THE MECHANISMS OF AGRICULTURAL RISKS MANAGEMENT AND ITS RESEARCHING FRAME

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Abstract: This paper started from the understanding of the concept of the agricultural risk. It takes asymmetric information and existed uncertainty as the risk occurring mechanisms. Therefore, through out some related theoretical analysis to setup a frame on the agricultural risk management study. It gives a rational knowledge on agricultural risk management.

Key words: Risk and uncertainty, Agricultural risk management, Risk decision-making

The development of agriculture is directly under the mutual influences of the natural risk and the market risk. When we enter into the new century, we can find our lives are facing more and more risks that are brought by the economic and advanced technologic development in uncertainty situations. It almost becomes the general knowledge that "The high technology with high risk, the high profit with high risk" in the real life. However, the natural disaster, as the risk background factor, is becoming more and more complex that has enhanced people's welfare loses. Therefore, the risk exists universally, if there is less or asymmetric information we will be difficult to treat uncertainty, which should be increasing in risks.

1. THE CONCEPT OF RISK

Different person has different understanding about the risk. Even today still, we cannot find a unified conception about risk. Regarding the risk wording significance, the Weber dictionary defines the risk as "the faced damage or the possibility of losses." In the agricultural economic management, the risk refers to that the operators make a variety of judgments and probabilities which will happen in the future production according to their formers experiences and related knowledge·(H· Knight, 1921 ；Peter H. Calkins, 1983).

In the field of insurance, risk means "disaster or possible loss". It is usually refers to the insured object, the causes of the loss and the loss opportunity in the risk management research. Therefore, usually the risk defined by the relative changes between expected results and the actual result (Harold D. Skipper, Jr, 1998).

The statistician Wald (1950) proposed that, the risk is the sum of anticipated experimental cost and the anticipated losses because of when using a special policy-making function to make the wrong final decision-making (Ding Yiming et al., 2001).

In addition, some scholars thought (Chen Chijun et al.,1999; Zhang Jikang，1991), the risk refers to the uncertainty of loss happening. It is a function between the probability of the disadvantageous event or the loss occurs and the related consequence, which we can use a mathematical formula to express: $R=f$ (P，C); R stands for the risk; P stands for the probability and C stands for the loss of the consequence when the disadvantageous event occurs. Therefore, we think the risk is the synthesized negative deviations of the consequence from the anticipated objective, because of people decisions for future behavior and the reality with the uncertainties. The risk refers to the negative deviations of the possible consequence from the main body. The negative deviations are several of paradigms and different importance. In the complex agricultural production and management activities, we need to perform the concrete analysis and the synthesis judgment according to the special details. Although the risk emphasizes the negative deviation, the positive deviation also exists in the reality. The positive deviations are what people want so they belongs to the risk revenue, which should be paid attention to in the risk decision-making in order to arouse people's willing to take risks, and get the risk revenue. The theory of risk utility is considered from this viewpoint.

2.   RISKS AND UNCERTAINTIES

There are different opinions about the conceptions of the risk, which are always used to describe the results of something is uncertain. Uncertainty roots in the inability of forecasting the future, so, under the complete uncertain circumstances, we do not know the probability that some things will occur. As a result, when producing a new agricultural product there are much more uncertainties, because when producing a new product the producer usually lack of production management experiences than his producing an old one. Especially when coupled with the variation of unknown natural environmental factors, these uncertainties will get more.

