusiasm of research specialists encouraged, use efficiency of agricultural researches promoted.

Secondly, scientific and technological management system of the agricultural research institutes should be reformed, intellectual property awareness of research specialists enhanced. It is imperative to improve the current performance evaluation system by increasing proportion of intellectual property in performance evaluation of research specialists. In addition to traditional project approval, paper and examination of research fruits, intellectual property indexes should be added to the evaluation system, patent and authorization for the right of new plant variety should be applied as indexes for the performance evaluation of research institutes and specialists, and related to profit sharing and promotion of research specialists.

4.2 Improving protection system of new plant varieties Intellectual property examination technology should be improved, and examination cost for the new plant varieties reduced. In the initial stage of implementing the right of new plant variety system, China lacks in practical experience, and the application procedures are complicate. Through a decade of practices, the application and examination procedures should be simplified on the basis of previous experience, e-government network improved, database of new plant varieties established to share resources with foreign databases. As a result, the examination efficiency will be highly improved, financial and time cost of cultivators will be greatly reduced.

4.3 Devoting more in protecting the right of new plant variety and benefits of the right owners Administrative protection of intellectual property in China should be further enhanced, regional protectionism should be broken. The unique double-track system (administrative and judicial) for intellectual property protection is adopted in China, but Chinese judicial authority lacks in professional technology and experience of hearing cases about agricultural crops, so advantages of administrative agencies in handling these cases should be made best use of, and administrative protection strengthened. Agricultural, forestry and aquatic departments should collect evidences according to seasonal characteristics of agricultural products, and investigate and punish infringement acts. Because agricultural administrative authority handles disputes about the right of new plant variety quickly, such disputes should

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(Table 5)

Ranking	Title	First Author	Institution	Journal	Publication Date	Citation Frequency
5	Micro RNA - 21 (miR - 21) post - transcriptionally downregulates tumor suppressor Pdcd4 and stimulates invasion, intravasation and metastasis in colorectal cancer	Asangani I. A	Univ Heidelberg	Oncogene	2008.04	431
6	I - TASSER server for protein 3D structure prediction	Zhang Y	Univ Kansas	BMC Bioinformatics	2008.01	385
7	The University Protein Resource (UniProt)	Bairoch A	European Bioinformat Inst	Nucleic Acids Research	2010.01	333
8	Protein secondary structure analyses from circulardichroism spectroscopy: Methods and reference databases	Whitmore, Lee	Univ London	Biopolymers	2008.05	307
9	The University Protein Resource (UniProt) 2009	Bairoch A	Univ Geneva	Nucleic Acids Research	2009.01	302
10	Rapid transcriptome characterization for anonmodel organism using 454 pyro - sequencing	Vera, J. Cristobal	Penn State Univ	Molecular Ecology	2008.04	266

4 Conclusion

Bioinformatics research is widely concerned throughout the world. Although bioinformatics research has stepped into the post-genome era, bioinformatics remains a new engineering and technology discipline and the post-genome era provides a wider stage. There are urgent issues to be solved in both theory and method and bioinformatics researchers are still confronted with opportunities as well as challenges.

References

[1] ZHAO Q, GU RS, DU SM. Research status and development trend of bioinformatics[J]. Journal of Medical Information, 2012, 3(5): 2 - 6. (in Chinese).
[2] CHEN M. Bioinformatics in post genome era[J]. China Journal of Bioinformatics, 2004, 2(2): 29 - 34. (in Chinese).
[3] NIU QW, CHEN JP. Review of common method of bioinformatics and application software[J]. Journal of Tropical Medicine, 2012, 12(7): 908 - 910. (in Chinese).
[4] CHEN YH, SUN K. Bioinformatics research progress and application[J]. Journal of Qinghai Normal University: Natural Science Edition, 2011(3): 69 - 72. (in Chinese).
[5] LI W, MAO M. New progress of bioinformatics—Review of the sixth national bioinformatics and genome research annual meeting[J]. Foreign Medical Sciences: Genetics, 1999, 22(2): 104 - 108. (in Chinese).
[6] TANG XQ, ZHU P. Developing trend of bioinformatics in post genome era [J]. China Journal of Bioinformatics, 2007(3): 142 - 145. (in Chinese).
[7] PRITCHARD A. Statistical bibliography or bibliometrics[J]. Journal of Documentation, 1969, 25(4): 348 - 349.
[8] TIAN YG, WEN C, HONG S. Global scientific production on GIS research by bibliometric analysis from 1997 to 2006 [J]. Journal of Informetrics, 2008, 2(1): 65 - 74.
[9] SWAPAN KUMAR PATRAA, PRAKASH CHAND. HIVPAIDS research in India: A bibliometric study[J]. Library & Information Science Research, 2007, 29(1): 124 - 134.
[10] TAMURA K, DUDLEY J, NEI M, *et al*. MEGA5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods[J]. Molecular Biology and Evolution, 2011, 28(10): 2731 - 2739.

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resort to administrative mediation first before the judicial proceedings. In the long run, judicial protection capacity should be gradually improved, experience of hearing such cases should be summarized timely, and professional trainings organized for judges to improve their law enforcement quality and protect benefits of right owners effectively.

References

[1] China's Ministry of Commerce. The analysis report of China agricultural products export in 2009[R]. (in Chinese).
[2] Japan's investigation of carnation from China[N]. Reference News, 2006 - 05 - 12. (in Chinese).
[3] SI YN. Guard against the Japanese new "species barrier[J]. Northwest Horticulture, 2004(2): 53 - 55. (in Chinese).
[4] GU HJ. Analysis on economy effect of Japan's amendment[J]. World Agriculture, 2005(3): 21 - 24. (in Chinese).
[5] Chinese Oil Network. China's soybean imports helped Monsanto rewarding [EB/OL]. (2001 - 04 - 07) www. cnyouzhi. com/html/Articles/200 90407/39762. htm.
[6] China's Ministry of Commerce. The analysis report of China agricultural products export in 2009[R]. (in Chinese).
[7] HU RF, HUANG J, PRAY C, *et al*. Impacts of plant breeders rights on rice seed prices and variety adoption in China[J]. China Soft Science, 2006(1): 49 - 56. (in Chinese).
[8] ZHU FC, YIN X. Institution reflection on the reform of traditional agricultural technology extension system and its innovation[J]. Forum on Science and Technology in China, 2009(2): 117 - 121. (in Chinese).
[9] LIAO WH. National Intellectual Property Bureau: 99% of the enterprises did not apply for a patent in China[EB/OL]. (2010 - 02 - 23) http://finance. people. com. cn/GB/1037/4335236. html.
[10] HE XY. Investigation of intellectual property rights protection in Yangling demonstration zone of agricultural enterprises[J]. Shaanxi Journal of Agricultural Sciences, 2006(6): 134 - 136. (in Chinese).
[11] LIU LF, GUO XW. The protection status, problems and countermeasures of agriculture intellectual property in China[J]. China Science and Technology Achievements, 2007(15): 15 - 17. (in Chinese).
[12] QU SQ. On Chinese traditional culture and intellectual property[M]. Beijing: Intellectual Property Press, 2006. (in Chinese).
[13] LUO ZL. Research on intellectual property rights of agricultural crop variety[D]. Wuhan: Central China Agricultural University, 2006. (in Chinese).