
Shenghao Guo
Shijiazhuang Foreign Language School
Shijiazhuang, Hebei Province
China, Factor 1: Plant Science

China: The use of biotech and living creatures in productivity improvement

Introduction

Food productivity has always been the most crucial factor for a country. There are different ways of improving it such as improving the natural condition, use more advanced equipment and special planting technics. However, the most effectual way is developing plant science. Today's world is a world depending on science and every task human beings have reached can only be accomplished with the help of the development of science. Therefore, enhancing plant science is obviously the fittest way. Among the field of plant science, one central part is biotech, in which the use of living creature is a specific and efficient way. Biotech is a large field in which I pay much attention and expect in GM tech and the discovery of divergent proteins. First, about GM tech, it is universal acknowledged that this tech is a relatively mature one. This tech is being used in a large range of places worldwide, though controversial. Even some of the big countries are using it like China. China is one of the countries using GM food in a large scale, not only in divergent species but also in the range of land. Now, over 98% of current planting and using soybean seeds are genetically modified, which ensure the sufficient production of soybeans in China. Corns and tomatoes are some similar examples, too. Although productivity is ensured by using the GM food, many people still have concerns on that tech like those seeds still have some weaknesses like those seeds can generate new seeds that can be used for planting next year, making it necessary to buy new seeds every year. This may cause the situation of production out of control since most seeds are bought abroad. Another concern is that no one knows exactly what by-result will GM food cause. Because that GM tech change parts of the plants' DNA, the essential of a creature and no prediction can be made like whether this change will cause more change in human bodies. Therefore, introducing this tech need more insurance. The other two methods are not mature and need more development compared to GM tech since the application of protein is not so well developed and the use of living creatures requires particular circumstances. In conclusion, all the methods are now in developing phases but the general trend is improving. It is high time that developing countries like China should develop biotech.

Family

Size: Normally, a family in china consists of 3 generations: 4 grandparents, 2 parents and 1 to 2 children depending on the need of labor and how well the Chinese population policy is followed. Therefore, the family size is about 8 people, consisting of 4 old about 70 years old, 2 adults about 40 years old and 2 children under 25 years old.

Diet: The most common kind of meat is pork, since pigs are the most popular in China, followed by chicken, beef, lamb and fish. In southern part, people normally eat rice while in northern part they eat noodles make from wheat. For fruit and vegetables, since there are lots of technologies to keep agricultural products fresh, people all across the country eat the same species: cabbages, tomatoes,

apples, oranges and so on. Additionally, people in big cities, those who are wealthy, sometimes have snacks or health-care medicines.

Education: With the government spreading the obliged education and developing top universities for over fifteen years, people all across the country now have access to a nine-year education of duty in public schools without fees. Sometimes, rich families would choose expensive private schools for better education.

The most common choice for the bourgeois families is sending their children into the university. Since the government has expanded the enroll number for universities, it is for the children to meet the standard of college entrance exam, that means, going to normal college. The graph below shows the number of students graduating from colleges every year nationwide:



The numbers on the left mean the year and the numbers on the right is the total number in ten thousands. China has become the country with most college graduates, surpassing America; this data shows the capacity of China's high level education from another aspect.

In China, the best universities must be Peking University and Qinghua University, and the competition to get into these two schools is very cruel.

Access to health care: China has been developing infrastructures for over several decades and hospitals and local clinics are undoubtedly parts of the program. Nowadays, people all across the country get basic access to health source and are able to cure normal diseases like flu and fever. What's more, some serious physical injuries can be cured. There are normally over ten big hospitals that can serve over 10000 people per day in big cities. Also, moving doctors are the most common kind in villages who provide health care to those too poor or too busy to go to the town for curing. However, big diseases including cancer and AIDS are literally unaffordable to normal family since there is no governmental insurance and the curing process really costs a lot.

Typical Farm

Size: The most common farms in China cover approximately half square kilometer, which is enough for both planting and raising livestock.

Crops: In southern part, since there are plentiful of warm and water, providing a long period of suitable time for planting, farmers mostly plant rice. Thus the rice becomes the most popular food in the south, being made into Zongzi, rice noodles and other dishes. In northern part, the weather is relatively cold so the most popular crops are wheat, corn and potatoes that are resistant to low temperature.

Animals: Nearly all the rural families raise pigs and chickens, for pork and eggs. In some specific areas with special weather condition, specialized herds are raised. For instance, in Neimenggu Province, with endless grassland countless herds of horses and lambs are raised.

