Risk Management in Agriculture: Theories and Methods

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Preface

This book is originally based on agriculture as a national economic foundation, but also a very special field, to study the issue of risk management and its existence. However, the concept of risk present in agriculture, especially in China, as a large agricultural country located in Asia, despite the natural disasters occurring very frequently, until the 1980s, agricultural risk management was few studied. After the new millennium, China's accession to WTO, the market-oriented reforms to carry out a comprehensively, increasingly strengthen risk awareness and agricultural production and management problems have been raised to the agenda. Therefore, this book attempts to collect over the past decade of our studies, to distribute from the concepts, methods and principles of agricultural production and business risk management to the readers.

Since China joined WTO in 2001, the concerns that people firstly afraid should be about the problem on "the agriculture, the rural and the farmers". Moreover, "who will feed China?" in the 21st century, in order to solve those kinds of difficulties, study the agricultural production, business risk management and decision issues becomes one of the arduous and complicated subjects of China's economic development. The agriculture in China not only is a weak and basic industry, but also it is a typical risk industry. The agricultural risk can be roughly summed up as two big kinds, which are called the natural risk and the market risk. To the entire agricultural development, other environmental factors or the exogenous factors of agriculture, like political system, law, policy and social factor and so on, may also have profound influence to its development. Thus, the development of agriculture general directly impacted by the mutual actions of the natural risk and the market risk, and indirectly come from the agricultural ecological environment, social economic environment, political and laws environment, science, technological and international economic environment and any other unfavorable factor variations of them might cause to increase agricultural

production and business risk. So that, China is making efforts to promote the modernization of agriculture, in the face of natural processes and market economy uncertainties and risks, expanding the scale of agricultural production, and forming the modern market system. The degree of agricultural organizations, marketization and socialization to improve, following more and more capital factors come into agriculture, which will make the risk management become truly important. We must study agricultural production management and business risk decision problems in using complex system methods, in order to adapt to this new historical stage existed requirements of socio-economic development.

However, uncertainty is common occurrence in natural environment, and usually impacts on agricultural production more than other industries. We are in an era of information-based economy, we find that scientific concept of information covers the relationship between risk and uncertainty. Therefore, the market risk of caused from it and the related disposal process will more relies on the information and financial technical support. This book is based on above understanding and to use of information economics and information technology extensively, to explore agricultural risk management information integration framework through the systematic economic analysis. Such as, to describe the agricultural production and business risks management as a system process, to build up system thinking pattern, which we refer it as an “Open Complex Giant System”, and think that information come from the system or its information contents is essentially important. If information is defined in system science, then different signals will form the structural concept of information, and to reduce uncertainty will be a functional concept of information. In fact, the signal and the noise, the possibility and the uncertainty, as well as the orderly and the chaos are all paired relative concepts, while only information obtained can help us. So that, obtaining information signifies to reduce uncertainty, to increase probability, to lower the system entropy and to improve the system’s order. Using information as the economic subjects or agents

can more accurately grasp the operation of the systems to cope with or deal with the risks. In addition, agricultural management decision-making under conditions of risk and uncertainty, both at the micro or macro aspect the economics analysis need to make the equilibrium study, and to pursuit of system optimization, which constitutes the study of methodology system.

Though the domestic and international scholars have already had a large amount of researching results to the risk question, yet direct against agricultural production and business risk management theory and decision methods are lack of integrating research. According to China agricultural actual development, this book goes on a deep and comparatively comprehensive study about the agricultural risk management. Including the introduction and conclusion, the full text book added up to nine chapters. The main research contents can be summarized as the following several respects:

I. Basic conceptions and theories of agricultural risk research

Based on the concept of information, to contact uncertainty and risk, to study of risk identification and measurement, constructed the basic theoretical framework of this study. These contents included in the book of Chapter 1-4, which mainly discussed such as: (i) Based on agricultural risk existed actual background and according to modern economics theory and risk management measures to construct the theory frame of risk discerning and measurement. (ii) Regarding the concept of entropy as an important foundation of the risk analysis, research and set up the inner link among the risk, uncertainty and information, to prove the equivalent relation among information entropy, variance and expected utility. It puts forward the concepts of absolute information risk, relative information risk and information technical ability risk, etc. to observe the information risk. (iii) A technical route was provided including the procedure, methods and theories of the study, the purpose at to identify,

measure and manage the operational risk of agricultural production, as well as a basis to establish the macro agricultural risk management system.

