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# Research on Agricultural Product Price Risk and Risk Management

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**Abstract** There are a variety of reasons for agricultural product price risk, and drastic volatility in agricultural product price can give a tremendous negative impact on agriculture and even whole society. The paper argues that the agricultural product price risks include (i) price risk caused by decrease in yield and quality of agricultural products due to natural disasters; (ii) price risk caused by actual change of the market supply and demand; (iii) price fluctuation risk caused by the change of the price of the related products; (iv) sharp price volatility risk caused by market speculation; (v) risk caused by periodic property of agricultural products and lack of elasticity of agricultural demand; (vi) risk caused by lack of government management. Agricultural product price risk poses great harm to farmers, small and medium-sized agricultural operators and general consumers. This paper brings forward the specific recommendations for solving agricultural product price risk.

**Key words** Agricultural products, Price risk, Risk management

## 1 Reasons for agricultural product price risk

**1.1 Natural disasters** (i) Price rise risk caused by decline in yield of agricultural products due to disasters. Firstly, China's complex geographical environment determines great possibility in the occurrence of agricultural natural disasters, thus seriously affecting the yield of agricultural products in China. Secondly, China's complex geographical environment determines the diversity of agricultural natural risk types. In general, the south has high temperature and heavy rain while the north has low temperature and drought, but there will be the opposite situation, causing great uncertainty in the impact on agriculture, thus affecting the yield of agricultural products. (ii) Price decline risk caused by decline in agricultural product quality due to disasters. Agriculture is greatly dependent on natural conditions, and agricultural products have different demand on rain, drought and light, but rain and snow are uncontrollable factors. Drought is conducive to photosynthesis but leads to crop growth problems, heavy rain is not conducive to the formation of photosynthesis, and drought and flood will lead to the occurrence of pests and diseases, further affecting the quality of agricultural products and causing price decline risk of agricultural products.

**1.2 Changes in actual market supply and demand** (i) Price rise risk caused by unchanged supply and rising demand. Due to the characteristics of the market economy, the supply of certain types of agricultural products is affected by the production cycle, and if actual market demand greatly increases but yield is relatively stable, the price will naturally rise, to a certain extent bringing risk. In January 2017, affected by rising demand during Spring Festival, the price of aquatic products rose by 6.4%, meat price rose by 5.7%, and pork price rose by 7.1%<sup>[1]</sup>. (ii) Price

decline risk caused by increasing supply and constant demand or decreasing demand and constant supply. The supply of eggs in China rises steadily, but due to the impact of bird flu in the winter of 2016, demand decreased, and the price of eggs continued to decline in 2017; from May 1 to May 7, 2017, the price of eggs decreased by 28.0%, reaching a new low over a decade<sup>[2]</sup>.

**1.3 Changes in the price of the related products** (i) Price fluctuation risk caused by industrial chain linkage. Agricultural products have a long growth cycle, up to about six months or even several years, so the price rise of industry chain-related products will inevitably increase the price of related products. In view of the long cycle, the products produced by the materials bought with high prices may be launched into market in the lower prices, so the price risk is relatively large. (ii) Price fluctuation risk caused by alternative price changes. In general, it forms a reverse price movement between substitutes. Taking meat and aquatic product for example, there is substitution between the two. After choosing meat, consumers will naturally reduce the demand for aquatic products, and demand reduction will inevitably lead to price decline. In meat, there is also substitution among pork, beef and mutton and poultry meat, with the same price trends.

**1.4 Market speculation** Small-scale agricultural products undergo repeated market speculation due to insufficient market supply. Taking garlic for example, the retail garlic prices soared to 20 yuan per kilogram in 2006, but after continuous sharp fall in 2007 and 2008, the lowest price even fell below 0.2 yuan per kilogram in March 2008<sup>[3]</sup>, and the highest garlic prices reach 25.6 yuan per kilogram in 2017<sup>[4]</sup>, an increase of 128 times within a decade. Violent market prices will form a great price risk. (i) Sharp price fall risk. The sharp fall price risk of agricultural products can lead to low income on investment or loss for farmers, and it will also erode the enthusiasm of the dealers for operation. The dealers will reduce the purchase and inventory to avoid great losses, and a backlog of considerable agricultural products will form for the farmers, causing a new round of price cuts, affecting the

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retail links and forming the dealer's losses. (ii) Sharp price rise risk. The sharp price rise risk will make farmers blindly expand the scale, increasing the cost of farming, but serious supply excess will lead to low prices and losses. After the sharp price rise, more agricultural products continue to rush into the market, which will inevitably lead to continuous decline in agricultural product prices. The agricultural products purchased by dealers at high cost have not yet been fully sold, and the cost is not even recovered to form a loss.

