Chapter 1

Introduction

1.1 Raising the Question

When we enter into the new century, we can find our lives are facing more risks that were brought by the economic development and the advance in technology than ever before. It almost becomes the general knowledge that "The high technology and high risk, the high profit and high risk" in the real life. The natural disaster as a risk factor is becoming more and more complex with the enhancement of people's recognition ability.

In the late 20th century, China implemented the planning economy for a long time. Measures dealing with the risks are characterized by command methods. As a result, we lack the market-oriented experiences fighting against the market risks. In the market economy, there is a close relationship between the risks and the people's livelihood. Therefore, there is a lack of research on how to deal with the risks by using the market mechanism. Agriculture is the foundation and the starting point of China's reform and opening. Now, we have entered a new era of economic development. The agriculture is facing unprecedented uncertainties and therefore the risks as a result of the economy transformation which is effective in improving the establishment of the market system in rural areas, optimizing the agriculture economic structure and promoting the economy of the countryside.

On December 11, 2001, China became an official member of World Trade Organization (WTO), which has laid a foundation for improving China's status in the world trade, improving the market economy, reform and opening. This is of great significance to China's economy. However, there are both opportunities and challenges facing Chinese agriculture after China's joining to WTO, especially the production structure of Chinese agriculture has to make prompt adjustments in the short run because of the challenges. In a word, it is of great

importance to research into the issues of the risks of agriculture production from the viewpoint of modern risk management.

Moreover, with the improvement of human awareness to nature and society, to enhance the ability to resist disasters has become a world-wide conception of sustainable development. Again, the approaches and the countermeasures to reduce the uncertainties have been well developed and thanks to the fast development of modern information science, information technology and the net economy. However, with the impact of the establishment of market economy and economic globalization, the economic uncertainties increase, people seem to feel is facing an increasingly elusive and uncertain world.

In the new economic stage, the agriculture still holds an important foundation and position in China. Agricultural production is affected by both natural and social factors which serve as risks when facing the global technology innovation, tide and a larger market. The organization and market levels of agricultural economy is not high, the risk-resistant and social security systems are not satisfactory. The agriculture risks are increasing and the hazard is getting serious, which leads to a worse non-controllability.

To sum up, China agricultural foundation is still very weak, the problems about "agriculture, rural and farmer" and farmer's low income is quite apparent. There is no sound social security system in the countryside, yet the agricultural production suffers from the interaction of both natural and market risks. The farmers are the poor community facing the risks characterized by universality, arduous, the complexity, which is a prominent barrier to agriculture modernization. Besides, China is now building a harmonious society, which refers to a coordinated development of ecology, economy and the society. The agricultural risks and the uncertainties definitely can bring the widespread influence to the entire national economy, forming the unstable factors to the society and the economic development. Therefore, we must study the issues of

the agricultural production risk management, decision-making and the relevant theories, since it is of the great theoretical and practical significance.

In the following studies, firstly we have defined and discussed several important concepts, analyzed the main characteristics of agriculture production risks. Through comparing research situation of the risk management and decision-making of agriculture in other countries, we have fixed the outline and the main contents of this book and concisely introduced the theoretical basis and the general information about the book.

1.2   Risk, Uncertainty and Information

1.2.1   The Concept of Risk

I. Different Perceptions Towards Risk

The risk exists universally, and different persons have different understanding about risk. Even today still we cannot find a unique concept. Regarding the word significance of the risk, the Weber dictionary defines the risk as "the injury or the loss probability which faces".

In the agricultural economic management, the risk refers to that farmers make a variety of judgments and probabilities which will happen in the future production dependent to their former's experiences and related knowledge (Frank. H. Knight, 1921) [1].

In insurance, the risk means, "disaster or possible loss." It is usually used to as the insurance sign, the loss reason and the loss opportunity in the risk management research. Thus, usually the risk is defined as the relative change between anticipated result and the actual result (Harold. D. Skipper. Jr. Sept, 1999. Chinese Ed.) [2].

In statistics, when uses a special decision-making function, then risk is the sum of anticipated experimental cost and the anticipated loss as a result of the final wrong decision-making.

Also some scholars thought, the risk refers to the uncertainty of loss happening, it is the probability and its consequence function which the disadvantageous event or the loss occurs, with the expression of mathematical formula is, R = f(P,C), where R presents risk, P presents the probability of the disadvantageous event occurs, C expressed the consequence of this event occurs [3] [4].

Therefore, we think that peoples consequences of risk will possibly determine and the causes of negative deviations does not have many kinds to synthesis the future behavior decision-making and the detachment condition with the predetermined target. Thus, risk refers to the occurrence of the many possible consequences of negative deviation. The negative deviations have many kinds and also have the different degree of importance. In complex agricultural production management, we need to perform the concrete analysis and the synthesis judgment according to the special details, although the risk emphasizes the negative deviation, actually definite also exists which is deviating. Because the deviating is what the people's earnestly seeking to and into the category of risk income, therefore we should also give to take the risk decision-making, to drove and dare the people to undertake the risk, to obtain the risk income, to consider precisely the question of the risk utility theory from this view point.

II. Risk Preferences and Disposal Measures

In economics, the expected value and expected utility have been used to present the risk. Currently, economists use Neumann-Morgenstern "expected utility" by the famous economist Von-Neumann and Morgenstern proposed in the 50's of 20th century, to study risk. Assumptions, the economic actors in the

decision-making will produces possible economic results x_1, x_2, ... x_s, every possible economic results to economic behavior x_i bring a certain utility level $U(x_i)$, if these economic results the probability were π_1, π_2 ..., π_s, the expected utility function for peoples of economic behavior in decision-making can be expressed as.

$$EU = \pi_1 U(x_1) + \pi_2 U(x_2) + ... + \pi_s U(x_s) = \sum_{i=1}^{s} \pi_i U(x_i)$$

Where $i = 1, 2,...., s$. This is the expected utility function, also known as Von ·Neumann-Morgenstern Utility Function. It is to some historical level of a dependent on people's observations, knowledge and incentives generated from the natural world and they play an important role to influence it. Therefore, the changes of inputs and outputs in production (cause and effect), in socioeconomic ecosystem must reflect people's ideas, their experience and rationality, the value of expected utility representation can reflect the subjective preferences of people for risk. In this regard, as it involves the issue of rational actors, but also led many economists longer theoretical discussion[1].