However, the approaches of decision-making to fight with risks and uncertainties can be divided into two kinds. One is risk decision and the other is decision with uncertainty. There are many research achievements in risk decision. While, the research on decision with uncertainty is just on a starting position because without information the uncertainty is hard to measure and forecast.   Along with the advancements in scientific experiments, as well as the human production and rich life experiences, research on uncertainties can transform into research on risks. The typical example is about the climate change, now the people may through collection of rainfall amount and illumination materials and so on to understand the meteorological target in probability distribution situation, which turn the problem of uncertainty to the problem of risk. So far, people have little command on the occasional things such as earthquakes.   Actually, uncertainties are everywhere in our daily lives because of a limitation of people's cognition and reaction ability. Both kinds of decision-making are involved in modern risk management, which carries on the classification, the analysis model, to study on causes and effects, and to change the features of uncertainty, in order to choose the suitable countermeasures. There is no clear boundary between the risk and the uncertainty in some works. Such as "the uncertainty comes from the risk's existence." "The existence of risk leads to the existence of uncertainty, and causes the decision-making process more complex" (Harold D. Skipper, Jr, 1998) (Harold D. et al., 1998).   In Fact, the risk is another side of the uncertainty, namely probability, not the certainty.   Davidson P. (1988) applied the stochastic process of the probability theory to carry on the explanation, which may explain this question better. He said, "If the situation has been faced is universality that could be considered as risks. If not, it is uncertainty." (Davidson P et al., 1998)

3.   EXPECTED VALUE AND RISK UTILITY

The risk can be the probability's expectancy of the wealth losses.   It relates to the value of a certain asset and its losses probability, and it is the algebra sum of the product of the two. If the value of the asset is too lower, it will not bring big losses or harm even if the loss probability is relative higher. Hence, if the value of the asset is very higher, when the risk comes true, (although the probability is small) the losses must be huge. Moreover, the risk has the relativity. First, it relates to the owner's asset size and its lost value. Second, it relates to the asset owner's attitude to losses. This is because every people's attitude or stand for various losses and the harms is different, and their abilities of taking risks are also varied that usually called "preference". This has caused the study on the risk utility and the risk value theories. Moreover, the bold speculators are tending to gain the opportunity benefit from the other side of the risk. This is, at the same time, the attitudes of the people who buy lotteries.

According to people's attitudes to the risks, who can be divided into different types of risk-aversion to affect people's choice when they facing the risks. In real lives, some people are willing to take risks by themselves; others are willing to pass the risk to the society. We are used to divide them into three types: risk preferential, risk neutral and risk averted people. For a society, what types of risks need to avoid or keep lookout by the social members and through market to transform are general decision-making choices. Answers to these questions relate to the policy, law, and the depth of the market, leading to different decision-making models and approaches to different risks. Therefore, in personal significant, risk utility and risk expected value may be not equivalent, as the former relies on individual preference choice and the later is general a social value judgment (such as market price). However, takes a society as a whole, risk utility and risk expected value should be equivalent, different societies may have their own choice.

4.   INFORMATION, RISKS AND UNCERTAINTIES

Information has built a bridge from uncertainty to probability. C. E. Shannon (1948) as the founder of information theory, who defined the information entropy refers to the measurement of information, choice and uncertainty. Knowing to increase the probability means to reduce the uncertainty. Information entropy definite as the single value reducing function of probability, the bigger the entropy is and the smaller the probability is, and which means to need more information to deal with the uncertainty.

Therefore, to reduce uncertainty means to increase probability, which makes the entropy decrease and we obtain more information. Qualified (accurate, on time and effective) information thus turns leads to increase expected value and reduces the risk, which becomes a basic condition to avoid and prevent from, and a key of the decision-making on risk. We have to know, Information is the necessary and sufficient condition for the recognition of risks, but it is only the necessary condition for risks aversion, because we also need efficient investment on material, energy, workforce modern tech, and build an efficient economic management system to transfer, disperse or reduce the risks. That is, if there is not enough information, means incomplete information or asymmetric information, the Game Theory should be used to prevent the uncertainty and the emergence, at same time a prevented infrastructure platform as the sufficient condition.

In this study, the applications of information theory and information management approaches have been paid more consideration. Especially the development of modern information technology and the study on the precise agriculture and modern management have shown that people's methods to reduce the uncertainties strengthened. We must notice the relevant scientific definition on the uncertainty, the probability, and the information entropy. If investment theory in economics has proved that square deviation is equivalent with the expected utility value, and from the information theory we can also find that information entropy is positive related with its distributed deviation, and negative related with its distributed probability. That shown us a new equivalent relations, "the mean value ~ the square deviation ~ the information entropy" (Wang Jian, 2002). Therefore, these can help us to find the necessary operation mechanisms of the agricultural risk management. At the same time, to build a relation among risks, uncertainties and information with both on theoretical and cognitive in order to probe a new direction on methodology and models, and put up new ideas on the decision-making of the risks.

