# Book review



**The Effects of Climate Change on Crop Production and Crop Price Fluctuation in North China during the Qing Dynasty [M]**

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## The Crop is the Foundation of People: Dynamic Investigation of Dual Game Between Nature and Society

Agriculture is the foundation of China, and the crop is the foundation of Chinese people in their lives. China is a large agricultural country, and the crop price is related to farmers' interests, social stability and even national security. In recent years, with the emergence of global warming, globalization and urbanization, China's crop production is facing increasingly prominent difficulties. Today, the international community is generally concerned about the changes in crop price. It is still of great theoretical and practical significance to explore the long-term and short-term fluctuation of crop price in historical periods, as well as the institutional and technical factors reflected in them, and the correlation between various crop prices. At present, the academic circle has made considerable efforts and written abundant research on climate change in historical periods and crop price in the Qing Dynasty. Existing historical research has shown that it is often those areas with fragile agricultural environment and immature market economy structure that are more vulnerable to extreme climate. *The Effects of Climate Change on Crop Production and Crop Price Fluctuation in North China during the Qing Dynasty*, written by Professor Li Jun and his team, of China Agricultural University, is a representative in this field. The research is not limited to the interpretation of traditional historical records and statistics of disaster historical data, but also incorporates the investigation of other social factors in order to explore a more reasonable impact mechanism. Supported by the National Social Science Foundation of China, this study is the outcome of the project "Impacts of Climate Change on Crop Production and Crop Price Fluctuation in North China in Historical Period". It was first published by People's Publishing House in December 2021. The significance and value of the book is self-evident, reflected in the following aspects.

### 1. Constructing the research paradigm of regional economic history in North China

Focusing on the North China Plain, this book analyzes the relationship between climate change and crop production and price from two aspects:

On the one hand, relying on traditional historical methods to construct a research framework, and on the basis of a large number of original historical records and previous research results, it clarifies the effects of climate changes such as temperature, precipitation and disasters on crop planting changes and the related situation of crop price fluctuation in historical period. And it expounds two parts: "the basic characteristics of climate change in North China during the historical period" and "the impact of climate change on the crop cultivation in North China during the historical period". The author has sorted out the temporal

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and spatial distribution of temperature, precipitation and disaster types in North China in the Qing Dynasty, and has studied the climatic characteristics of the Little Ice Age in the Qing Dynasty. In particular, the Zhili Province, the most important region of North China in the Qing Dynasty, was selected as a case to analyze the long-term and short-term effects of climate change on the crop planting structure.

On the other hand, from the perspective of economics, the book quantifies historical data and climate change data of the Qing Dynasty to explore the correlation between climate change and crop production and crop price fluctuation. It discusses three parts: "Climate change and the crop price fluctuation in North China during the Qing Dynasty", "Market integration to mitigate the effects of climate change" and "Compensation of the impact of State behavior on climate change". At present, the Western academia often combines the research on climate and agriculture with the research results of biology, astrophysics and anthropology, and tries to add relevant variables into the discussion on climate and agricultural economy to deduce a more complete mechanism of action. Professor Li's research, apparently with the academic frontier, considers the market and government behavior factors as the buffer and compensation factors of climate change to the economic society. The development degree of the market can show the flow degree of crop between different regions, and the flow degree of resources can also show the ability of the market to buffer the fluctuation of crop price caused by climate change. After quantitative analysis of the data, he found that there was no close correlation between crop price fluctuation and various natural disasters in North China in the middle and late Qing Dynasty. Market integration and cross-regional crop circulation in North China in the Qing Dynasty mitigated the impact of climate factors on crop price. At the same time, in the Qing Dynasty, a systematic system of grain transport, storage, harvest reporting, disaster reporting and grain price reporting was established, as well as a system of state intervention in the crop market formed in the Qianlong period [1]. Their coordination ensured the timeliness of state administrative intervention in agricultural production and trade activities, thus mitigating the impact of climate change on crop price. Therefore, it is clarified that the level of market development and government behavior are also two important factors affecting crop price fluctuation.