The risk may be the probability expected value of the wealth loses, it may have the probability which occurs with some property value and its related loss, also in algebra is the sum of the two products. If the property value is very small, although its probability loss is bigger, also cannot bring the very big lose to the person, therefore, when the property value is very big, and the probability loss is very small, but once the risk occurs also is not a small loss. The risk has the relativity, on the one hand, it relates to the property scale and the size of the loss value. On the other hand, it relies on the owner's attitude for losing the property. Because the ability to take risks varies individually, this has caused the research of the risk utility theory and the risk value discusses, moreover on the other side

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1 EU Theory initiated by John von Nemunna & Oskar Morgenstern in 1944 on "Theory of Games and Economic Behavior" [M]. After this, Luce, Raiffa, Arrow and Pratt had improved and developed. Reference: https://en.wikipedia.org/wiki/Von_Neumann-Morgenstern_utility_theorem or ©2006-2015 MBAlib.com.

the risk speculator always expects relative to obtain the opportunity income from the risk. The lottery people frequently harbor this kind of manner.

In the risk fundamental research usually according to the person's different manners to deal with the risk, divides them into the different types of risk aversion. This affected the people's choice of facing the risk. In real life, if some people did not have the society's force, he will be able to remain the certain degree of risk for oneself, but some people then are willing to pass the burden to the society. Any risk needs aversion through the society or using the market with the disperser, as well as how does, this already involves the policy, legal, the system consummation, the degree of the market growth and also simultaneously has formed the pattern and the method of each kind of risk decision-making.

1.2.2 The Concept of Uncertainty

For uncertainty to person's understanding may be individually different, which relates his own subjective judgment, beliefs or emotion. Even if the probability does not exist, he always tries to measure, calculate and remove the uncertainty. On what is "uncertainty", Dennis Lindley gives an explanation: "There are some statements that you know to be true, others that you know to be false, but with the majority of statements you do not know whether they are true or false. It said that, for you, these statements are uncertain" (Understanding Uncertainty; Denis, 2006) [5]. He thinks that despite this extensive knowledge that you have, there remain many things whose truth or falsity is not known to you. It applies to predictions of future events, physical measurements already made, or to the unknown.

Yet, somebody think that after the doubt (or hunch) of an event will happen there is uncertainty, uncertainty maybe include not-knowing and ignorance, because of from ignorance or not knowing result to uncertainty still missing

some scenarios generated doubt or conditions. Therefore, uncertainty may be divided into two sources: (i) Objective uncertainty based on epistemological or ontological uncertainty, such as not-known; (ii) Subjective uncertainty is because of moral or rule reasons, such as ignorance.

In short, uncertainty refers to the indeterminate result from the inability predictable future, therefore, in completely uncertainty situation, the probability, and the event's appearance of each kind of the probability condition cannot be known. Uncertainty as a keyword refers to the event to appear some kind of consequence under some kind of condition and probability cannot be reliably quantitative or people do not know the probability of some things will occur.

Such as, in the agricultural production management decision-making, produces one kind of new agricultural product, because the management main body lacks the experience of production management, that it exists more uncertainty than the past producing the product in the market, as well as in the natural environment some unknown variable factors existent, thus can have a bigger uncertainty.

1.2.3   The Relations Between Risk and Uncertainty

The loss of a disaster or economic activity may result from both risk and uncertainty. Typically the difference between risk and uncertainty is whether they can be predicted, that is, whether there is a probability or can be measured. That means uncertainty and risk both impact on the economic activities, but they are different. Thus, the early economists hold views on both were different. Because for risk and uncertainty the forecast is different in real life, even there might be of the same prevention treatment, but generally have formed different economic management countermeasures.

American economist Frank H. Knight (1921) established the earlier distinction between risk and uncertainty: "Uncertainty must be taken in a sense

radically distinct from the familiar notion of risk, from which it has never been properly separated....". "The essential fact is that 'risk' means in some cases a quantity susceptible of measurement, while at other times it is something distinctly not of this character. Moreover, there are far-reaching and crucial differences in the bearings of the phenomena depending on which of the two is present and operating.... It will appear that a measurable uncertainty, or 'risk' proper, as we shall use the term, is so far different from an immeasurable one that it is not in effect an uncertainty at all" [1].

However, later the economists such as J. Hirshleifer criticized: "while we have not been able to accept Knight's attempt to distinguish between risk and uncertainty, he was, getting at — through imperfectly express — an important and valid point. In his discussion Knight suggested that a person's actions may well depend upon his 'estimate of the chance that his estimates is correct". So that, according to J. Hirshleifer (1972), "Uncertainty, of a type that is at least partially dispelled by unfolding of events over time" [6].

Many peoples facing the risk and uncertainty management decision-making methods are divided into two kinds. One kind is called the risk decision-making, another is called uncertainty decision-making. Regarding the former, research content is rich and the achievement is many, regarding the latter, because the uncertainty with difficulty to determine weight and forecast, guarded against uncertainty theory is still to be at the scattered exploration stage. Davidson. P. (1988) had given an explanation in applied probability stochastic process, as if can better illustrate this question, he said: "If a scenario is an ergodic process, it may sum up as the risk problem, if the case isn't ergodic that will be a problem of uncertainty" [7].

Sometime, about the concepts of risk and uncertainty existed difference that did not actually affect their use in economic management research, which frequently displays in risk and the insurance works, seems there is no boundary

their distinct uses and clearing logic. For example, "the uncertainty comes from the risks existence". "Risk existence results to appear uncertainty, makes the decision-making process more complex [2]".

Along with the scientific experiment, as well as the human production and experience of rich life, many uncertainties are possible transferring to the risk research. A typical example is about the climate change, now the people may through special technologies, such as collection of rainfall amount and illumination understood the meteorological index of the probability distribution situation. This has turn uncertainty question into the risk research. Thus, the primary measures to address the risks and uncertainties rely on scientific discovery and technological progress.

Actually, the risk corresponds should be faced the additional side of uncertainty, namely probability, but it isn't the certainty. So that, we need to find a scientific theoretical concept, cover the understanding of both relationships on risk and uncertainty, and to achieve the ordinary application.

1.2.4   The Relationship Among Information, Risk and Uncertainty

I. Information and Its Function

The humanity is seeking continuously to reduce the risk and uncertainty. It has not only urged each kind of community or social organizations formation moreover has developed the information technology. In particular, the development of modern information technology, precise well agricultural research management and so on, prominently has displayed the people in the reduced uncertainty aspect diligently with the method strengthening. We must pay attention to uncertainty concept related to information, means the humanity had found a direction to actually uncover a mysterious veil between uncertainty and possibility.

On what is the information there have been about hundreds of concepts. However, the core of the problem is that the information must somehow be able to transmit to people by signal carrier, including from signal acquisition, processing, transmission and utilization, signals need to go through from the source to reach the receiver in a series of complex processes, as well as to deal with some possible existed noise to obtain the information function of reduced the uncertainty.

C. E. Shannon as the founder of information theory ever pointed a scientific concept: "Quantities of the form $H_n = -K\Sigma P_i \log P_i$ (the constant K merely amounts to a choice of a unit of measure) play a central role in information theory as measures of information, choice and uncertainty" (Shannon, 1948) [8]. In statistical significance, H_n in the formula is used to represent information entropy, where P_i refers to the probability of an event i in the system occurrence, and in stochastic space may be i=1, 2…, n.

