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# Issues and Recommendations on Supply-Side Structural Reform of Maize in China

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**Abstract:** The background of supply-side structural reform of maize in China to solve the problems caused by the temporary purchase and storage policy of maize. The eight years of the policy's implementation leads to issues related to maize's excessively temporary inventory, manifested as the significant increase in numbers of its planting area, its output, it and its substitutes' import have. The key concept of maize's supply-side structural reform is to replace the previous policy with the "marketized acquisition with subsidy" in order to allow the market to be a more important role in the determination of maize's producing, consuming and purchasing, which contributes to solve current issues. In the practice of the reform from 2016 to 2017, the influence is notable that the number of the planting area and output have decreased to a certain extent, and the government's inventory has decreased accordingly. But there are still some concerns in the maize industry to be addressed, including balancing the interests in the short term and long term, reducing the effect of auction on inventory, balancing the relationship between the product price and planting income, reducing the potential negative effect of new processing capacity on the whole industry, taking other unfavorable factors into account, and considering the related enterprises' lack of risk awareness. Given the above analysis, six suggestions are put forward by the author, including to design the policy on the basis of breaking the contradiction cycle, to ensure the market's effective operation, to promote the marketization of maize price with full use of the tool of insurances and futures, to prudently implement maize processing projects, to improve farmer's management ability, and to improve the enterprises' risk management ability by perfecting market system.

**Keywords:** Maize, Supply-side Structural Reform, Temporary Purchase and Storage, Structural Adjustment, Reduce Inventory, Planting Area, Price, Yield

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## 1. Introduction

In the course of the development of agriculture in China, issues on its structure constantly emerged. The Central Rural Conference in 2015 emphasized that it is necessary to solve long outstanding issues through implementing the agricultural supply-side structural reform to form an effective supply of agricultural products with a reasonable structure and impactful support. Among these issues, the structure of maize planted is most apparent.

From 2008 to 2014, with the implementation of China's temporary purchase and storage policy of maize, the policy price increased yearly, which led to the increase of market price accordingly. Taking the C. I. F. price in Shenzhen as a representative of sales regions, it increased from 1800 yuan/ton in 2009 to 2500 yuan/ton in 2011, risen by

38.9%. The price was maintained at 2500 yuan/ton until 2015, and the price difference with international market was once up to 1000 yuan/ton. In terms of the area planted, it increased from 31.8 million hectares in 2009 to 38.12 million hectares in 2015, risen by 22.3%. The output of maize increased from 164 million tons in 2009 to 225 million tons in 2015, risen by 37.2%. The import of maize increased to 40 million tons in 2015 due to the over high domestic price of maize for local customer companies. By eight years of consecutively implementing the policy, the government's temporary inventory of maize was once up to 2.5 billion tons. In order to solve issues listed above, China started to implement the agricultural supply-side structural reform. The key concept is to replace the previous policy by marketing tools, including the marketized acquisition with subsidy to allow the market to determine maize's price, thus adjust market participants'

behaviors to reduce its area and government's intervention.

## 2. Review

Current researches on the supply-side structural reform of maize are mainly limited to the field of discussing the reform's necessity from the perspective of the high output and government inventory [1-3]. In terms of methods to carry on the reform, some studies put forward general suggestions like "the subsidy shall be separated from the market price to ensure the principle of being marketized" [2, 3]. A few studies come up with operational suggestions including switching to plant other crops, strengthening farmers' skill training [4], optimizing the planting structure and carrying out the soybean revitalization plan [5], and increasing the consumption of maize to reduce its inventory by developing and upgrading its processing industry [6, 7]. In this paper, by deeply analyzing problems and solutions of the supply-side reform, the author raises some concerns, such as balancing interests in the short term and long term, reducing the effect of the auction on inventory, dealing the relationship between the product price and planting income, reducing the potentially negative effect of the new processing capacity on the whole industry and so on. Given the above analysis, the author puts forward some solutions accordingly, such as to design the policy on the basis of breaking the cycle of contradiction, to ensure the market's effective operation, to promote the marketization of maize price with full use of the tool of insurances and futures, to prudently implement maize processing projects and so on [8]. Considering the new situation, this paper deeply demonstrates existing problems and solutions.