Humans are seeking the approaches to reduce the uncertainties, which not only have promoted the formation of all kind of communities or social organizations but also have developed the information technology. The famous economist Kenneth J. Arrow (1988) (Kenneth J. Arrow, 1984) who has won the Nobel Prize with the research on the information economics said that, "once the existence of the uncertainty can be analyzed in the paradigm; the economic function of the information will become very important. People can spend labor and money in changing the uncertainty in the economy and other aspects of lives and this kind of change is just the gaining of the information." Therefore, gaining the information means reducing uncertainties, and thus uncertainties means the economic cost. Hence, reducing uncertainties become a kind of revenue, which, to some

extent, can reduce the risks or provide the prerequisites for preventing the inevitable natural disasters.

In a system view, when we try to find the relations among the concepts of risks, the uncertainties and the information, we can turn to the explanation of modern system science. According to the theory of dissipative structure (I. Prigogine 1967, 1969), the exchange entropy can form a negative entropy flow in an open system, which is far away from the balancing state and exchanges materials and energies with the surrounding of the system. The increase of negative entropy flow can produce a new structure of the system, making the system better organized. The better organizing means more information can be got, and the more systematic uncertainties or the higher entropy will be reduced. Seeing from the system theoretical point of view, system disorder related to the chaos of the system. The more randomness means the more entropy, when the system reaches balance entropy is the biggest. In this significant, entropy has two explanations, one is uncertainty related to information, another is disorder related to system structure, and thus we can understand those conceptions in equivalent: loss information~ uncertainty ~ complex ~ disorder ~ chaos.

We can see that system complex is relatively, it is linked the people intelligent system and surrounding physics system, where the entropy can be as a unified measurement. Einstein once said that, "The theory of entropy is the first law of the entire natural sciences." In a thermodynamics physical system, the rule that the natural process displays is the second law of thermodynamics. That is, entropy always in increasing (R. J. Clausius, 1822-1888) (Raymond A.et al., 1982). Energies have been dispersed in the natural evolution process from the order to disorder. Therefore, it is only can depend upon people's wisdom to forecast and deal with the flood of natural disasters. Through fixing and using the energy, artificially join the energy to the negative entropy flow in a closed natural process, making it open and forming a dissipative structure means that the people can change the nature and themselves in order to get rid of the natural shackles. The human beings, who survive in the natural environment, have been reproducing, surviving and developing up today by fighting with the negative factors of the environment. Karl Marx once explicitly pointed out that, "can only consist in socialized man, the associated producers, rationally regulating their interchange with Nature, bringing it under their common control, instead of being ruled by it as by the blind forces of Nature;... ..." ("Marx, Engels Complete works" 25th volume, page 926-927, People's Publishing House, Beijing, in 1979). Facing bigger uncertainties and universal risks in today's world, the humanity must adopt combined actions and resist the common disasters. The United Nations "the 21st Century Agendas" was a common manifesto in a sustainable development. Therefore, global risks management information systems need to be reconstructed.

5.   AGRICULTURAL RISKS MANAGEMENT COUNTERMEASURES AND STUDY FRAME

Risk management related a serial processes, which include risk recognition and measurement, risk evaluation and forecasting, risk programs and decision, risk control and effective appreciation. The countermeasures to deal with agricultural risks we can take a wide view about risk management nowadays. There are several major countermeasures, generally to be shown in following six aspects.

(1) The risk dissolve, that means turn peril into safety, cancellation risk, if want to exterminate risk still have to remove risk concealed suffer from, make it become naught, this is a kind of exhaustive risk treatment.   In practice, the first, when we find the risk occurring can escape from it and avoid the risk directly harm us. The second, we usually use futures market for some agricultural products to evade risk.

(2) The risk dispersion, that means to transfer the risk and carry out its total load in which people can bear of the scope. This is a kind of measure of coordination.   General risk market has this kind of function, such as insurance and futures markets are usually used for risk dispersion, which can transfer the risks to society.