Knowing probability excluding uncertainty that means reducing uncertainty should be a function of information. Information entropy H_n is a single real-valued reducing function of the probability P_i [9]. Here P_i can be used in measuring of the risks. Thus, the bigger the entropy H_n is, the smaller the probability P_i will be, which will more information or knowledge be needed to deal with the uncertainty. We have the information demand due to the uncertainty reduced that has been the vital and basic measure to avoid and prevent from risks. That is to say, the definition of risks initially needs information in order to get lower uncertainty with less risks, information is the key of making decisions to solve the risk. Therefore, if there is not enough information, the Game Theory should be used to prevent the uncertainty and the emergence. Information is the necessary and sufficient condition for the recognition of risks, but it is the only necessary condition for risks aversion, because we also need some investment for material, energy and workforce,

efficient and scientific management and modern technologies transformation, to diversify and reduce the risks. In the view of system science, different signals will form the structural concept of information, and to reduce uncertainty will be a functional concept of information. That means if we want to reduce uncertainty, we have to observe and collect signals. So that, in the study, the approaches and application of information theory and information management will be paid more attentions.

II. Understand Entropy

The concept of entropy originally came from physics since 19 century, by R. T. E. Clausius (1822-1888) first proposed, which was also named the second law of thermodynamics. The law used physic entropy as a measurement of natural system disorder, to illustrate "entropy always increasing in natural process" [10]. Later, Boltzmann (1844-1906) pioneered statistical physics, studied the calculations on physical entropy. As a development of scientific conception, after nearly a hundred years, when C. E. Shannon studied communications systems he presented information entropy. Whatever, physical entropy is a measurement on system structural disorder, then information entropy is a measurement on uncertainty, but both as scientific conception in theory the essence is the same.

When we try to establish the relations in concepts of the uncertainty, risk and information, we may also use the concept of modern systems science and the theory to enhance the understanding. Prigogine I. proposed theory of "dissipative structure" (Prigogine, 1967, 1969) [11], pointed out that in an open system which is far away from the balance state, often accompanied the exchanging material and energy of the system with outside. The system exchange entropy may form of one kind of the negative entropy flow. Because of increase in the flow of the negative entropy will cause the system to have some kind of new structures. The system's forward will be able to strengthen.

Has the forward enhancement means to increase the gain of information, to the system of uncertainty reduction or reducing the system entropy to increase.

Reduction entropy may enhance the performance of the system. From the perspective of system theory, the disorder of the system is related to the level of system chaos, more disorder of a system means its entropy augmented, when the system reaches balance, the system entropy toward maximum. Albert Einstein said that "entropy law is the premier law of all of sciences, which was referred to as the supreme metaphysical law of the entire universe"[2]. In thermodynamics of a physical system, the natural process is demonstrated by the law to describe the Second Law of Physics, that is the natural process of evolution from order to disorder energy is dissipated, therefore, face with natural disasters, flooding, and so on, intelligent life can only rely on ability of prediction and management, through the use of energy and materials to realize fixation and transformation, as artificial and social process added negative entropy flow to target system.

That means human beings can through transform nature and change themselves, to get rid of the shackles and survival in the natural environment. So far, it has been engaging tenaciously struggle with natural adverse factors of those existed in reproduction, survival and development. Marx had clearly pointed out: "socialized man, the associated producers, will be reasonable adjust the material between them and the natural transformation, put it under their common control, instead of it as a blind power to govern themselves; ......"[3]. Facing to the world's existence of greater uncertainty and risk, human must take more various joint actions to resist a common disaster, the United Nations "Agenda 21" is a joint declaration on sustainable human development. Currently, establishing eco-civilization, constructing harmonious society and

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2 Quoted from Rifkin J. "Entropy: A New World View"[M]. New York: Viking Press. (1980): P.6.

3 Marx and Engels Collected Works (Volume 25) [M]. People's Publishing House, Beijing. 1979. P.926-927.

developing international economy, the market is a manner of economic cooperative, and the information is an effective tool.

III. Scientific Concept of Information Covers Risk and Uncertainty

Information comes from a concept of system science. In Shannon's entropy definition it covers the relationship of uncertainty and probability. This allows us to study the risks and uncertainties, analyzing and assessing for the disaster's economic losses based on information.

As we know, expected utility was expressed by Neumann—Morgenstern to study risk. It's believed, that rule is absolutely crucial when apply decision theory under uncertainty. Therefore, if economic actors face random performance with specific numerical probability that situation involves risk, however, if economic actors on the different possible events cannot give specific probability, then this situation involves uncertainty.

This is the gains of information to reduce the uncertainty, thus increases the probability. Before and after an experiment and the change in the experimental probability means the people have obtained the information. Therefore, we have the necessity first in theoretically to establish the risk with the understanding in between uncertainty and the information relation, explores the new direction in the methodology and the model aspect, proposes the new opinion in the decision-making question.

The famous economist Kenneth J. Arrow who obtained Nobel Prize had published a book in title of "Information economics" (1984). He pointed out that once uncertainty existence may be to analyze in the form, the changed economical information function are extremely important. The people may spend the manpower and the financial resource to change the uncertainty which the economical domain (as well as the other aspects of life) faces. This kind of change exactly obtained the information [12]. Therefore, acquiring information

means to reduce the uncertainty, but the uncertainty does have the economic cost, the uncertainty reduction becomes one kind of income. This may help to reduce the risk in some kinds of significance or for guarded against certain inevitable disasters for the essential prerequisite.

Economists J. Hirshleifer and J. Riley had written a book, "The Analytics of Uncertainty and Information" (Hirshleifer and Riley, 1992). According to the book indicated: "uncertainty is a type that is at least partially dispelled by unfolding of events over time". That a person's informational action, though not his terminal actions do depend "upon his confidence in his beliefs" and other conditions (Hirshleifer and Riley, 1992) [13].

As we see, regarding to the risk recognition, information is sufficient necessary condition, but regarding the risk aversion, the information is only the necessary condition. As it often needs to invest a lot and improve the level of effective economy management. So that, study and use modern management technical methods we can try to disperse, shift, reduction, aversion, prevention, bypass, even to use risk reasonably.

If there were not correctly observation, without signals to analyze and forecast the risk, that would closely linked to uncertainty. Therefore, even risk definition is not only one, and it is also usually used to describe the different results in relative uncertainty conditions. Discover and create conditions to improve the knowledge and capacities, the prerequisite is obtaining information. A contemporary view on the feedback process of a system that more manifested is a set of information understood by person. Without information there will be no feedback to control.