Agricultural Practices: In China, farmers' agricultural practices obey the nature rules and cycles. In spring, they select seeds, clean up the field they own and then plant the seeds. They select the species of the ear very carefully, considering not only economic profit, but also sustainable development. For instance, when planting vegetables for a long period of time, the plants would use up the nutrition in the soil and make the land barren, and thus the farmers plant soybeans that can generate and restore nutrition for a whole year and then begin to plant other crops.

All these methods come from their ancestors' experience, since no agricultural school is available for that. Then in summer, they take good care of the crops, using advanced techs nowadays like drop irrigation to keep the crops healthy through the tough summer. What's more, in some regions in the south, some species can even be harvested. Therefore, summer is the busiest season for the farmers. Autumn is the happy season for harvest, harvesting all the fruits, crops and vegetables. Since farmers are getting increasingly richer, lots of them can afford big machines that can cut down and select crops in great efficiency. In winter, with the help of plastic tent that can maintain water and heat, some farmers manage to grow fruits that are not of the season, which can be sold in a greater price than usual.

Major Barriers

Increasing Agricultural Productivity: The first barrier is the low education quality. Since education

resource in China is contributed uneven, a large proportion of farmers only get nine years' of duty education and thus they rarely know anything about scientific agriculture. Although cutting-edge machines have long been introduced to the rural area, farmers have no modern knowledge about planting and that greatly limit the efficiency of cultivation. It is universal acknowledged that planting soybeans can store nitrogen in the soil and thus provide nutrition for the coming crops. However, this knowledge only comes from experience and is not taught systematically. What's more, the farmers no nothing about managing the distance between the rows of plants in order to receive the solar energy in the greatest efficiency. All of these are basic knowledge that can be learned in some farming school but unfortunately it is obvious that Chinese farmers don't have access to better education resource till now.

The second barrier is that they can't get in touch with those really talented and knowledgeable scientists. The situation is, the scientists come up with efficient method that can greatly improve the quality and quantity of the farming but all the results remain in labs and universities, making themselves remain useless. As far as I'm concerned, if proper direction can be given to those farmers, the agricultural productivity can be well improved. For example, in a village in Hebei Province, farmers have long been planting pear trees and are always having trouble with worms. They tried to use pesticide but the lack of knowledge caused overdoes of the pesticide which result in bigger loss in profit. Finally, the government sent a group of scientists for help and their solution came out to be using bio-tech. They then introduced woodpeckers along with coccinella septempunctatas to limit the worms. This solution turned out to be very effectual and thus solve the problem without harming the environment. In conclusion, the main barrier to improve the agricultural productivity is the limitation on the modern plant science to the farmers. As long as good education situation can be achieved and appropriate instruction can be offered, the quality and quantity of the farming production will be greater than imagine.

To Employment at a Living Wages: As is well known, China has the world's largest population, which results in a strong competition when finding jobs. As shown in the graph mentioned before, the number of college graduates in China is increasing rapidly, while the working opportunity remains almost the same and thus cause a barrier/difficulty in seeking for jobs for those who just graduate. Normally, the companies would like to hire those who are mature and experienced so generally speaking, graduation means firing. Also, for those who come from the rural areas, remote regions and small villages, their low education quality become the biggest barrier for them because in modern world, a man without knowledge is useless.

农民工务工 graph

The most common result for those who come from is doing physical drudgery in the construction sites. What's more, with the increase of the average salary in China, the price of all the things keeps ascending. However, for those who don't have jobs or just starting to work, their salaries are relatively low; therefore they can't afford daily expenses. Considering these three factors, the barrier for people to get living wages is huge and almost unbreakable.

Access to Food Market and adequate nutrition: Frankly speaking, the barrier for this problem is not serious since the life quality is significantly improved after the carrying out of reform and opening-up policy. If there really is one, then it only exists in those really remote regions and provinces. Those regions are either of extreme weather condition that are unsuitable for farming or are far away from other agricultural production regions that fresh vegetables, meat and fruit can't be transported in time. A typical example is Xizang Province, which is not only remote (on a plateau) but also cold and lack of oxygen. All in all, food supply is sufficient now and the mere two problems are transportation and weather condition.

