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China: The situation of genetically modified food and solutions to developing reliably

Genetically modified food is a controversial public topic around the world since it first appeared. No one can deny that the genetically modified food is now being involved in our daily life. Though the genetically modified technology has developed more mature, however, because the safety of the genetically modified food is closely related to the health of generations of human beings, it must be acted with caution. We must admit that genetically modified food has many advantages of solving the problem of the shortage of food, reducing the use of pesticides, saving production costs, promoting the production efficiency and so on. However, it is still something new. For lack of examination of time, there may be some hidden dangers in it, for instance, the problems of the toxic effects, the allergic reaction, the destruction of the nutrition, the resistivity to the antibiotic, etc. (Li Chuanyin, P10-11)So the research of genetically modified food still needs deepening. Thus China shouldn’t develop the genetically modified food so speedily. It is essential to make every step solid.

The transgenic plant technology started at the beginning of the 1960's, and the first genetically modified food research was done in America and began at the beginning of the 80's. The world's first genetically modified food put into commercial production in America market in 1994 approved by USDA (United States Department of Agriculture) and FDA (Food and Drug Administration) was transgenic tomato named Flavr Savr which could delay maturation. (Zhao Xingxu, P7) After entering twenty-first century, the world-wide transgenic crops developed rapidly and the total area of genetically modified crops planted in the whole world has been expanding constantly. According to a survey by ISAAA (International Service for the Acquisition of Agri-biotech Applications) in 2013, the increased planting area of genetically modified food is 5,000,000 hectares more than that in the previous year. China is one of those countries which have been developing the genetically modified food and is now the sixth largest planting area in the world, which is 4,200,000 hectares. (China Broadcast Network)

At present, many important crops can get the trait of herbicide resistance, disease resistance, insect resistance and so on through the technology of genetic modification. And the crops can produce various kinds of food material, such as edible oil, flour, syrup, flavor enhancer, toner, etc. and much more other genetically modified food. (Zhao Guangxu) Many varieties of genetically modified food are now in the markets. Corn and soybeans are the most widely found. China had considered having the genetically modified food cultivated commercially at home, but it was not approved.

On November 27, 2009, the China’s Ministry of Agriculture issued security certificates for the production and application of two transgenic rice (“Hua Hui 1” and “Bt Shanyou 63”), and another transgenic gene corn. (The Agriculture Ministry’s GM safety Management Office) This meant a major step forward for

our country to the door of the commercialization of genetically modified staple food. However, the latest news showed that the certificates have expired since 8, 17th, 2014. They haven't disclosed about the process of renew. If the continued application was not successful, it means China will not have a genetically modified staple food grain has a security certificate, not to mention the commercial license. This is an important time node for Chinese transgenic road of industrialization.

We can through a living example see the development and current situation of genetically modified food in China.

Hubei Province, Hunan Province and some other provinces especially in the south of China are planting the transgenic rice which has reached a certain scale. A farmer from Hubei Province named Dong Kejiang, who has the experience of planting rice over 30 years, can set a typical example in planting the transgenic rice. Dong Kejiang is a farmer over 50 years old from Dong Village, Tuditang Town, Jiang Xia Area. There are 7 people in his family: his parents, his wife, two sons and a daughter. He had secondary academic education, and then helped his parents to farm until now. Both of his parents are farmers, they spent most of their life on farming. His daughter at the age of 19 is at university, who is the only one in his family to have health insurance. One of his sons at 21 is helping his father in the field， another son at 14 is a junior high student. The size of his field is 9 mu (3/5 hectares). During these years, in 2 mu (2/15 hectares) of his field he plants watermelon, 2 mu (2/15 hectares) early rice and 5 mu (1/3 hectares) hybrid rice.

He did a research by himself, 1 kilogram chemical fertilizers per 1 mu (1/15 hectares) field need around 150 yuan, 1.25 seeds per 1 mu (1/15 hectares) field need about 50 yuan, 60 yuan pesticides for per 1 mu (1/15 hectares) field, 40 yuan for watering per 1 mu (1/15 hectares) field. In conclusion, the prime cost per 1 mu (1/15 hectares) field is about 300 yuan. After a year, the value of sales is around 1000 yuan, and the profit will be 700 yuan. Thus what the farmers need is to promote the volume of production.

He looked back to the end of the 1970s, there was a variety of high-yield rice popularized by the governments, but it caused a serious plant diseases and insect pests. A large number of pesticides were compelled to use in the field and it did harm to the environment. However, although the traditional seed isn't productive, it really has the advantages of great taste and fewer pesticides. Thus Mr. Dong Kejiang missed it very much, but they are lost nowadays. He once found some traditional seeds from a remote village, but this kind of rice attracted plenty of pests around the corner and the result of total crops failure forced him to give up.