1.2.5 Significance of Agricultural Informatization

The concept of agricultural informatization has a profound meaning and wide extension. We believe that the basic meaning of nothing more than information

and knowledge is increasingly become the basic resources of agricultural production and power of development, information and technology consulting services has increasingly become one of the industrial bases for the whole agricultural structure, information and intellectual contribution to agricultural growth increasing gradually. In short, the concept of agricultural informatization should include not only computer technology, but also include microelectronics, communications technology, optical technology and remote sensing technology etc, a number of information technologies is popular and systematic to be applied in agricultural process. As an important component of the information construction of national economy, agricultural informatization promoting agricultural modernization is great significance in pursuing the coordinated development of national economy and society.

(i) Agricultural information is the full and wide application of modern information technology in agriculture, so that penetrates into agricultural production, circulation and consumption, rural sociology, economy, technology and other links, which greatly improve the level of agricultural productivity, so it is said "rural informatization".

(ii) Agricultural informatization makes information and knowledge become increasingly the basic resources and development power of agricultural production, information and technical advisory services is becoming increasingly the one of the basic industry of agricultural structure because of the contribution with information and intelligence activities in agriculture continuing to grow.

(iii) From the perspective development of information technology, agricultural information is a process of systematic and general application in agriculture on a number of information technologies including not only computer technology, but also including microelectronics, communications

technology, optical technology, remote sensing technology, Internet +agriculture and so on.

(iv) Agricultural information resources must be developed to adapt to the development of agricultural informatization. There are two general understanding of information resources, narrowly refers to the information content itself, and in a broad sense, is defined besides information content, including information related equipment, information workers, information systems and information networks. Therefore, one of the important tasks of the information construction is to improve the quality of information users, that is to improve the technology and skills of farmers using a large amount of information tools and the main sources of information to get answers to questions and to strengthen the education and training of farmers on information technology and information literacy.

Speeding up the construction of agricultural information is important means to interface farmers and market, to raise the level of agricultural equipment and technology and an important part of developing modern agriculture and new socialist countryside. Further strengthening the construction of agricultural information and transforming traditional agriculture through information technology and connecting agricultural production, market and information services has become an important task in new rural construction. In short, the process of agricultural informatization shows that the comprehensive application of information technology in rural economy and social development to reached extensively penetration. With the main characteristics of advanced information technology equipment, richer rural information resources, advanced service industry should contain in rural informatization, rural areas production informatization, rural economy and rural social informatization.

1.3   The Characteristics and Present Situation of the Agricultural Risk Management

The agricultural production risk management refers to the all economic activities that organizations or individuals use market tools, financial and information technology to supervise and control the risks in agriculture according to certain methods and procedure in order to reduce the losses resulted from the risks, and the economic activities which aim to increase profits by risk investments. The whole process of agriculture production and operation includes supplying, producing, marketing and the risks exist in all of them and are affected by multiple factors such as society, politics, market, technology and so on. Often, the risks in agriculture production consist of natural risks, economic risks, technical risks and policy risks, etc. These risks have frequent effects on the exchange and emergence of the materials, the fix and consumption of the energy, the transfer and exchange of the information in agricultural system. Agriculture risks finally affect farmers' welfare and the economic lives of the public in the form of economic fluctuation and uncertainty, which in turn will pass to all over the world via the international market and world trades. Therefore, the risk system in agriculture production and operation are characterized by multi-dimensions, multi-levels, multi-factors and dynamic no-linear complication, which has proposed higher level requirements to the risk decision-making in agriculture production.

American scholar Harold D. Skipper, Jr. once pointed out that, how makes the decision-making to process the certain risk behavior and the process has changed extremely complex. The wrong decision-making or merely is because the luck is not good not only to the policy-maker, moreover to the customer, the supplier and the inhabitant can have the extremely disadvantage influence. Moreover these disadvantageous influences maybe cross the profession demarcation line and the border, creates the serious harm for many innocent people. Therefore, to study

how to manage the risk at any time is very important [2]. Similarly, the agricultural production risk management and the decision-making research have also changed more and more importantly.

1.3.1 The Complexity of Agricultural Risk Management Research

The Agricultural production risk management is to move in the open complex system. Its special complexity in the agricultural production process is the natural reproduction and the social economy reproduction closely intertwines in the same place. The time in the agricultural system is carrying on material, energy and the information exchange with the external environment, this kind of interior fluctuation causes to be far away for the balance movement and maintains the system condition for the forward spread structure. In this process, fortuitousness or not determinism to system mode change key function. The agriculture took the social economy system as the important constituent, the commodity economy more develops, exchange relations thus also more developed, but simultaneously manages the factor of certainty which the main body the production and the management decision-making faces not to be able to be more, possibly brings the more managements risk. Facing the change in the environment of agricultural production management, the huge disparity of agricultural economics management at present exists in the western developed country and as well as in China. The risk guard process of agricultural production management and the risk averse with the risk management question appears prominently. Generally it was believed that the agricultural production risk management has the main characteristic are given below.

(i) Agricultural production risk management is existed objective and universality. The agriculture intertwines in the process of the nature reproduction and the social economy reproduction, occurs frequently each kind of disaster loss as does not change by peoples subjective will, and usually

surmounted them to have uncertainty. In the entire agricultural production cycle, it is that there is no place and does not have time.

(ii) Inevitability in the management process of the agricultural production, and some concrete risk has fortuitousness and the occurrences of the massive risks. The result of a concrete risk occurrence often have many risks factors and other factors affects together, in the agriculture the performance is one kind of interaction stochastic phenomenon. The occurrence of individual failure is accidental, chaotic, but to the massive disasters accident is the material observation and the statistical analysis, may discover its presence has the rule of the obvious risk movement.

(iii) Agricultural production risk management used to have the variability. In the agricultural production management process, each kind of risk has changed in nature and quantity, because risk factor multitudinous, the risk variability is obvious. In the agricultural production management process, the risk which relates with the management effect and the goal decision-making often is endogenous variable, and they sometimes may be controlled and observed. The exogenous variables relates to the natural disasters sometimes cannot be controlled or cannot be observed.

(iv) Agricultural production risk management general has multiplicity and multi-levels. Because the agricultural production and the demand have the multiplicity, the scope of affects the nature and the society broadly, there are many risk factors in quantity, moreover there are numerous and diverse type of risk causes to vary the agricultural production risk management. Because each kind of risk factor, inside and outside the agricultural production management system, the factor overlapping mutually affects, causes the agricultural production risk management to demonstrate the level of multiplicity, it also can be manifested by distributed at system's hierarchy.

(v) Agricultural production risk management is of great complexity. The agricultural production cycle is long, also with the nature, the economy and other social factor intertwines in the same place, between massive risks factor intrinsic relations interesting, often displays for the dynamic non-linearity and the quite high uncertainty characteristic. Especially we stand highly inspects the agricultural system risk on the whole world, the research on agricultural production risk management must use the approach of complex great system, therefore the agricultural production risk management constituted an opening complex giant system.