西藏各地年均温

地点	北纬	海拔高度(米)	年均温(℃)	一月均温(℃)	七月均温(℃)
安多	32° 21'	4800	-3.0	-15.0	7.9
那曲	31° 29'	4507	-1.9	13.9	8.9
昌都	31° 11'	3240.7	7.6	-2.5	16.3
当雄	30° 29'	4200	1.3	-9.9	10.8
波密	29° 52'	2750	8.5	-0.2	16.5
拉萨	29° 42'	3658	7.5	-2.2	15.1
林芝	39° 33'	3000	8.6	-0.2	15.6
泽当	29° 15'	3500	8.3	-0.7	15.5
日喀则	29° 13'	3836	6.3	-3.8	14.2
江孜	28° 55'	4040	4.7	-5.1	12.8
定日	28° 38'	4300	0.7	-11.3	10.9
察隅	28° 39'	2327.6	11.8	-4.0	18.6
帕里	27° 44'	4300	-0.1	-8.8	7.8

From left to the right in the first row is: places, altitude(meter), average temperature through the year, average temperature in January, average temperature in July.

Factor Selected: Plant Science; The use of biotech and living creatures in improving the productivity.

Nowadays, biotech has gain increasingly lots of attention, not only from the government but also companies and normal farmers gradually. In other words, biotech is gaining itself a high status especially since the sustainable development began to be highlighted. It's a recent trend that every country, every person is taking sustainable development seriously. However, because that people has been using chemical herbicide, pesticide and other harmful substances for a long period of time, it is very hard to change people's way of thinking and acting. Moreover, although it is high time that human should come up with a new environmental friendly way of improving agricultural productivity but such a method is not facile to find. Here, biotech provides a solution, both beneficial to the environment and profitable. Most importantly, since China has the biggest population in the world, its

demand for cutting-edge biotech is urgent. Therefore, the status of biotech becomes very high, a crucial status, and the government is putting in effort in developing it. The development of agricultural biotech then becomes one of the priorities for China.

In China, the most important place for this research is Chinese Agricultural Science Academy. It consists of several labs each developing diverse aspect including the GM species, worm protection and planting equipment. This academy is funded by the government and receives over hundreds of millions RMB each year. All of its research results are examined and put into use as long as they are proved to be efficient and secure. Thanks to the academy and the fund, Chinese biotech level is increasing rapidly, greatly improving food productivity. The trend for the biotech is increasing results from another reason: individual researchers and farmers. An outstanding example is a father and a son in Hunan Province. They are typical farmers but they devote their passion to the development of new cole flower hybrids. They faced a big barrier of the lack of fund and they couldn't even make lives. Finally, they came up with a new hybrid that unprecedentedly improves the productivity of the cole flowers. Most importantly, they finished this task with no help from the government or other scientists. From them we can see the potential of individuals and the power of strong willing.

For typical family, biotech is something that can bring benefit but in some aspects inaccessible. Obviously, if the family can make good use of biotech, it can reduce expense and improve the productivity. GM seeds are planted widely in China and are bringing big profit to Chinese farmers. The graph below shows the range and the profit of GM plants. Some other biotech is now in use, too, but they were not widely spread, such as using natural enemies to expel harmful species or using natural pesticide produced from living creatures. Technically, except GM tech, other biotech is not ready for using widely: some are too expensive and others need specific conditions. Take the use of frogs for example: frogs need to live somewhere full of shallow pond and waters, so they are suitable in south; however, since northern part is lack of water and generally plant wheat, frogs have nowhere to live and thus make using frogs to deal with harmful worms impossible in the north. So the general situation is that the most efficient and popular biotech now in use is GM tech but the use of living creatures is a very potential one. If the use of living creature can be spread, then farmers would not only change the crops they plant to fit the animals, but also develop agriculture in different dimensions like combining planting with livestock husbandry. What's more, agriculture will be more eco-friendly and contribute to the sustainable development.

In the country aspect, the use of biotech will undoubtedly ensure the sufficient food support to the large population. Moreover, since the total area for agriculture is almost unchangeable now, the only way to enhance the productivity is to improve the planting efficiency. Although biotech is the kind of technology that requires a long period of researching time and capital, it is worth the spending. Most importantly, the environment problem is very serious in China now. Biotech can provide ways of absorb wastes and reduce the omitting of carbon dioxide. From these two aspects, developing biotech is beneficial to China.