## 3. The Supply-side Structural Reform of Maize in China

The essence of the reform is to adjust the current crops' planting structure and reduce the inventory. Being started in 2016 and deepened in 2017, the effect of the reform on adjusting the structure go beyond the expectation. The vision for the development of maize industry in China is to adjust the structural and reduce the inventory, while there are still some issues and contradictions to be settled. Taking the negative impact of the past policy into account, the adjustment should be viewed from the perspective of the whole industry's general development. Based on the long-term layout, it is necessary to design a stable mechanism with measures to promote the sustainable development of the maize industry.

### 3.1. Positive Results of the Supply-side Structural Reform of Maize

In 2016, local governments in China were encouraged to take actions to optimize its agricultural producing structure and regional distribution in order to response to the national agricultural supply-side structural reform according to their actual situations. By methods of "replacing maize with

soybean", "replacing grain with forage", "replacing grain with oil plants", local governments reduced the area of maize planted in non-dominant regions and adjusted the agricultural planting structure [9]. The data of the National Bureau of Statistics shows that the nationwide area of maize sown in 2016 was 36.80 million  $\text{hm}^2$ , 12.57 million  $\text{hm}^2$  [10] less than 2015. The data of the Ministry of Agriculture and Rural Affairs shows that the nationwide area of maize planted decreased nearly 2 million  $\text{hm}^2$  [11], which is roughly equivalent to the estimation of some research institutions. The reduction of the area leads to the reduction of the output. The data of the CNGOIC (China National Grain and Oils Information Center) shows that maize's output in 2016 declined from 225 million tons in 2015 to 220 million tons in 2016 by 2%. It was the first time in 10 years that maize's output was in short supply. The implementation effect was encouraging in 2016.

In 2017, there was almost no difference between predictions on the area from many institutions. In early of the year, the National Bureau of Statistics of China predicted that the nationwide area of maize planted would continually decrease nearly 1.33 million  $\text{hm}^2$  for the whole year, which was consistency with the date announced by the Government Website of China [12] in late 2017 and the data forecasted by some market institutions. From 2016 to 2017, the total reduction of maize planting area was at least 2.67 million  $\text{hm}^2$  and was mainly focused in the "sickle bend" region. The current achievement is already close to the target specified in National Planting Structural Adjustment Plan (2016 - 2020) which says that by 2020 the total area of maize planted will be maintained at about 33.33 million  $\text{hm}^2$ , and the area in the key "sickle bend" region will decrease more than 3.33 million  $\text{hm}^2$ . The output of maize in 2017 was effectively reduced. The data of CNGOIC shows that it decreased from 220 million tons in 2016 by 1.82%. It is estimated that the output is 40 million tons less than its annual demand, which helps reduce the inventory smoothly.

Meanwhile, the two years' effective implementation of "the subsidy separating from the price and market purchasing" contributed to the marketization of the maize price. The domestic price was once close to or even lower than the import price, which stimulated the domestic demand to a certain extent and helped reduce the inventory. Overall, the supply-side structural reform of maize achieved some significant positive effects.

### 3.2. Issues on the Supply-side Structural Reform of Maize

The amount of temporary inventory is the redundant amount in the case of normal maize inventory. By the end of March 2018, the temporary inventory is about 180 million tons, which decreased about 70 million tons compared with its historic maximum. Although the achievement is significant, the huge inventory is still a severe financial burden for the government. The burdensome task to reduce the inventory has a tight schedule with many potential problems. The progress of the inventory reduction will be impeded if the maize planting rebounds rapidly in the future.

### **3.2.1. Negative Side of Structural Adjustment and Inventory Reduction of Maize**

The established target states that the area of maize planted in "sickle bend" region, which is the non-dominant planting region, is supposed to decrease more than 3.33 million hm<sup>2</sup>. Surveys conducted by market organizations suggest that after two consecutive years of structural adjustment, the target has been achieved by more than 80%. Considering the national average output (excluding the 2016 and 2017 when the annual output was affected by the reform), it is equivalent to reduce the output nearly 20 million tons even if the adjustment ends now. At the same time, the maize processing industry develops rapidly. A lot of related factories are established in Northeast China. It is expected that the maize's industrial consumption will increase more than 15 million tons by 2020, and the consumption as the forage will increase as well. The auction amount of maize in 2017 was 57 million tons and is expected to be more than 60 million tons in 2018. The number suggests that the combined effect of the output's decrease and the consumption's increase is significant. If the production capacity is reduced over fast, it may lead the shortage of producing. The new contradiction may emerge immediately after the old problem is solved. It is realistic to consider that how to balance the relationship between the structural adjustment and the inventory reduction in the reform.