1.3.2 Current Research on Agricultural Risk Management and Decision-Making

A serious shortage of investment in agriculture leads to overload of agricultural infrastructure and the sharp decline in function. Since long ago, China implementation gives priority to the industry development policy, to agricultural investment insufficiency, weak agricultural accumulation, the infrastructure get solder, causes the agricultural resistance, withstanding nature and the ability to make worse risk of the market economy. Statistics have indicated, the 20th century nearly during 50 years, China agricultural department's fund only current capacity amounts to more than 700 billion Yuan, 1/5th of the new agricultural creation value had shifted to other departments. In addition, through the difference in price of agriculture and industry, the agriculture every year over 1000 hundred million contributes to the industry, on the contrary, the proportion of the farmland capital construction occupied actual total investment of whole nation is in tendency of unceasingly drops [14]. Agricultural investment is insufficient causes the overloading operations of agricultural infrastructure and suddenly to weak the function.

At present the market risk further enlarges the transaction of the agricultural product organized and standard request sale, wholesale and futures market are

also caused individual farmer small scale production, low output, the quantity of goods are less, grain marketed proportion also 30%. Thus is unable to form sufficiently affects the market supply and demand condition, the quantity of goods to urge the price is advantageous to producer's direction change, always causes the farmer to be at the extremely disadvantage out of position in the transaction process. Moreover, leaves the womb under the plan system, the difference of China farmer culture quality and the commodity consciousness is at a loss how to proceed facing the market economy, intensified defense risk arduous. After joining WTO, when the industry has the certain self-accumulation, self-development ability should return nurturing to parents the agriculture, but no longer deprives to the agricultural implementation.

The developed country developed the agriculture and unceasingly strengthens the ability to resist natural calamities, which will be helpful to develop the modern risk management system. Through comparing the Chinese and foreign agricultural production risk management measures, the research on modern risk management theory and the decision-making method, we can discover China's agricultural risk question processing existence disparity with the developed country. Reference the overseas experience not only to be able to points out the direction for our next research and the exploration, moreover will be advantageous to strengthens the China agriculture risk, the macroscopic management research and the risk guard system construction.

I. The Present Situation and Comparison of Domestic and Foreign Agricultural Production Risk Management

The agricultural insurance has become the important method for the nation to support agriculture; the various western countries agriculture insurance system is still very perfect. The trade of the developed country agricultural insurance, their agricultural insurance compensation paying rate is very high, the profit is small, the company and the government compensates each insured farmer

household and is paid for the multiple danger, moreover also carried out to formulate the agricultural insurance compulsory method. In America nearly each farmer household has several thousand acres of land, the farmers may adopt many kinds of averse to measure the risk, for example, the diversified management, the production contract, the sales contract, the stock guarantee the value, the output insurance, the crops income insurance and so on [15]. They have implemented many kinds of crops' disaster insurance since 1938, the farmer may act according to own actual situation and the wish, chooses out the insurance type and the insurance level, the part of the insurance premium is paid by the farmers, another part of insurance premium gives the government as a subsidy to the insurer. Looked from the category, the insurance may be subdivided as the single farm output insurance, the crop's income insurance, and a county as unit yield insurance, so on. In June 2000, the United States Congress through "Agricultural Risk Protection Law" [15], will plan in the future 5 years provides the total grand of 8.2 billion US dollars for the expenditures, will subsidize the agriculture to be safe, will insure the policy especially about the big disasters, the farmer only must pay 60 US dollars handling charges to each kind of crops to be allowed to participate, when the actual output will be 50% lower than the normal output, which will be lower than compensation paying rate is 55%, obviously through the extremely big agricultural insurance subsidy. For example, the American government once stipulated, if the compensation paying rate is between 100-120%, the subsidy rate was 100%. If the compensation paying rate below 100%, the subsidy rate is 85%. Moreover, the government also provides subsidy to the private insurance company, the insurance company only pays the insurance premium income to the government 1-4% to take the business tax, all other tax revenues will be exempted. But China's entire insurance industry still has underdeveloped, and in the countryside of China the average per household only has less than one acres of land, so that government supports the agriculture in many ways for the disaster

relief and the price subsidy. Started from 1982, the People's Insurance Company of China (PICC) comprehensively set up an experiment for the agricultural safety, first the company directly undertakes the insurance for farmers, because this kind of operation mechanism did not coordinate with the agricultural characteristic, agricultural insurance unfolding, industry was difficult to collect fees, the claim to compensate is also difficult, created the problems in day by day prominent, had become the direct barrier to puzzle the agriculture insurance development. As PICC accounted up to 1995, the farm insurance occupied on total business volume and its service scale was just approximately 3%. In the annual report of Swiss reinsurance company in 1997 [2], in 1995 the whole Chinese insurance density and the insurance depth separately occupied the world position at 76th and 66th obviously. In 1997 the agricultural insurance service was developing with steady steps and the foundation has definitely realized. Those years the maintenance and the growth level of the insurance premium income remain stable and the compensation paying rate remained below 80%, the exploration of the commercial company set up the goal and the pathway of agricultural risks. The insurance premium income grows with steady steps, compensation paying rate to continue to drop, since basically has represented on China's agriculture continuous stimulation for 12 years in safe situation. Therefore, after we entered into the 21st century, along with the market reforming, the system construction insured the market to the agricultural function and the utilization still waits for further improvement. In 2013, Chinese agricultural insurance premium income ranked second in the world, to achieve the main area of 77 million hectares of crops insured, the insurance amount 1.39 trillion Yuan. But agricultural insurance penetration and density is still low, in 2013 China's agricultural insurance density of 48.71 Yuan/person, a depth of 0.54%. According to our investigation, only approximately 60% of the farmers have expressed to understand the insurance, and satisfied with claim service. (Zhao Junyan, Nov. 2013)

II. The Developed Country Extensively Carries Out the Agricultural Product Price Protection and the System of Financial Credit Subsidy

In America 2/3 of agricultural products enjoys the national price support; European Economic Community to 70% agricultural product implementation goal price; Japan outdoes the international market 6-8 times of high protections prices to the rise long-term implementation. The price protection policy had guaranteed the rise of agricultural comparative advantage and the agricultural product trade stability, reduced the agricultural production risk management. Except the price protection policy, the country also developed a big dynamics of agricultural financial subsidy, in 1992 the economically developed country reached as high as 354 billion US dollars to the expense of each kind of agricultural subsidy, US was 91.1 billion US dollars, Japan was 74 billion US dollars, the European Economic Community was 155.9 billion US dollars. The large amount of agricultural subsidy powerfully supported and has guaranteed the agricultural means of production market and the stable agricultural development. At the same time, the after-disaster relief tools for agriculture adopted by governments of several countries, such as recovery funds, subsidies, favorable loans, also played the important role of the risk compensation.