**1.5 Periodic property and lack of elasticity in demand of agricultural products** Agricultural products have cyclical characteristics, and the prices are high in the early and late market but low in the peak market. Agricultural products also have a feature that demand lacks elasticity, such as grain with rigid demand. Regardless of increase or decrease in production of these products, residents' consumption will not be much increased or reduced. The price is relatively high during non-market peak and is not very low during market peak. However, the price of vegetables and fruits is greatly affected by market period and market supply, with great relative flexibility and large price fluctuations.

**1.6 Lack of government management** The lack of government management appears in the production and sale links. In the production process, farmers' decentralized operation leads to orderly personal plan but unplanned entire market, which will inevitably bring about market demand and supply imbalance and price risk. In the sale process, the market often amplifies a certain result. The government departments fail to effectively manage. There is a large difference between purchase price of agricultural products and the consumer price, and too high logistics costs and agricultural distribution center management costs reflect the serious absence of government management.

## 2 Agricultural price risk hazards

**2.1 Harming the interests of farmers** Amid surge of agricultural product prices, farmers get far less benefits than the middleman but suffer the biggest loss in the price crash. The market price of agricultural products can give producers a certain tip so that they can make the next year's planting plan in advance. However, the market information after "surge" is free from the law of circulation market and demand market, and market information distortion can easily lead to farmers' blind planting expansion; after a slump, farmers remain overly cautious and extensively reduce or stop production. Therefore, the incorrect judgment of market information causes a great impact, which further exacerbates large fluctuations in the market of agricultural products.

**2.2 Harming the interests of small and medium-sized agricultural dealers** There are many kinds of agricultural products, the storage requirements are different, and there are many sellers, so that it can not form the business model as industrial products. Consequently, a variety of agricultural product dealers of different sizes appear naturally. The capital scale affects the ability of the enterprise to resist risks, so in the case of drastic agricultural price

changes and man-made hype or even manipulation, the small and medium-sized agricultural dealers are difficult to obtain profit, but because of relatively short sale cycle, they bear much smaller risk than the farmers.

**2.3 Harming the interests of ordinary consumers** The end consumers of agricultural products are ordinary residents, and bearing a certain cost of consumption for natural disasters is inevitable. It is natural for the ordinary residents to pay for the additional expenses for their own consumption preferences. For an agricultural product, consumers need to pay several times more than the normal price to purchase the necessities of life, and the additional expenses become the excess profits for the illicit profiteers. If all the agricultural products are manipulated, the price will be doubled and the cost of living will be also doubled, which may cause a big problem affecting social stability.

## 3 Conclusions and recommendations

**3.1 Conclusions** There are a variety of reasons for agricultural product price risk, and drastic volatility in agricultural product price can give a tremendous negative impact on agriculture and even whole society. The paper argues that the agricultural product price risks include price risk caused by decrease in yield and quality of agricultural products due to natural disasters; price risk caused by actual change of the market supply and demand; price fluctuation risk caused by the change of the price of the related products; sharp price volatility risk caused by market speculation; risk caused by periodic property of agricultural products and lack of elasticity of agricultural demand; risk caused by lack of government management. Agricultural product price risk poses great harm to farmers, small and medium-sized agricultural operators and general consumers.

**3.2 Recommendations** (i) Actively responding to natural disasters. China has diverse climate and complex terrain, so there is a great probability of occurrence of natural disasters. The relevant meteorological departments should actively do a good job in various weather warnings, and effectively deal with the natural disasters which may cause damage to agriculture and result in violent fluctuations in agricultural prices, so as to minimize the losses. (ii) Strengthening market management and preventing malicious speculation. The market economy operates according to its own rules, but human manipulation can not be ignored. Industrial and commercial departments and price department should crack down on the price manipulation behavior to maintain market order. (iii) Expanding the proportion of "company + farmers" pattern and increasing the scale of contract farming. Expanding the proportion of "company + farmers" pattern can help to effectively extend the agricultural industry chain, cope with price risk, enhance the orderly operation of agricultural industry, avoid blind investment, and deal with the risk of falling prices. (iv) Strengthening cooperation between departments and use of big data. The national agricultural departments and scientific research institutions should