### **3.2.2. The Maize Market's Inefficiency Caused by the Auction**

The excessive purchasing price in the maize's temporary reserve policy is the root reason for the excessive temporary inventory. Firstly, the high price causes the overcapacity of the maize's producing. Secondly, it shrinks the consumption of the downstream industry. The large price differences between the domestic and international maize market leads to a large amount of substitute such as sorghum, barley, cassava and DDGS entering the domestic market for many years. The domestic price is in line with the international market in some phases since the policy has been abolished. However, in the practice of the current inventory's auction, the timing and frequency are served by the purpose to protect farmers' interests as well. Under the condition that the reform causes the annual producing shortage, the non-market impact factor of the auction raised the price and deviated the market. In 2016, the domestic and international price difference kept increasing after the maize harvest. In 2016/17, the import amount of maize and its substitutes was more than 15 million tons. In 2017, the price difference after the maize harvest was up to 200 yuan/ton in Guangzhou port. The amount of in 2017/18 is expected to be more than 17 million tons. The existing contradiction between large domestic inventory, high maintenance cost, large import amount, and high raw materials cost for the downstream industry affects the market's efficiency.

### **3.2.3. Imbalance Between the Maize Price and Planting Income**

For a long time, the planting income was a simple calculation of multiplying the output and price, and it was

deeply understood by people that low grain price hurts the peasants. The cobweb model has its theoretical foundation. The implementation of maize's temporary purchase and storage policy in 2009 was based on the purpose to protect the farmers' income by ensuring the price not to be too low. In the reform, the principle to protect farmers' income continues in the way of subsidizing. In 2016/17, the average subsidy in the Northeast China to farmers was 300 yuan/ton while the price decreased 600 yuan/ton. The price went higher after the maize harvest and farmers' income increased accordingly. Under the expectation of better planting income, there will be a substantial increase in the planting area of maize in Northeast China in 2018. However, the cost of land leasing and agricultural production also goes up greatly, thus the total cost will increase 200 to 300 yuan/ton. In case of a significant increase in the maize output, the farmers' income will be affected directly, and even it is possible that a vicious circle of cobweb theory could be caused once the price goes down. The balance between farmers' income and the maize price is important for resolving problems and developing the maize industry in a sustainable way.

### **3.2.4. The Disturbing from New Processing Capacity of the Maize to the Industry's Development**

Increasing the consumption is another effective way to reduce the inventory. The consumption as forage and industrial material accounts for 90% of the total amount. The consumption as forage is limited by the consumption of livestock products. The current domestic consumption is higher than the number in Japan and South Korea. The peak period of growth has been over, and the subsequent growth is getting slower. Therefore, it has been mainly focused on [13] developing the industrial needs in recent years. The ongoing processing capacity in Northeast has reached about 20 million tons. Since 1990s, there are many practices to adjust the maize consumption market from the perspective of adjusting the industrial processing industry. And the experience shows that it is easy to alternate from one extreme to another. Around the middle of 1990, to consume the rotten rice, it was encouraged to set up superfluous ethanol fuel factories and came up with the problem of material shortage. Around 2006, the concept of bio energy also caused the boom of investing in the fuel ethanol projects, resulting in the maize price's off-season rise, which ended up with a number of policies were published to restrict the maize processing projects for many years. To reduce the maize inventory effectively, the office of the National Development and Reform Commission (NDRC) abolished the provision of Matters Relating to the Management of Deep Processing Projects for Maize in April 2017 to loosen the strict management of deep processing projects for maize. In the long run, the current surplus of maize is periodical, which is caused by the historical policy and the overuse of arable land. The new processing capacity should consider the shortage of maize supply after the inventory reduction is completed, which may result in new excessive capacity. The government should focus on regulating projects' management and

avoiding the waste of resources caused by the repeated construction. The policy adjustment must learn from the past experience and never make the similar mistake.