III. Strengthens the Construction of Market Information System, Impels the Network of Agro Development

Now the developed country all established has been keen, fast, the highly effective agricultural information system to the agricultural per-produce, mid-production, the post-produce each stages of production, the sale campaign carried on the instruction. In the information time, the American agriculture production arrangement and the product sale all directly or indirectly relies on the correlation information instruction. The American agriculture takes the market as the guidance, the American government unification planting plan and the purchases plan, the farmer is engaged in the farming business and the management according to the market information, the independence makes the

production and the sales decision-making. The American agricultural commodity proportion is very high, exportation compared significant, due to domestic and international markets double influence, without have the accurate, the prompt and the effective information, its production and trade will difficulty carry on. The American Ministry of Agriculture had been established from 1862 until now, US in agricultural information aspect and so on the development use information work content, the organizations and agencies, the work method has experienced the long-term evolution, has formed the modern age huge, complete and the perfect information system. The system has established the whole world electronic information network which the method is advanced and extends in all directions, becomes the American agriculture stability and the safeguard of the powerful advancement. The American Ministry of Agriculture's information work not only is earlier than other west capitalist countries, moreover provides the agricultural economy and the market information to the whole world has the pivotal influence to the world trade. At present, the American Ministry of Agriculture's information investigation and the issue main content has formed 12 series. (i) Product price, agricultural expend, agricultural labor force and wages situation; (ii) Agricultural production and efficiency situation; (iii) Agricultural income situation; (iv) Agricultural product circulation cost and expenditure situation; (v) Agricultural product expense and use situation; (vi) Land value and land use situation; (vii) The planter industry and the animal husbandry production surveys; (viii) Farm cooperative organization situation; (ix) Market news; (x) overseas agricultural situation; (xi) Fund balanced situation; (xii) Agricultural production cost situation. In recent years China although saw the information construction importance, but the agricultural information construction speed as compared to demand is slower, the network system, the function and the standardized management level was not high, network construction "last kilometer" question not yet true comprehensive solution.

IV. Establishment of the Perfect Agricultural Product Futures Market

The unique futures market covering the time guarantee value, the discovery price function by the overseas agricultural enterprise, the farmer household is often widely applied to the production, the processing and the import-export trade has provided the guard price risk measure for the spot transaction. Many developed countries power transaction form is protecting the farm price, reduces the large amount of expenditure. If US attempts from 1993 in places encouragement agriculture such as Ohio state, according to advantage Illinois state to enter CBOT (Chicago Board of Trade) the time power market, the purchase of corn, the wheat and the soybean is expected to fall the time power. If the forward price is lower than the shoe order price, the buyer (farmer) may use the shoe order price to sell the stock contract, otherwise the farmers may give up the time power, only must lose the time power expense. Like this causes the corn, wheat and the soybean price to maintain at the reasonable level, which brought many advantages: (i) Partial price risk may obviously shared by the market transactions and government's financial subsidy payment reduced. (ii) When the time power transaction will form an agreement to the price transaction of both the anticipated future supply and demand condition, there will be able to reflect or the stable of actual supply and demand situation. (iii) the power transaction form encouragement, guides the farmer to enter the market, to understand the market, the academic society locks the farm price, the disperser risk using the time power transaction and protects oneself, enhances the competitive ability and the survival ability and promotes the agricultural development. With the current micro and macro-economic policies examined, China is still short of studies on how to play the functions of insurance market and the futures market to cope with agricultural risks. The risk markets reconstruction should become an important aspect of China's socialist market economic system.

V. The Research on the China Agricultural Production Risk Management and Decision-Making

Strengthens the fundamental research and the positive analysis to enhance the agricultural production management and the level of decision, reduces in decision-making the technical risk is a main direction of domestic and foreign agricultural production risk management decision-making research. At present there are many theories related to the risk research of economic theory, however is less in view of the agricultural production risk management research, especially the China agricultural development relates to the actual situation to feel extremely lacks. Although this research work both arduous and is complex, but we not yet retrieve the massive related special domestic and foreign academic periodicals. In China the implementation of the long-term planned economy involves in the discussion of the agricultural risk question. In recent years, along with profound market reform, it calls for the study increased in intensity.

In April, 1994 a conference paper was presented in the international development agriculture insurance academic seminar held in China Northwest Agriculture University. The theory, the experience and the question a book was published in February 1995 by the Chinese agriculture publishing house [16]. The book discusses the topic divides into the insurance economic, the agriculture risk management and the loss compensates, the agricultural insurance development pattern, the agricultural insurance management engineering research, the agricultural insurance practice and the experience and so on several aspects, introduced the attending domestic and foreign scholars then research results. Looked from the situation of the meeting paper publication, many domestic scholar's article for experience and present situation introduction, more policy suggestion, but comes from the overseas scholars are more related questions, real diagnosis and case analysis of fundamental research.

The developed country long-term market economy implementation, the consummation market system including the insurance, the stock and the money

market standard movement accumulated the massive empirical data, also has laid the foundation and real diagnostic analysis for the agricultural production risk management. As early as the American scholars came to China in 1983 in its agricultural enterprise management study, the chapter of the teaching material has contained the part of the agriculture risk management questions [17]. In 1984 Peter J. Barry compilation "In Agricultural Risk management" and in 1990 Boulder, Colo "Agriculture Risk management" concentrated reflection 1990s before western agriculture risk management research situation. Is unceasingly thorough along with China market reform to foreign countries opening up unceasingly expands, in particular in 1997 after Southeast Asia financial crisis, domestic started to take the risk management question research, Professor Cheng Siwei in 1998 proposed must use the complex system theory to study the financial risk guard question. Professor Myron S. Scholes shared the Nobel Memorial Prize in 1997 on Economic Sciences study, once invited to make a speech at Zhongshan University on "the risk management development" (November 16, 2000) [18]. In recent years, the international website of risk related research massively emerged [19] [20]. The home also proposed the topic of agricultural macroscopic risk management research, Summarizes the following several principal aspects. Therefore, the agriculture risk management research and entire risk economy research synchronization had a new research and development tendency [19] [21] [22] [23]. (i) Property combination and optimized theory in agricultural risk decision-making application, like price risk and farm investment scale relations research. (ii) Construct the agriculture insurance market and the safe system of modern agriculture. (iii) Agricultural product stock set of time guarantees the value and the time power fixed price theory. (iv) Information and its network technology in the applied research of agriculture risk management. (v) Applied VaR analysis in the decision-making of agriculture risk management, following the financial technology and its analysis tools grow. (vi) Chaos economic theory application in agricultural risk

decision-making, like agricultural production stochastic superiority choice, non-linear method and mutation theory, fuzzy mathematics and so on. But until now not yet appears in China related systematically studies the agriculture risk management and the comprehensive achievement of decision-making question. Specially, nearly for two years' poultry epidemic disease risk sometimes occurs, the harm is very broad, although already gradually accumulated some to guard against controls the experience and the data material, but a system of macroscopic risk management still waited for perfectly. Therefore, we must urgently strengthen the objective of this question by thorough scientific research.

