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# The Research of the Balanced Development of China's Urban-rural Spatial Integration Based on the Evolution of Regional Spatial Structure

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**Abstract** The general law of regional spatial evolution is researched. In the process of the evolution of four stages, namely the early stage of traditional agriculture and industrialization, the middle stage of industrialization, the later stage of industrialization and post-industrialization, the types of space are homogenized space, polarized space, pole-axis space and integrated space respectively; the choosing of the spatial location is influenced by economy, society and environment, and the spatial structure extends along with three-dimensional space. Based on the fact that China's urban-rural spatial structure evolution develops rapidly, and the outstanding characteristics of dual structure becomes the main obstacle to urban-rural balanced development, the thesis poses the countermeasures of China's urban-rural spatial integrated balanced development. It points out that the healthy development of socio-economy is the external environment of realizing urban-rural spatial integration; the urban-rural coordinated planning is the prerequisite of realizing urban-rural spatial integration; fulfilling the governmental function is the key to realizing urban-rural spatial integration; promoting agricultural industrialization is the approach to realizing urban-rural spatial integration; perfecting social security system is the basis of realizing urban-rural spatial integration.

**Key words** Space, Urban-rural, Evolution, Integration, Coordination, China

"Space" is the place where human kind engaging in socio-economic activities, and the vehicle of any public life style and right action. The human socio-economic activities are the components of constituting spatial structure, such as reclaiming farmland, afforestation, constructing railway and so on. In addition to transportation fees, land rent and clustering, the state of spatial structure is influenced by various factors, such as resources distribution, topography and climate, historical characteristics, social structure, association with the surrounding areas, and the decision-making standard and decision-making level of decision-makers<sup>[1]</sup>. The industrial revolution promotes the great transformation of urban-rural spatial structure. The big social division of labor of separation between city and village, projects the ominous shadow of urban centralization theory on the cooperating relationship between city and village. The mutual separation between urban settlement and rural settlement since the ancient times and the independent development bring a series of social problems. The dual economic characteristics of city and village in China is prominent, and the great gap between city and village have caused a series of social contradictions. City and village are the two important components of regional economic system. If the two develop in tandem, then we can realize the optimization of whole economy and maximization of social welfare. Based on the general law of researching regional spatial evolution, coupled with the status quo of

China's urban-rural spatial unification, we put forward the countermeasures on the balanced development of China's urban-rural spatial unification.

## 1 The general law of regional spatial evolution

**1.1 The phase classification of spatial evolution** The economic development promotes the evolution and development of regional spatial structure, and there exists outstanding "U" relationship between economic growth and regional unbalanced development. The regional space takes "hub-periphery-network" as basic structural unit. Influenced by the interaction between clustering and spreading, the regional space has evolving law of spatial structure with the characteristic of phase. In the process of the evolution of four stages, namely the early stage of traditional agriculture and industrialization, the middle stage of industrialization, the later stage of industrialization and post-industrialization, the types of space are homogenized space, polarized space, pole-axis space and integrated space respectively<sup>[1-2]</sup>. The organization form of space evolves from the hierarchical structure of scattered point form, non-developmental axis and non-scale to point-axis system, and then to spatial network integration system. The urban-rural spatial relationship develops from symbiosis, separation and antagonism to urban-rural spatial integration. The general characteristics of regional spatial structural evolution can be seen in Table 1.

**1.1.1** The stage of traditional agriculture. This stage has a long history, and most of the people engage in agriculture. The low economic developmental level just can meet the basic life need. In a certain region, some rural settlements with the main

function of residence gradually emerge; the economic development makes the surplus products arise, and the small towns with the function of merchandise exchange gradually come out, thus the urban-rural structure gradually takes form. But being that the social development is slow, the level of regional infrastructure is low such as the urban-rural transportation, the

communication of personnel, goods and material, and information is scant, so it has not formed the density problems of regional economic development, and the spatial structure form has great stability, namely there is a low level spatial balanced developmental form.

**Table 1 General characteristics of regional spatial structure evolution**

Development stage	Industrial structure		Spatial structure	Consumption and income structure	
	Sorting of three industries	Leading industry		Consumption structure	Income level
Traditional agriculture stage	I > II > III	Agriculture	The state of low level and homogenization	High Engel coefficient	Low
Early stage of industrialization	II > I > III	The light industry and mining industry	Polarized development	Increasing demand of industrial goods	Relatively high
Middle stage of industrialization	II > III > I	The heavy industry	The preliminary formation of point-axis development and urban system	The increasing durable consumer goods and the consumption of labor services	High
Later stage of industrialization and post-industrialization stage	III > II > I	The tertiary industry and the high technological industry	The homogenization of spatial layout and serialization of urban system	Culture, entertainment and enjoy	High

Note: "I", "II" and "III" refer to the primary, secondary and tertiary industry respectively.