He decided to plant the transgenic rice for 3 mu (1/5 hectares) field since 2005, which made him hesitate for a long time. That is because, on the one hand, he heard that the seeds may come illegally, on the other hand, some of his neighbors had got and planted this kind of seed. He also mentioned that one of the seed companies showed him a kind of seed which they said could resist the insects and didn't need the pesticides and the seeds were bred by government (the government argued that it is not true). On the package, there was no sign mentioning the genetically modified product, but just a pattern of a worm on it.

He said that farmers could get this kind of seed from some agro technical stations and some individual companies. At the first time, only a few farmers chose this kind of rice to plant. Later, more and more farmers decided to follow. But most of the farmers acted with caution towards genetically modified food. There is a fact that most of the ripe transgenic rice is sold to the individual rice companies or to feed the fowls and the farmers themselves don't eat this kind of rice. And this kind of transgenic rice doesn't mean growing without any pesticides and resisting any pest. Just spreading pesticides with fewer times and the ability of resistance to pests has the selectivity which means only affecting one special variety. He also noticed that the pests have a better ability of resistance to pesticides and the high production is not very evident. Some experts explain that situation of the experience field is quite different from the farmers' field, so the result in the farmers' fields is not perfect. Nevertheless the statement cannot get everybody convinced.

This kind of genetically modified rice is named Bt transgenic rice in academia. It has the introduction of a specific gene, which can produce Bt protein. The Bt protein can make snout moth's larva induce intestinal paralysis and death. It is such a special insect resistant function, which can get the reduction of using rice pesticide, and then achieves the purpose of increasing production. (baidubaike) In America, in accordance with the provisions of government regulations, planting Bt genetically modified maize, must be interplanting non Bt genetically modified maize at the same time, and the quantity of the non Bt genetically modified maize shall not be less than 20% of the whole corn planting area. The non BT genetically modified maize is called "refuge for insects", the aim is to give opportunities for some pests which don't eat Bt genetically modified maize to eat, lest produce new pest generation which can swallow Bt genetically modified maize.

Nevertheless, he hasn't planted this Bt transgenic rice during the past few years, because there is no more purchasers. He also forecasted that if the governments accepted and promoted the transgenic rice, the seed would be sold well.

Actually, most Chinese people do not clearly know about the genetically modified organism. There is a lack of scientific publicity and listening to public voices. In April 2010, a magazine named Xiao Kang published the survey that over 40% people in the survey think genetically modified food does harm to human health, over 2/3 people are worried about the security of genetically modified food and prefer to buy non-genetically modified food and over 1/3 people argue that transgenic crops are destructive to the ecological environment. (zhongguoxiaokang) The statistics clearly show the social psychological tendency. Even many other countries, such as Britain, think of the genetically modified as a new technology that may threaten the development of the worldwide agriculture, ecology and human's health. In Russian Federation, the government prohibits planting the genetically modified crops, they do believe there are many hidden dangers in the genetically modified food, because of the lack of the time and examinations. However, the dispute in Russian Federation has never subsided. However, many people still believe in the new technology and the production, because some of them are approved by the administration. (Zhao Xingxu, P8) There was a statement that American have had genetically modified food trustingly more than a decade which has been denied by many Americans in Cui Yongyuan's

investigation, who is a deputy to the People's Congress. But America has the most optimistic attitude towards the genetically modified food and plant most widely.

In addition, scientists in the international academia haven't reached a consensus with regard to the safety evaluation. Because many governments poured money into the genetically modified technology research, many scientists have contributions to the development of the genetically modified food. Martina Newell McGlonghlin, a biology scientist from the University of California at Davis who was invited to have an academic exchange with China , has said that though the older generation of bio-tech-products were not perfect, they are perfectly safe and perfectly fine, but the newer technology can even be better. Bridget Owen, an assistant governor from NSRL (Natural Science Research Laboratory), said that the topic has been researched significantly for many years and the risk assessment has been done around the world, all the studies have found no risk to human health, animal health or to the environment. Some scientists object to it with some scientific evidence. For example, Nancy L. Swanson, a professor in Western Washington University, has discovered that growth coefficients of some diseases and the development of the genetically modified food are similar more than 0.9(1 is perfect). David R. Schubert, a professor of neurobiology from Salk biological institute, said that Bt toxin can be a good example. Bt toxin is widely involved in the genetically modified rice, but little in the genetically modified beans. And a recent research paper showed that some rodents (eg. Rabbits and mice) and pigs which are fed by Bt toxin will get the inflammatory bowel. Therefore, he has questioned the security of the genetically modified food. (Cui Yongyuan's documentary)

In my opinion, China shouldn't hurry for commercialization of genetically modified foods. As a developing country which has advanced biotechnology, China should adhere to the important policy of "Scientific planning, Study actively, Advance steadily, Strengthen management" and the principle of Substantial Equivalence from *Safety Evaluation of Foods Derived* by Modern Biotechnology-Concepts and Principles, which was set by OECD (Organization for Economic Cooperation and Development) in 1993. Meanwhile, all of actions should be according to the national conditions.