(3) The risk control, that means limit the risk in the certain scope, or open up a path to the risk, limits its diffusion proliferation and changing its moving direction. It is also a rules and regulations risk, but do not let it injure people's basic benefits. A precondition is that recognizes the risks, then measures and analyzes them to make risk programming, to realize optimal risk decision.

(4) The risk reduction, that means to make the strong risk become small risk, but not only is to carry on dispersion to the risk, the key wants to contract the whole scale of risk existence, namely reduce have already existed of uncertainty factor. A basic work that needed is risk information statistic and makes risk forecasting, finally using the methods of statistical analysis, programming on risk, stochastic dominance analysis etc help us to realize the decision of the risk reduction.

(5) The risk prevention, that is subjective to strengthen the defense and away from risk and uncertainty, taken measures to avert the damages. Based on the universal theory of stochastic process, risk occurring is a random in subjective to prevent it is very important. However, uncertainty outside of a universal stochastic process used to be an inevitable event. In fact, for a society generally requires great invest in workforce, material and finance to build preventing mechanisms. To setup the prevention system is a giant system engineering, it ask for mastering the game theory under the every

cases of uncertainty, to complete market system, to enforce social infrastructures and build modern information system.

(6) The risk utilization, including turn bad luck into good of plan, exactly recognized that risk is either an opportunity or a threat, thus tend benefit to avoid harms can be named as risk utilization. Pursuing a risk speculation income in bond and stock markets are many peoples preference. In modern society, become natural disasters into benefits is also an idea, such as become water inundation into water conservation that means to create a reasonable irrigation system and to go in for large-scale hydraulic construction.

About agricultural risk management, the paper tries to give a study frame in following figure 1. It illustrates that under the guiding theories and methodology of modern science, to combine market economics with complex system approaches, we are able to study agricultural risk management. A real process of the researching will be risk recognition, risk measuring, risk managing decision making and the implementation of the every plans. Only if the risk is inescapable, we have to apply the strategies of transferring, dispersing or reducing the risks.
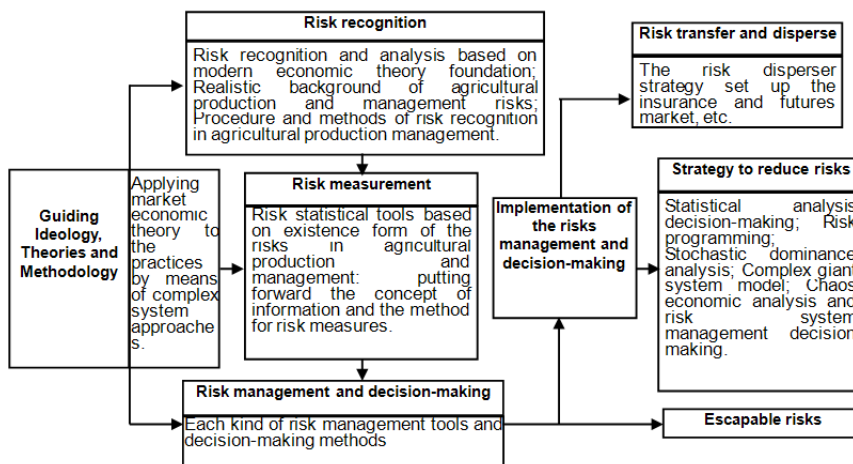

Figure 1. A Frame of Agricultural Production and Operational Risk Management

In conclusion, the agricultural risk management is complex system engineering, except to spend a great quantity of social resources, which it also needs a complete market system. Applying the modern information technology to collect and process data need to setup special agricultural risk management information system. The risk decision-making methodology has formed a frontier knowledge set that is to treat uncertainty and complex things. Especially to find the important disaster occurring rules, it generally asks through out the analysis of nonlinearity, chaos and uncertainty.

Through the analysis of above, we find by means of information and its technological application, establishes the related social economic organization that forms a dissipative structure, which both are the guaranties of the agricultural risk management mechanisms operation.

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