### **3.2.5. *The Disturbing from Other Unfavorable Factors***

Apparently, the maize supply-side structural reform aims to reduce the planting area and the temporary inventory. Essentially, its purpose is to fully integrate the producing and consuming of maize into the market, to adjust the supply and demand relationship through market rules, and to encourage farmers to be the main participant in the market to auto-adjust the planting structure. Thus, the relationship between producing, consuming and purchasing will be rationalized. However, there are many unfavorable factors in actual producing steps, including three key problems. Firstly, the long-term implementation of temporary purchase and storage policy and minimum purchase price policy make it difficult for farmers to fast adapt to the free market environment. Limited by their own educational background, information sources and market experience, it is difficult for the majority to switch from simple producers to market operators. Secondly, the traditional mode of working in an independent and scattered way does not correspond to the modern mode of a large market. China's maize planting is mainly based on small producers with small area, while large-scale planting is less common. According to the actual situation, farming as small producers will exist for a long time and for a large proportion. Considering that China insists the principle to protect farmers' interests to ensure the stable development of the country, the cost of maize marketization will be increased. Thirdly, government guidance under certain conditions may adversely affect the structural adjustment. It is difficult for the government to accurately judge the ever-changing market. In the past two years, there was some case that government used to overly encourage farmers to plant other grains to replace the maize. At the end, these grains were over produced, and the market prices were so low that farmers suffered the loss of income.

### **3.2.6. *Difficulties for Enterprises to Manage Market Risks Caused by the Lack of Risk Awareness***

In the daily operations of domestic processing enterprises, the majority are happened in the independent spot market, and conducted in line with its basic situation and development trend. The spot market is unilateral and with great risks in producing and operating. Most enterprises have not fully realized the importance of the futures market in managing the price risk. Through investigations, it is noticed that there are three main reasons for it. Firstly, the implementation of maize temporary purchase and storage policy has interfered the normal formation of market prices. The maize futures market was not active enough to effectively play the market function, which resulted in a low degree of concern and participation of enterprises. Secondly, with the long-term policy expectations, the market situation is clear, and the competition between enterprises are mainly about management and technology, which reduces enterprises' awareness to actively manage market risks.

Thirdly, most of the enterprises are small in scale, unsound in mechanism, weak in risk management awareness, inadequate in risk prevention measures, and lack of talents in futures industry. Thus, the ability to manage risks in the futures market is limited.

## **4. Recommendations**

### **4.1. *Adjusting the Structure Smoothly and Breaking the Cycle of Contradictions***

Adjusting the planting structure should be in line with the market's reality and should prevent the output from changing over radically. Meanwhile, in order to better play the government's role in the market adjustment, the government should focus on problems of the over exploitation, over fertilization and overuse of cultivated land caused by pursuing high grain output for a long time. Besides, the government should learn from the United States' Land Fallow Protection Reserve Plan to provide financial supports to a certain number of cultivated lands with poor resources and fragile environment [14], and encourage the rotation and fallow. It helps reduce maize inventory, recover the productivity and promote the output of the cultivated land. Thus, the cycle of contradictions alerting from one extreme to the other one will be broken.

### **4.2. *Properly Arranging the Auction to Ensure the Effective Operation of the Market***

In the current situation with the large temporary inventory and import, the most effective way of adjusting structure and reducing producing capacity is to lower the domestic price. The amount of domestic producing and imports could be reduced by the interest guiding mechanism. It would be to properly arrange the auction's schedule by changing the previous mode of conducting at fixed time into perennial actions, increasing the auction volume moderately to effectively manage conflicts of the large inventory, high domestic price and large imports. It helps ensure the reasonable structure of the upstream and downstream industries of maize and the effective operation of the maize market.

### **4.3. *Insuring the Farmers' Income by Using the Tool of Insurances and Futures***

Setting the grain price as an index to measure the farmers' planting income will result in a non-marketable method intervening the price. However, the planting income comes by multiplying the price to the output. The price itself could not reflect the farmers' planting income. The US government protects the its farmers' income through agricultural income insurance. For maize, the way to calculate the insured amount is that in March the settlement price could be chosen from a maize futures' contract of December to multiply to the average output of 5 years. In 2012, the post-disaster income insurance covered from 50 percent to 90 percent [15]. Thus, their planting income can be basically guaranteed in the case

of large fluctuations in prices and output. China should learn from the US agricultural income insurance policy to protect its farmers' planting interests. At the same time, China has carried out "insurances + futures" pilot work on maize and soybean planting for 3 years, which has protected the farmers' planting interests [16] to some extent. Insurances and futures can play a more important role in protecting the interests by summarizing and promoting the current experience.