Professor Li's research has established a paradigm for the study of economic history in North China, which relies on the foundation of traditional history and conducts interdisciplinary research at the same time. Firstly, the author has noticed that the existing studies paid more attention to the relatively developed Jiangnan Area (an area in the south of Yangtze River), while another important region of North China was not given sufficient attention. Secondly, based on the general geographical scope of "North China", the author defined the research scope as North China Plain, spanning Beijing, Tianjin, Hebei, Shandong, Henan, Anhui and Jiangsu Provinces, including 44 prefecture-level administrative units in the Qing Dynasty, according to the similarities of natural geography and meteorological environment. Thirdly, the Qing Dynasty, the intersection period of Chinese tradition and modernity, was chosen as the time axis. The author has an acute research perceptive that places China in the midst of the modernization wave of global economic and social change. The Qing Dynasty inherited the peak of Chinese traditional agricultural economic development and started the rise, fall and re-development of modern agriculture. Finally, the existing data related to grain price in the Qing Dynasty are relatively sufficient and comprehensive, and the quantitative method is feasible. Therefore, Professor Li's research is of great value in academic research and practical significance.

In the international academic circles, although western scholars emphasize the role of the environment on human economic activities, they do not blindly magnify it, but comprehensively examine various relevant variables. In the late 20th century, influenced by the theory of disaster economics, to a large extent, the discussion of crop security in western academia shifted from focusing on crop supply to studying the

change of crop exchange rights. This shift of paradigm allows discussion of crop issues to take into account not only environmental factors and market contexts, but also the response of different classes of people to famine, as well as the problem of political or social marginalization. From the perspective of the research paradigm of regional economic history, Professor Li's research is undoubtedly macro and advanced, paying attention to the role of market and government regulation on economic development, following the track of international academic research.

## 2. The analysis mode of "literature sorting and interdisciplinary research"

Professor Li's quantitative historical research method is very worthy of reference for historical research. He analyzes and demonstrates on the basis of actual historical records and combined with interdisciplinary knowledge. The "Grain Price Database of the Qing Dynasty" (referred to as the "Grain Price Database") and the "Grain Price Table from Daoguang to Xuantong of the Qing Dynasty" (referred to as the "Grain Price Table") selected in the book are widely influential. It is a difficulty in quantitative historiography to make reasonable use of the data of ancient documents by comparing and distinguishing the two databases. The data extracted from the imprecise ancient language for quantitative analysis, Professor Li made many new attempts in the analysis of historical records and constructed new data series, which will in the following details.

Professor Li's effective integration of the knowledge of economics and history is also commendable. The two themes, climate change and crop price fluctuation, clearly belong to different fields of knowledge, and their intersection is reflected in many chapters of this book. In Chapter 5, taking the wheat market of North China before the Opium War as an example, the data of grain loading charge, transportation charge and tariffs recorded in *The Regulations of The Ministry of Revenue Formulated by Emperor,* compiled by Zailing during the reign of Tongzhi are quantitatively analyzed, and it is found that transportation charge plays a decisive role in the normal operation of wheat trade among the government states of North China in the mid-Qing Dynasty [2]. The author used Johansen's co-integration test to analyze the wheat price from 1776 to 1840, and tested whether there was an integrated market among the 44 provinces and cities in North China. It was concluded that the existence of market integration was conducive to the flow of grain between different regions, and to a certain extent, it reduced the impact of climate change on grain price fluctuation. Another example is in Chapter 6, which studies the compensation of state actions to climate change, established the quarterly sequence of state actions at the prefecture-level through the implementation of six kinds of state actions in *the Record of Qing Dynasty*, including reward, remission, delay, borrowing, trade and change of levy, and statistically analyzed the implementation frequency of each act, proving that the above state actions do not show significant seasonal characteristics. By using the comprehensive mediating effect test procedure, this book empirically analyzed the mediating effect of government disaster relief in North China wheat market from 1776 to 1840, and revealed the internal relationship between government action and natural disaster and the internal mechanism of influencing economic and social development. The ideas in the book show that the author has his own understanding of the theories and methods of quantitative history, which is of great enlightening significance to the domestic historians who attach importance to the interpretation of historical records but ignore the analysis of data.

## 3. Reconstruction of the data series of disasters of prefecture per month

The most personal characteristic of Professor Li's research is his qualitative and quantitative approach to historical records. The reason why the research group of quantitative history is minority is that it is too difficult to datalize historical records. From the current academic

achievements, some scholars use the method of mathematical statistics to quantitatively analyze the relationship between disasters and crop price, but lack of specific historical research for comparison. Some scholars focus on the phenomenon description of historical events, but it is difficult to get more rational and intuitive cognitive results. Mark Elvin put forward some problems of environmental history research in Mainland China in the 1990s, most of which were based on traditional data to describe environmental changes, so some articles were informative in content and anecdotal in structure, confusing natural disasters with man-made disasters (Mark Elvin *et al.*, 1995). However, what is gratifying in Professor Li's research is that his team developed their own understanding:

Firstly, they analyzed the crop price fluctuation in the middle and late Qing Dynasty (1776–1911) by using statistical and econometric methods. The existing research results on crop price fluctuation in the Qing Dynasty mostly focus on the trend, seasonality and periodicity characteristics, and less attention is paid to the volatility characteristics of crop price fluctuations, the price relationship of different crop varieties and the actual crop price changes. The main reason is the single research method, which makes it difficult to realize the comprehensive and effective analysis of the characteristics of crop price fluctuations. In view of this, Professor Li explored the seasonal effect, long-term trend, fluctuation degree and abnormal changes of crop price fluctuation in North China in the middle and late Qing Dynasty by using the ratio-to-moving-average method, the exponential long-run growth model and the Quartile Statistics, from four aspects: seasonality, trend, dispersion and correlation.

Secondly, the prefecture-level monthly data series of natural disasters in North China during the Qing Dynasty were reconstructed. In the past, the data series of natural disasters in the historical period of China were based on the provincial year, and there was no statistics of prefecture-level samples. At present, the widely used *Atlas of Drought and Flood Distribution in China in the last 500 Years* only covers drought and flood. The frequency of existing statistical data is annual data, and no monthly or quarterly frequency data have been formed. Based on the local records collected in *China Meteorological records Collection of 3000 years*, Professor Li reconstructed the monthly data of eight types of climatic events closely related to agricultural production in 44 prefectures (Province) of North China in the Qing Dynasty, including drought, flood, low temperature, high temperature, wind hail, wind haze, insect pests and epidemics. He made a breakthrough in the sample types and frequency.

Thirdly, the data series of government disaster relief per month was reconstructed in North China during the Qing Dynasty. Existing research studies on government disaster relief behaviors in the Qing Dynasty are mostly by the method of macroscopic investigation. Only a few scholars have analyzed from the two dimension of time and place, "year and province", but no research studies based on the two dimensions of "month and prefecture" have been found. Professor Li established a more detailed data series of government relief behavior based on *the Records of Qing Dynasty*, which included the categories of relief policies for hunger and poverty, the time dimension of "month" and the place dimension of "prefecture". Theoretically, according to this, daily samples can be established in time sequence frequency. As a result of that, county, prefecture and province samples can be established at administrative unit level. It is also feasible to build a daily national behavior sequence at the prefectural level. However, the author thinks that the establishment of such a high frequency national behavior sequence has no obvious benefit to the objective and content of the research topic, so it is sensible to establish the monthly data series of the prefecture-level, and the quarterly national behavior series of the prefecture-level can be further constructed.

## 4. Conclusion

*Lü's commentaries of history* (Compiled by Lü Buwei) said: "crops depend on people to sow, the soil to cultivate and the climate to nourish." Neither crop production nor crop trade is

inseparable from the cooperation of the proper time, beneficial geographical condition and human being's harmony. The topic, discussed in the book, including climate change, North China, crop production and crop price, as well as market integration and state behavior, both of which have perfectly reflected the dialectical unity of the four elements of weather, soil, man and crop, positively manifests the dynamic game between the following two systems, the natural environment and the social economy.

Professor Li has been concerned about disaster issues for nearly 20 years. As early as his doctoral study, he has taken disaster and the development of economic society as important research options. The work, having been done by his team, is of great academic value, with distinctive features of method innovation and theoretical speculation. The analysis model of "literature sorting and interdisciplinary research" used in this study, and the reconstructed prefecture-level monthly data series of natural disasters and government disaster relief behavior in North China in the Qing Dynasty are very important additions to the field of regional economic history. It is believed that the publication of this book will promote the further and extensive attention and discussion on some basic academic and theoretical issues in the field of agricultural economic history.

The study of the crop production and the change of crop price in China from the perspective of climate change is an important emerging research direction of agricultural economic history. Through the mathematical statistical analysis of crop price in the Qing Dynasty, the author may try to explore the influence of crop price fluctuation on the national economy and the periodically economic law. Crop price, socio-economic factors, historical processes and other factors can also be included in the conceptual system of climate change affecting crop security, so as to deepen the understanding of the spatio-temporal differences and nonlinear characteristics of the relationship between climate change and crop price. The agricultural history researchers are expecting for the author furthering the study and making benefits to the academic field.

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**Notes**

1. Nourish People and Gather People: State Regulation in Grain Market during Qing Dynasty (1644–1840) [J]. HU Peng; WEI Ming Kong. Agricultural History of China. 2021(6), p. 60.
2. Effects of climate change on crop production crop price fluctuation in North China during the Qing Dynasty [M]. Beijing: People's Publishing House, 2021, p. 159.