1.4   Research Technical Route, Content and Frame

1.4.1   Research Technical Route

The agricultural production risk management has a series of complex characteristics, first must distinguish the risk and its origin in the agricultural production risk management decision-making process, appraised the risk size and its influence, take the suitable risk guard and the effective risk management measures and carries on the track surveillance to the implementation of risk decision-making plan and finally effect the development appraisal. Generally, we must have the following five main steps to form the risk management technical route as shown below in Figure 1.1.
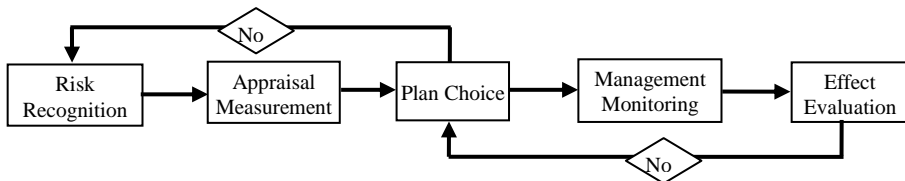

Figure 1.1   *Technical Route of Risk Management Research.*

First, to apply all the possible methods recognizes that bring the agricultural loss and reduce agricultural income significantly risk factors, such as analyzing

those factors variation processes and rules in risks production, distribution, transmission and spread.

Second, to appraise the possible loss factors and the loss degree includes loss expected value, variance, risk utility and risk systematic characteristic changing influences.

Third, to study the corresponding measures of risk prevention and aversion, as well as the management pattern, discusses the related risk decision-making method and the risk management strategy usage.

Fourth, to implement the plan of risk decision-making carries on the monitoring management for plan implementation process.

Fifth, the final is to evaluate the actual effect of risk management measure and decision-making plan.

1.4.2   Research Content and Frame

The above five steps constitutes a technical route of this research. Because the selected article conducts the comprehensive research on the agricultural production risk management and the decision-making, not only discuss the elementary theory and the method of the risk decision-making, but also conducts the main research measures of the risk management. According to the agricultural production risk management the above mentioned five steps of decision-making process had determined the basic content of this book and the frame expressed in Figure 1.2.
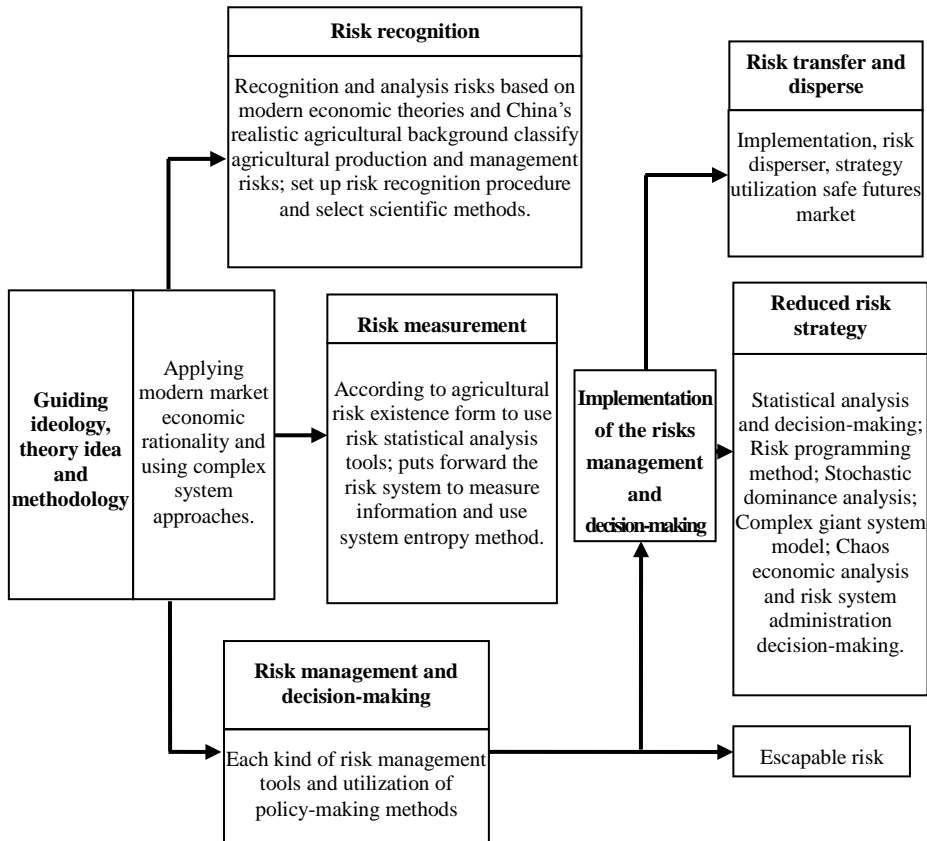
Figure 1.2   *Agricultural Production Risk Management Research Content and Methods.*

In Figure 1.2, the book first chapter must transfer the research guiding ideology and the theoretical idea as the introduction, must elaborate the selected time of the topic background, limits the important basic concept, the present situation of the analysis research objectives and its complex characteristic, and thus forms the full text of the research frame. The second chapter must utilize the modern system approach according to the modern economic theory and establishes these theories and the method analysis foundation will make the theory preparation for the later through research. Third chapter will discuss the agricultural production risk management recognition question. Fourth chapter measures the research question

for the development of agricultural production risk management. In the fifth and sixth chapter, we discuss the concrete risk management measures and the method of operation research. We divided it into two kinds of management decisions-making measures carrying on the research, such as agricultural production risk and the agricultural business risk management and massively related to the reality. In seventh and eighth chapter, we further discuss the agricultural production risk management and the decision-making complex situation, first is the analysis and the discovery risk movement complex rule, next is the exploration of the complex agricultural production risk management decision-making method including the establishment of agricultural risk macroscopic management system, optimized the design and so on. Ninth chapter has discussed the review and summary of the book.

1.5   Book's Rationales and General Information

1.5.1   The Certain Rationales of the Book Study

First, this book studied and summarized the research on the agricultural production risk management, economic rationale and carried on the system analysis to the agricultural production management process, inspected each economical relation on the agricultural production management in the circulation of market economy and established the agricultural production function duality model and obtained some important conclusions. Introduced the risk utility theory, like the risk measure axiom, the risk preference, the risk aversion coefficient, the risk income, the principle of risk income utility and so on has produced certain useful concepts and further had proven expected utility and the mean-square deviation equal in value relations have laid the rationale for the agricultural production risk management through research.