**1.1.2** The early stage of industrialization. The industrialized process caused by the industry revolution in the 18th century has greatly boosted the urbanization worldwide. The traditional scattered urban-rural spatial framework which takes family and workshop economy as the main body disintegrates rapidly, thus the regional spatial structure steps into centralized form developmental stage from scattered form developmental stage. The social reform and scientific technological development promote the quick economic development, in the mean time, the social division of labor speeds up obviously. The advent of waterborne traffic, railway and highway transportation, further aggrandize the scale of commodity production and exchange. Along with the socio-economic development, the effect of "cluster economy" begins to arise. The advantageous geographical environment and complete infrastructure make the city and town absorb the resources of immense rural areas increasingly, and at the same time export merchandise to the surrounding areas. The city and town gradually forms the growth pole of economic development. The low efficiency spatial balanced form is broken and the spatial economic ladder looms large.

**1.1.3** The medium stage of industrialization. The economic development makes the GNP snowball by leaps and bounds, and the national and private investment ability stronger. The development of scientific technology further emancipates the productive forces, the heavy industry becomes the social dominant industry, the tertiary industry began to burgeon, and the pace of industrialization and urbanization step by step quickens. The development of resources, transportation and telecommunication makes new city and town emerge increasingly. The simplistic model of "center-periphery" evolves into multiple nucleus structure, and the functional division of labor and hierarchal system initially takes shape. Due to the dominant status of cluster economy in the decision-making of socio-economic location, the society and industry mainly concentrate in high grade city and axis, the system of "point-axis" forms gradual-

ly, the imbalance of regional economy sharpens, and the spatial structure still changes incessantly<sup>[3]</sup>.

**1.1.4** The later stage of industrialization and post-industrialization. The high degree development scientific technological civilization is applied extensively in economic construction, urban-rural planning and ecological protection. The modern traffic and telecommunication make the economic development break away from the shackles of location factors, and the development of "cluster economy" surpasses the boundary allowable, resulting in so called "Agglomeration Diseconomies". The democratic system of "voting by feet" makes the difference of consumption, income, employment, and opportunities choosing in urban-rural areas and regions vanish gradually. The concept of ecological civilization is paid high attention, and the space and resources in regions are used reasonably. The agglomeration of city and town is dominant in "point-axis" spatial system which gets more improvements. Its hierarchal difference becomes more and more infinitesimal, and the whole spatial structure back again in the "counterpoise".

## **1.2 The three dimensional model of spatial evolution**

The development of scientific technology always determines the evolving process of spatial structure. Before the medium stage of industrialization, the relatively weak economic foundation and the strong desire for material life, make the socio-economic spatial movements focus on clustering, and its main impetus is economic factor. The developmental model of growth pole becomes the optimum alternative, and the imbalance of regional spatial structure is inevitable. When in the middle and later periods of industrialization, equality, justice and equality developmental opportunities and other socialized factors gradually play the dominant role. The role of economic factors is downplayed, and balancing layout and giving play to social benefit get more and more attention. The decision-making of socio-economic location may deflect from the optimum scheme in economy, and extend along the two-dimensional space of economy and society. When in the stage of post-industrialization, the powerful

means of technology strongly change the natural structure and ecological environmental structure. The ecological environmental factors influence the resources development direction of country and regions, industrial location, industrial choosing

and spatial layout. The spatial location choosing influenced by economy, society and environment concurrently, and the change of spatial structure extends along three-dimensional space (Fig. 1)<sup>[3]</sup>.

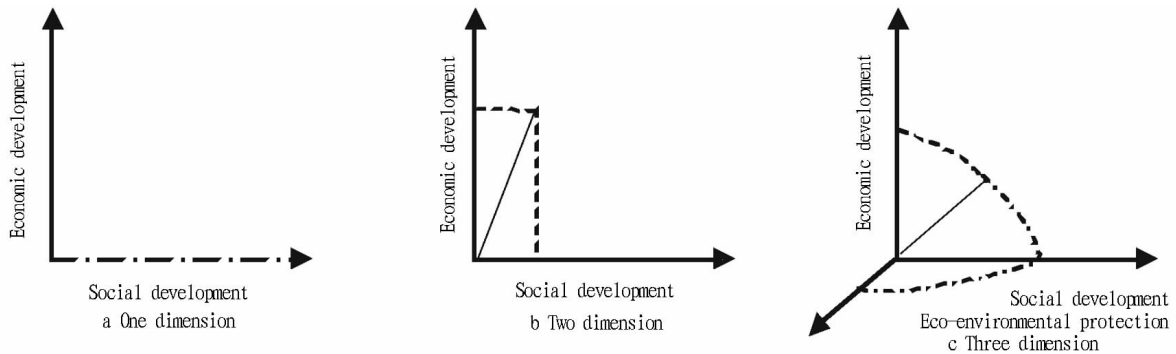


Fig. 1 Economic development in the space of three dimensions

## 2 The status quo of integrated development of China's urban-rural space

**2.1 The pace of evolving process of urban-rural spatial structure quickens** At the inception of establishing China, for the original accumulation of industrialization, China adopted the strategy of giving priority to the development of heavy industry and put the focus of development on city, while the agricultural departments only provided grain, material and labor forces for industrial departments. This caused decreased output of agriculture, shortage of grain, stagnant development of agricultural departments, the increased gap between city and village and severe imbalance of urban-rural spatial structure, which consigned the national economy into predicament<sup>[4]</sup>.