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the greatest plant height while Yunrui 465 had the smallest plant height. The ear height was 70–150 cm, and the test varieties had greater ear height than the control variety Beiyu 16. Ear position ratio was 0.27–0.54, and reasonable ear position ratio was conducive to plant ventilation and lodging resistance. The number of productive ear per plant was 0.70–1.05, indicating that the double bract rate of test varieties was low. The test varieties had different degrees of grey speck disease and leaf blight resistance. TRL3 had the worst grey speck disease, reaching grade 3, and other varieties had strong grey speck disease resistance. TRL3, Yunrui 668 and Yunrui 62 had the most serious leaf blight, reaching grade 3, and other varieties had no leaf blight.

**3.2 Economic traits** As shown in Table 2, the ear length of test variety was 15.4–19.3 cm, and Yunrui 392 had the longest ear while Yunrui 339 had the shortest ear. The ear diameter was 4.6–5.2 cm, and Yunrui 465 had the largest ear diameter while Yunrui 102, Yunrui 108 and Yunrui 62 had the smallest ear diameter. The bald tip length was 0.4–3.0 cm, and Yunrui 668 had the longest bald tip while Yunrui 339 had the shortest bald tip. The ear row number was 12.8–16.4, and it was largest under CK, followed by Yunrui 465 and Yunrui 392. The number of kernels per row was 27.8–38.2 cm, and Yunrui 392 had the largest number while Yunrui 108 had the smallest number. The grain number per ear was 411–570, and Yunrui 3915 had the largest number while Yunrui 108 had the smallest number. The seed rate was 81.4–87.7%, and it was highest under CK, followed by Yunrui 506 and Yunrui 339. The thousand kernel weight was 280–385 g, and it was heaviest for Yunrui 407 while it was lightest for CK. The yield per plant was 127.6–190.6 g, and Yunrui 392 had the highest yield while TRL3 had the lowest yield.

**3.3 Yield** Studies of Evans<sup>[4]</sup> indicated that the length of the growth period of maize grain was closely related to yield. As apparent from Table 2, the test variety yield was 6343.8–10937.6 kg/ha. The yield (10937.6 kg/ha) was highest under CK<sub>1</sub>, the yield was 9281.3 kg/ha under CK<sub>2</sub>, and the average yield under CK was 10109.5 kg/ha. The yield of the test varieties was lower than under CK<sub>1</sub>, and there were two new varieties with yield higher than under CK<sub>2</sub> (Yunrui 392, 9531.3 kg/ha; Yunrui 407, 9312.5 kg/ha), and the average yield decreased by 578.2 kg/ha (a decline

of 5.7%) and 797 kg/ha (a decline of 7.9%), respectively, compared with CK. The average yield of other varieties decreased by 37.2–8.5% compared with CK.

## 4 Conclusions and discussions

The current environment for China's maize development is extremely complex, and there are some contradictions and problems difficult to deal with<sup>[5]</sup>. It is necessary to take into account high yield, high quality and wide adaptability in choosing fine maize varieties. Through comprehensive analysis of the test varieties, it was found that Yunrui 392, Yunrui 407 and Yunrui 7 had good comprehensive traits, good lodging resistance, stable yield and good disease resistance, and their yield (9531.3, 9312.5, 9250.0 kg/ha, respectively) was close to that of the control variety, indicating that there was large potential for yield increase, and these varieties could be widely planted in Chuxiong Prefecture to replace some varieties with low yield and poor resistance. Before mid-July 2015, the rainfall was rare in Chuxiong Prefecture, and especially in the early growth period of maize, drought brought some impact on normal growth of maize. The drought caused by rare rainfall at the early growth stage of maize might make the advantages of some varieties fail to appear, the yield of other varieties was low, and there was a need for further experimental observation to decide whether to widely plant.

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strengthen agricultural technical services and agricultural variety services and estimate the planting area of one agricultural variety in the country. The bureau of statistics should take full advantage of various types of statistical information for information services. The business administration departments should carry out timely supervision and inspection on the market services. The development and reform commission should timely intervene in the price manipulation behavior and regulate the behavior of market players. The meteorological departments should enhance weather warning in a timely manner, and reduce the blind expansion of production and price information asymmetry by multi-party cooperation and large data analysis and sharing so that production, sup-

ply and marketing are at a reasonable level.

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