Next, it introduced the necessary elementary knowledge, important concept of probability statistics to measure the risk, such as the probability density and

its distribution, the shape and the digital characteristics of the probability distribution, location parameter as well as these concepts and the methods in the actual center application. At the same time, under entirely uncertainty condition it utilized the game method to solve a series of actual cases. Based on the concept and the principle of C. E. Shannon information theory, it discussed the relationships of information transmission and risk transfer model, such as some complex risk forms through process of series, parallel, even mixed and feedback. According to the Kenneth J. Arrow's information economics theory has proposed the concept of information risk. Professor Myron S. Scholes (Nov. 2000) also pointed out that, chaos fundamental study how to discover useful salient event from the complex numerous and disorderly information, through the wheat from the chaff, to seek order from disorder, by analysis of salient events, to achieve the desired purpose of the decision-maker. [18] From those viewpoints have indicated precisely the relations between the information and the chaos corresponding, therefore, formed the important foundation of risk management study, especially the entropy theory should constitute an important part of the chaos economics research. Once more, the statistical analysis method, the stochastic dominance theory, the Markowitz investment portfolio theory, as well as the operations research all related in the actual process to obtain the successful application.

Third, establish the concept of the risk system, cannot leave the concept of opening giant complex system, this concept first proposed by China renowned scholar Qian Xuesen. We utilized this concept to establish a global risk system and have studied the certain rules of the risk movement in system. Therefore, the method of non-linear theory becomes a powerful tool to solve this kind of complex question.

1.5.2　General Issues About the Study

In the book the author reads massive literatures and several social investigations, summarizes the predecessor research results as foundation of the study, has conducted more systematic research to the agricultural production risk management method and through made some comprehensive exploration and innovation work from the related theory to the model application. The selected topic of the book embarks from the system synthesis angle, not only had studied the agricultural production risk management and the decision-making, but also has discussed the measures of agriculture production risk management, moreover has introduced the complex system theory and explored the complex system approach in this domain application. Which is a kind of the agricultural production risk management systematic research and try to use unified decision-making theory and the methods, elaborated some actual cases in this book. The following are the several specific points.

First, this book attempts to put the risk, uncertainty and information as three inner linked concepts in an identical system, throughout inspection and discussion to find their relations and differences in application. Based on this understanding, as a well known the expected value and variance equality, for example proved the expected value maximization equal to variance minimum in following Chapter 2, and in turn the variance related to the value of information entropy as we discussed in Chapter 4. It can be proved that maximum entropy is the function of the variance in different probability distributions. But in practice, it also broadened "the average value-variance principle", however, in view of information conception included any kind of probability distribution, it overcomes a limitation of that random variable must obey the normal distribution. Events and signals measured by information entropy can have any probability distribution, when we use it to analyze risk problems, certain distribution constraints can be loosened, such as in computation of asset

portfolio (Harry M. Markowitz, 1952) or VaR (Philippe Jorion, 1997), we hope it should be helpful. In other words, without satisfied normal distribution condition it can also be allowed to utilize "the average value-variance-information entropy principle", therefore in order to expand the application value of the information principle, regarding agricultural risk management complexity and its application value exploration, we have to pursuit for the development of analysis agricultural production risk study and in cope with the management progress.

Second, this book utilized information theory and information management engineering method to research on agricultural production risk management and its transmission rule. We know from the information theory, the conditional event entropy is not greater than the unconditional event entropy has. That gives us an advice to deal with risk event and reduce uncertainty, at first is to find the conditions (factors) of the event occurring, and even transform or create conditions to realize risk aversion in agricultural management. So that, it proposed the concept of information risk, which can be divided as absolute information risk, relative information risk and the information skill risk. Those initial studies have carried out in Chapter 4, applied system analysis and description by a series of models, which also implies a prominent characteristic of the book. It may be useful particularly for analyzing farmers' behaviors with the low quality and lack training.

Third, embarked from a global vision, put forward the concept of global risk system. Defined the agricultural risk system as a global risk sub system, studied the agricultural production risk management with the complex system idea, proposed the risk recognition procedure, and the method has established an agricultural risk macroscopic management pattern and the three-dimensional risk management system.

Fourth, when consider the agricultural risk system as an opening giant complex system. The research has discovered four big movement rules of the risk system. Simultaneously, use the simulated method to express and describe the risk system, risk hierarchy distribution, the risk converge, the risk transmission and the risk spreading movement rule, and find the complex process of all these risk movements will cause the nonlinear, fractal dimension to be resulted from the chaos economic phenomena.

Fifth, in the system of agricultural production risk management, some problems of the risk decision-making initially utilizing the non-linear theory and the chaos economic method have been discussed, which certain theories and the actual problems have obtained a series of important conclusions. For example, this book studied the poultry epidemic disease risk transferring through the international trade and the domestic market under the open economy condition, the home production and the consumption have many kinds of system management channels to govern the transform. So that, design and establish the model of agriculture risk management system became the necessary to solve the problem. Supposed each kind of risk transmitting and managing channel was risk aversion, and can be calculated by the Arrow-Pratt absolute risk aversion coefficient. Thus, the structure of the risk management system was illustrated by "the system kernels", and has conducted initially the analysis by the optimal model. Such animal disease risk transfer management model may be distinctive.

Sixth, the book has presented a series of exploration in applying the general theory to realistic cases. For example, to analyze agricultural insurance market usage for wheat yield of Hebei province, the computation related to insurance benefits and the expected value matrix analysis. The issue proposed that, if the wheat yield below 3500.4 kilograms per hectare then the farmer must join the insurance. Based on this study, a further suggestion was proposed to set up a

modern agricultural insurance system. For agricultural production in risk management, relying on the risk income stable principle, there are the variety of business strategies, the optimal portfolio strategy of reduced risk and the stochastic dominance principle. The computations used as agro-risk analysis were the deviation factor, the correlation coefficient, quadratic programming etc, which the conducted research refer to actual cases of typical crops in Hebei province vegetables, the grain production, and provided a plan for the agricultural structure adjustment and optimization of the production. In addition, general statistical analysis on the aspect of futures market research has carried out on the obtained actual massive data through the investigation. The study utilized the collected data from China Zhengzhou commodity exchange, the condition of the wheat prompt sale operation, discussed the main analysis methods of agricultural product prompt sale, has evaluated the price discovery function of the China wheat futures market, and analyzed hedge strategy. It was a beneficial investigation analysis for the development of China young futures market.

Finally, about the aspect of giant system macroscopic economical environmental research, by means of the analysis over 60 years of China macroscopic economic movement, it explored to use the economical elastic fractal dimension to analyze macroeconomic cyclical fluctuation. On setting up national multistage agro-information system was an important measure and initial conceive of the study. Other as AHP method to apply in practice, as fundamental research like the risk utility theory, the duality analysis, etc, also has been studied. Currently, research and theoretical writing on the topics of risk management enjoy growing popularity. Agriculture as a specific field of application and should have its own place in the whole of scientific management.