What's more, for the Chinese government, the legislation is the foundation of the management, because there is a fact that China has no enough special legislation on genetically modified food safety issues. Many other countries like America, Australia and European Union have enacted a set of laws and regulations. European Union use the precautionary principle as the basic of the management of the genetically modified food, and it has the Transgenic Biological Instruction of The Intention Environmental Emissions and 5 specific regulations [Regulation (EC) 1829/2003, Regulation (EC) 1830/2003, Commission Regulation (EC) 65/2004 Commission Regulation (EC) 641/2004, Directive 2001/18/EC]. In America, FPPA, FFD-CA, FIFRA, TSCA, FFD-CA are the laws towards the biotechnology. In Australia, Food Standards Australia New Zealand (FSANZ) has set <Food Standards Law Code>, it has the special provisions to the genetically modified food and Australian Pesticides and Veterinary Medicines Authority (APVMA) has its own laws which are under the Law Code. The legislation can set up under conditions prescribed by CAC (Codex Alimentarius Commission), such as, Principles for the Risk Analysis of Foods Derived from Modern Bio-technology (CAC/GL 44-2003),

Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants (CAC/GL 45-2003), Guideline for the Conduct of Food Safety Assessment of Foods Produced using Recombinant-DNA Microorganisms (CAC/GL 46-2003). On top of this, it is necessary to establish a unified and coordinated, comprehensive and effective management mechanism to define the department responsibilities for the work. Such as, the National Development and Reform Commission should bear the responsibility of formulating plans and policies, the Ministry of Agriculture should shoulder the responsibility of procedure for examination and approval, the Ministry of Health should to manage the sanitation and food hygiene, the Ministry of Science and Technology is responsible for biotechnology research and development and safety assessment, the Ministry of Commerce takes the responsibility of input and export management. All of these ministries should be interconnected and coordinate with each other. Genetically Modified food safety detection is the basic and core of the safety management. The great sums of data are significant references for judging the safety. Thus it is vital to establish and develop the data base. (Chen Wenbing, 2005) For instance, GMO Compass, Biosafety Clearing-House and ADBios set good examples. The information should absorb not only basic information about food, but also the results of research, the methods to detect and so on. (China Agriculture University, P216)

Not only does the government need to strengthen the publicity objectively and elevate the management effectively, but also scientists need to deepen the research and improve the technology so that it can give a convincing guarantee. The products must be in conformity with the principle of Substantial Equivalence. The risk perception is socially constructed. The safety problems can’t be overlooked, as it concerns the very existence of human beings. The research should have independence from the society, the experience seeds cannot be available in markets. Because of this, a subsidiary company of Huazhong Agriculture University had been punished. (ChengDu Daily Evening News) The precautionary approach is needed at the same time. The precautionary approach should be clear enough to response to emergencies effectively. It must include the compensation. Towards the transitional corporations, the import and export management system should be perfected and tight up. The products must be exanimated and approved. There shouldn’t be direct actions between farmers and corporations, the dispute should be handled by special committee or let governments involved in.

Although genetically modified crops have significant potential to increase production and farmers’ incomes. As for farmers, it is a better way to teach them how to use the local crops effectively if government wants to bring benefits to them. In order to let farmers know more about their local situation, township governments and village committee should set up some related knowledge trainings taught by specialists on a regular basic (maybe twice a year as reference) and give the fund for support. Giving the special lecture to introduce the modern equipment and technology, handing out knowledge handbooks, putting up posters are possible way in village. The topic can involve, such as, how to use adequate crop rotation, green manure and fallowing to maintain and enhance land capacity. The scientific knowledge and specialized knowledge would be gained from the education. Therefore, the children must receive compulsory education and should be encouraged to receive higher level education. If a student who achieved university degree or above come back to devote themselves into develop the farming practice, the township government should give reward according to their contribution. And farmers should raise

awareness of rights and can fight for their own rights by using laws as weapon. The process from purchasing seeds to selling crops should run legally.