II. Concrete methods in agricultural production and business risk management

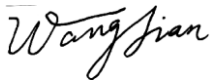
Due to agricultural risks can be divided into natural risks and market risks, therefore, their management measures have been classified as production risk management and business risk management. To reduce and prevent as risks aversion from internal of an agricultural production system, it studied the analysis of production risk and optimal. To disperse and transfer agricultural risks it introduced market risk management tools, such as insurance and future markets. Those included in Chapter 5-6, especially discussed concretely as: (i) Integrate with practice, probed into agricultural insurance and futures market tools to disperse, averse and take precautionary measures against agricultural production and business risks. (ii) Reducing risk decision methods as inner risk management tools, study with statistical analysis, such as, Quadratic programming, stochastic dominance, etc. to produce optimal strategies of agricultural production and business risk portfolio. (iii) As the markets of agricultural risk management, insurance and futures take play an important active role for certain scale of agricultural production. Here are just introduced some of preliminary analysis on the use of methodological and the market tools, basically mainly is about wheat insurance, setting agro insurance system, as well as wheat futures market analysis.

III. Exploration the macro-management system of agricultural risk

Considering agricultural risk management as an open complex giant system, set up the concept of risk-based system, especially using entropy methods to study the agriculture risk hierarchical distribution model, risk converging model, risk transmitting model and risk scattering model. Which included in Chapter 7-8, some of the main contents are as following: (i) According to risk formed pattern of described by open complex giant system theory, then summarize four possible major risk systematic rules, such as, systematic risk

hierarchies distribution, risk converging, risk transmitting and risk scattering, proposed to establish a stereoscopic and multidimensional risk management system. (ii) Based on the giant system should be open, macroscopic, complex and uncertain, defined a concept of global risks system, thus, the risk management system of agricultural production and management should be as one of its subsystems. Taking for animal disease risk desperation and spread as an example, we designed a management optimization model on. (iii) The book in Chapter 8 finally discussed to use Internet and information technology support to establish a comprehensive information management system, which will be formed Internet +agriculture (agricultural standard production, market, insurance, finance and risk management in integration). It has been a prospective development direction of modern agriculture towards intelligent era. Currently, agricultural modernization, industrialization, urbanization and informatization, i.e. "four modernization synchronization promoting" has become the strategic initiatives of enforce China's economic development.

Based on its contents, this book is intended and useful for academic community, audience and for ordinary citizens as much as the study is linked to the Chinese experience and seems to reflect the viewpoints of domestic researchers. The book also would be useful for practical experts as much as it would fill the gaps of their theoretical background. Since the book consists of a good case study of risk management in practice, it will be of interest for researchers in the fields of risk management, insurance, agriculture, agricultural economic management.



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Author's Biography

Prof. Dr. Wang Jian, the first author of this book, was born in Beijing on 13th October, 1958. He currently works in Agricultural University of Hebei, Baoding, P.R.China as a Professor. He has 110 graduated master students, 11 Ph.D students, published 18 books and more than 190 academic research papers. And he has got so many awards, honors and has the exposure to present the research papers in national and international conference. The main Scientific Research areas are Agricultural Development Programming, Environmental Protection, Agricultural Sustainable Development, Rural Information System and Network Construction, Agricultural Industrialization, Agricultural Risk Management and Insurance with China Access to WTO and the development of poultry industry in Hebei province. Besides, he has remained the Vice President of Baoding Price Society, member of American Rural Sociological Society, Director of the Association for Soft Science of China.

Dr. Abdur Rehman, the second author of this book, was born in District Chitral, on 11th April, 1982. He currently works as an Assistant Professor, in the Department of Agricultural Economics, Faculty of Agriculture, Gomal University, Dera Ismail Khan, Khyber-Pakhtunkhwa Province-Pakistan. He completed his B.Sc (Hons) and M.Sc (Hons) degrees in Agricultural Economics from the University of Agriculture Peshawar-Pakistan in 2004 and 2006 respectively. From February 2006 to September 2011, he worked as a Business development officer in Khushhali bank limited Pakistan, from September 2011 to October 2012, he taught as a lecturer of Economics in Institute of Business and Management Sciences, the University of Agriculture Peshawar-Pakistan. Besides, he completed his Ph.D in Agricultural Economics and Management from the Agricultural University of Hebei, Baoding P.R.China in 2015. He has published 9 research papers in the national and international journals.

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