Other Factors

When things come to the use of living creature, the most influential factor must be the natural circumstance, the weather condition for most of the creatures that can be used need specific weather

conditions to make their lives. Take woodpecker for example. Generally, they feed one worms that live on pine trees and pine trees do not live in tropical areas and thus introducing woodpeckers to tropical regions to control harmful worms is no possible. Another factor is the proper combine of different creatures. We can still use the example of woodpeckers. Woodpecker, from its name we can see “wood” in it. And the fact is they have to build their nests on the trees and eat worm in the trees so it would very inappropriate to use them in fields that plant wheat or rice. These two factors affect the use of living creatures most and they obviously limit the application of the method. There are also some minus factors. One of them is the economic capacity of the farmers. Since using the living creature for agricultural production require at least two species and often times only one out of these two have interest in it, and farmers need to pay for the other one for no profit. What’s more, it’s harder to maintain two species’ living than maintain only one. Although more benefit can be brought, this method is still risky. This also point out the direction for future development: safer and more profitable, to find the most proper pairs of species.

Recommendations and Suggestions

- 1) Reach more education resources for further education.
- 2) Learn more about biotech, like the basic limits, the suitable seasons.
- 3) Try to set plans and bases for creatures farmers will use.
- 4) Farmers form groups to buy needed creatures and raise them together.
- 5) Hire experts to keep the creatures and learn from them.
- 6) Regularly invite doctors and scientists to monitor the eco-system and the health condition of the using creatures.
- 7) Communities gather farmers together to build pit, buy needed animals and hire people to look after them.
- 8) Communities provide insurance in order to reduce the loss of the farmers once the project fails; Farmers are vulnerable because of their low income and poverty.
- 9) Government motivates national scientists to go to the villages for field trip.

-
- 10) Government funds potential individual projects and monitor them.
 - 11) Government sets up special agency to supervise GM tech and applied mutant proteins.
 - 12) Organization builds up co-relationship with farmers, offering regular scientific direction and funds.

Local Project

In Shijiazhuang, Hebei, my hometown, a university called Hebei Normal University has a project developing specialized protein. It's a project led by a professor from biology faculty. It mainly focuses on proteins that plants generate when facing stimulus and try to apply them. One of the items is to observe a protein that was generated when plants are in hot condition. Researchers try to inject the protein into healthy plants and see whether they become heat resistant. It is still in process but it a renovation in biotech field. Once it is finished, the protein can be produced in the factories and be applied in real fields.

Conclusion

Biotech is a big field, improving rapidly and is full of potential and hope, with an optimistic trend. First, about GM tech, it is quite mature now and is being applied in a large range of countries. Although it is disputable, more people are likely to support it because the benefit it brings obviously overcomes the potential harm. It is necessary for the government to ensure the quality of modified seeds for it can strongly affect a country's wealth and security, as well as the benefit of all the farmers. All in all, GM tech is still the most efficient biotech method that can greatly improve the agricultural productivity now. Second, I'd like to state that using proper pairs of creatures to improve the productivity is a very important method, hopefully it can increase another interest resource for farmers and at the same time save the environment. The most common example is rice and farm cattle. Farm cattle can not only serve as a primary function of plowing the land, but can also make the soil more solid so that it can hold the water the rice needs for growth. Moreover, cattle can also be traded and eaten, providing another income for the farmers. Admittedly, this method is not ready to be applied in real fields but sooner or later it will. Finally, maybe the most cutting-edge method, is the specialized protein. I would have no idea about it if I didn't go to the nearby university. There learnt how this infant tech was developed and how it will work in the future, and I finally decide to include it in my paper because I give most attention and expect on it. I believe it is the one that can change the world, for it is not only useful in agriculture but also in health care and so on. It is new and it is unlimited. This biotech is the most unreliable one so we can expect it to appear in front us in a short time, but the day it is mature is the day that productivity can be ensured.

Work Cited

Wang X., Ma X. and Wang H. etc. “ *Proteomic study of microsomal proteins reveals a key role for Arabidopsis annexin 1 in mediating heat stress-induced increase in intracellular calcium levels*” The Purdue OWL. Jan 13, 2015. Web.

Bai Y.S. “ *35 years of dream: a father and a son’s journey for cole flower hybrid*” The Purdue OWL. Feb 2, 2014. Web.

China Meteorological Administration “ *Weather condition in Xizang Province*” The Purdue OWL. Feb 24, 2015. Web.

Li X. “ *The mechanism of soybeans restoring nitrogen in divergent soil*” The Purdue OWL. Dec 31, 2014. Web.

Hao A.P. Hou J.C. “ *The present situation and future of the use of living creatures to control worm harm, Forest Science*” The Purdue OWL. April 23,2002. Web.