There are many other ways to elevate the farming, such as the development of planting technology, irrigation equipment and many other aspects even the social welfare and insurance can help farmers to live a better life. The new rural cooperative medical insurance system in China should be widened and deepened to give a guarantee to the farmers' health. The development of agriculture of China cannot depend on genetically modified food. Instead, we should develop organic foodstuffs which is good for the health and environment or hybridization which could develop production safely and improve the system of the safe production of agricultural produce. The Chinese farmers have rich traditional experience in using manure to attach the importance between soil and nature. The organic agriculture has been one of key fields in 16 multidisciplinary actions. There are also some challenges, including the lack of encourage policy, certified enterprises' self-discipline is not strong and others. (Chen Shengming and Lu Guoquan) Chinese hybrid rice technology research and extension has been in a leading position in the world, but compared with western developed countries, the degree of industrialization technology of hybrid rice is not very high, that is because the Chinese economic and social environment are closely related. The state macro-control policy directly affects the acreage planted to hybrid rice especially in the early days. From the beginning of the 90's, the extension of hybrid rice was introduced to the market mechanism, the hybrid rice area accounted for more than half of the total area of the rice planting and the level is tending to stability. Main problems in the industrialization process are the separation between scientific research and enterprise system, market disorder, seed regional blockade. In addition, the stereoscopic agriculture and mechanizing production and can be good measures to raise production, which is suitable for large farms. According to the limitation of funds and resources, farmers can cooperate though farmer cooperative, family farm or others to realize mass production.

As a student of new period and ordinary people, what we need to do is to have a good command of basic knowledge and related knowledge and be concerned for hot spots of society and all mankind. We can propaganda basic knowledge and related knowledge through posters, articles, research and so on to acquaint more people with the genetically modified food in case that they don't know what they eat in their daily life. We can also be supervisors to expose illegal activities to protect civil rights. People can make up local or international organization to let more people take part in the discussion of the issues. Global Chinese GM Problem Concern Group has though a comprehensive appeal to strongly call for The Party Central Committee, the National People's Congress and all levels of government to order an immediate halt to promote commercialization of genetically modified crops and stop the import and export of genetically modified food. Greenpeace is also a notable organization. They use researches and reports to expose and reflect the fact. For instance, they reported that there is illegal GM rice in markets of Hubei Province. (China.com)

As for the manufacturers which take the direct actions to the genetically modified produce, they should be supervised to mark it clearly to remind the customers and protect the right of choice independently and the right to know. There was a counter-example in October, 2003. A Shanghai consumer charged Nestle

SA for using the genetically modified product without marking which did harm to the civil right to know. The mark should be ruled the size, composition and specific aspects.

There is an old saying “food is the first happiness of people” in China, meaning that food should be the basic material of individuals’ life, thus every step of genetically modified food development should be cautious and careful when we enjoy the advantages. I do hope we can have a secure environment and a better life.

Works Cited

China Agriculture University. *Genetically Modifies Organisms Food Safety Detection and Standardization*. (Beijing: China Materials Press. 2010) ISBN 978-7-5047-3317-7

Zhao Xingxu. *Transgenic Food Biotechnology and Safety Assessment*. (Beijing: China Light Industry Press. 2009) ISBN 978-7-5019-6897-8

Nan Bingdong, “Genetically Modified Food Safety Research”,in http://www.paper.edu.cn

Li Chuanyin, “The Advantages and Disadvantages of Genetically Modified Food”, in *Bulletin of Biology*, the ninth issue (2001), P10-11

Hua Ling, “Development and Social Efforts of Transgenosis Technology” , in Chemical Industry Times, Vol.21 NO.4 (Apr. 2007)

Zhang Junxiang, Li Xiaofeng, “Prospects of the development of Genetically Modified Foods in China”, in China Technology Summit, NO.11 (2011)

OECD Safety evaluation of foods derived by modern biotechnology: concepts and principles, organization for Economic cooperation and Development(OECD) pairs 1993

FDA Guidance for Industry Use of Antibiotic Resistance Mark Genes in Transgenic plants

The Agriculture Ministry’s GM safety Management Office,《2009 年第二批农业转基因生物安全证书批准清单》 http://www.moa.gov.cn/ztzl/zjyqwgz/spxx/201202/t20120203_2474158.htm

China Broadcast Network. China is now the sixth largest planting area of GMF in the world.13 Feb. 2014. http://china.cnr.cn/NewsFeeds/201402/t20140213_514845075.shtml

Chen Shengming and Lu Guoquan. *Organic Agriculture and Food Securty.* (Beijing Press.)

Bt protein. < http://baike.baidu.com/view/703810.htm?fr=aladdin>

CHINADAILY.com.cn “Are there any genetically modified food?” < http://sp.chinadaily.com.cn/ssys/20140713/729000.html>

ChengDu Daily Evening News. “A subsidiary company of Huazhong Agriculture University had been punished.” <http://news.ifeng.com/a/20140730/41361358_0.shtml>

China.com. The appeal from Global Chinese GM Problem Concern Group. <http://club.china.com/data/thread/1011/2722/39/84/3_1.html>

China.com. “Greenpeace reported that there is illegal GM rice in markets of Hubei Province.” <http://club.china.com/data/thread/1011/2709/29/05/0_1.html>