#### ***4.4. Prudently Implement Maize Processing Projects and Developing the Industry in the Long Term***

In recent years, the surplus of maize in China is temporarily caused by the policy guidance and overuse of cultivated land. After the reform, the situation of the market's supply and demand will be basically balanced or even insufficient supply. New processing projects should be considered in three aspects. Firstly, the new producing capacity should take the subsequent supply of maize into account. The demand for wheat and maize should be based on the domestic market to ensure the food security. Secondly, the overall domestic situation must be considered especially the supply and demand relationship. Currently, only in the northeast area the supply of the maize is surplus. It seems to be beneficial by distributing a large number of processing projects there, while actually affects the balanced development of the whole country. To meet the demand of moving out low-end industries in big cities such as Guangzhou and Shenzhen, the Northeast could develop the forage and aquaculture industry which helps retain the added value in Northeast and benefit the development of the domestic relevant industrial chain. Thirdly, the maize industry should focus on the long-term development by learning from past lessons, avoiding the new contradiction constantly emerging, making plans in advance and coordinating the development. It is necessary to adjust the structure and reduce inventory to lower its management cost and prevent the risk of the quality being spoiled. Meanwhile, it also needs to plan from the overall perspective, increase the accordance of the local and the central, and the balance of supply and demand,

#### ***4.5. Improving Farmers' Market Operation Capability and Consolidating the Reform's Achievements***

Under the scattered production model of maize, in order to consolidate the reform's achievements, it is necessary to improve farmers' market operation capability from three aspects. Firstly, by drawing on developed countries' experience, the skill training system for farmers can be set based on relying on agricultural technology extension schools, training centers, agricultural technology promotion institutions and others. Through the system, farmers' abilities in sensing and judging the market can be cultivated. They could be market participants those who can decide and operate independently. Secondly, by making full use of local organizations and rural cooperatives, the large market

awareness can be formed. Forming substantial or at least formal cooperative organizations will help adapt to the socialized grand production and large markets. Sharing information and resources enables farmers to actively adjust the planting structure, accurately grasp the timing of grain sales, use futures market to avoid planting risks and rationally lock in the planting income. Thirdly, the government's service function should be brought into full play. It must carefully conduct investigating, monitoring and statistics, accurately release the information related to producing, marketing and policing, provide a good support in market guidance and information services, and help farmers to judge market and price trends.

#### ***4.6. Improving Enterprises' Risk Management Ability by Perfecting Market System***

To improve enterprises' risk management ability, firstly, the market mechanism needs to be perfected. With the abolition of the maize temporary purchase and storage policy, the marketing degree should be constantly promoted to allow the maize market to form a reasonable supply and demand structure according to the market rules. The maize futures market should be more active to fully realize its function of price discovering and risk hedging. The maize OTC options market should be constructed gradually to launch maize options. Secondly, enterprises' risk awareness and risk management ability should be cultivated by relying on the governmental and industrial organizations and learning from the experience of developed countries. With the implementation preferential loan policies for risk management, enterprises can be encouraged to actively learn to use the futures tools to manage spot operational risks. Thirdly, small and medium enterprises' management mechanism can be established and improved by relying on industry organizations and relevant market organizations to formulate risk prevention measures, train risk management personnel, recruit risk management talents, and improve the ability to manage risk.

## **5. Conclusion**

Through the above discussion, the following three main conclusions are obtained:

- (1) The supply-side structural reform of maize has acquired a great of achievements. Realizing the market-oriented reform's contribution to the healthy development of the maize industry, the government should considerate using fewer non-market-oriented means to intervene in the market.
- (2) The development of maize industry should be combined with using tools like insurances to ensure farmers' income and reduce the impact of price fluctuations on income. Meanwhile, the development should be based on a long-term vision to avoid the interference from the short sightedness.
- (3) The government should focus on cultivating market entities. Farmers should be educated to be able to judge

the market and operate the business independently while processing enterprises should be trained to use risk tools to effectively avoid market risks caused by price fluctuations.

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