Since the reform and opening up, under the multiple backgrounds of globalization, informatization and marketization, China's urban-rural structure is undergoing sharp spatial evolving process due to the push of socio-economic transformation<sup>[5]</sup>. The direct foreign investment and international trade growth as well as the expansion of international production network of multi-national corporations, promote vigorously China's economic structural transformation and economic development. Along with the high speed urban economic development, the urban construction takes on the rush of large-scale development, and the urban-rural spatial structure takes on outstanding evolving process. Recently, China's economy develops rapidly. At the end of the year 2008, the GDP per capita was 22 698 yuan, and it has basically formed the conditions for promoting urban-rural spatial integration. Firstly, the infrastructure facilities are improved prominently; the structure of consumption and industry is upgraded rapidly; the economic growth model and comprehensive strength are promoted; the pace of urbanization and industrialization develops rapidly, and the comprehensive strength is further elevated. Secondly, the social undertakings develop rapidly; the undertaking of education, sanitation, and culture develops increasingly; the social security system becomes sound gradually; people's life standard is improved prominently, and people on the whole live a well-off life. Thirdly, China has established the economic system of socialist market preliminarily; the central government issues many docu-

ments in order to coordinate the development and planning between city and village.

**2.2 The outstanding dual structural characteristic has become the main obstacle to urban-rural balanced development** Although China's economy develops continuously and rapidly, we should be aware that China's urban-rural socio-economic development is imbalanced, and the dual structural characteristic has become the severe obstacle to economic development and social stability. The developmental road of taking heavy industry as dominant industry at the inception of establishing China makes contribution to industrialization. But the two measures of "inhibiting agriculture to protect industry" and "city and town deprive village" impair the objective of social equality and scathe agricultural efficiency. The rural population in a large number has no domain to transfer but to remain in the limited agricultural space. It is hard to realize the agricultural scale economy. The slow growth of agricultural labor productivity in conjunction with the great income gap between city and village resulting in the long term shortage of effective demand, have become the insidious peril to continuous economic development<sup>[6]</sup>.

The urban-rural spatial layout in China is disorderly, and the spatial expansion of most cities is mired in the disorderly sprawl. There is a state of scant expansion. Firstly, the quick development of urbanization makes multitudinous rural surplus labor forces swarm into city and town, which brings a series of excessive problems of urbanization such as traffic congestion, shortage of housing, population expansion, hard employment, skyrocketing prices of land and so on; in addition, the urbanization diverts and diffuses the industries with low technological level and severe pollution into rural areas, and in the means time it extends the pollution into rural areas, resulting in new pollution regions and imbalanced relationship between human and nature<sup>[7]</sup>. Secondly, in most of regions, especially in the western regions, the urban scale has a fault, namely it is devoid of big cities, which is not conducive to the quick agglomeration and diffusion of economic factors and industry, and not conducive to exerting the leading role of central cities. But due to scant investment of small towns, low standard of facility construction of life and service and the poor ability of absorption, some enterprises are not willing to take root in small towns,

which makes it difficult to carry out the reasonable industrial layout and to alleviate the great pressure of population in metropolis. The severity of the problems lies in that although the big cities have many demerits of excessively centralized industries and population, it still has the tendency of continuous centralization. Thirdly, in terms of industrial development, the degree of dependence among cities is not high, there is a great fall of industry and economy, and the orientation of urban function is not clear. The industrial developmental contradiction between the central cities and surrounding towns is irreconcilable; the dominant industries in medium and small cities are universally weak; the development of the tertiary industry is not adequate and the emerging industries development laggardly, such as high technology industry, information industry and modern service industry. Fourthly, in terms of administrative management, most compete disorderly and viciously. They develop unevenly and cooperate disorderly.

### 3 Countermeasures on coordinated development of China's urban-rural spatial integration

**3.1 The healthy socio-economic development is the external environment of realizing urban-rural spatial integration** The end of propelling urban-rural spatial integration is to bring about the mutual help and economic development between city and village, and create a goods environment for sustainable development of humankind. The healthy development of macro economy is the basic prerequisite and foundation of any reform. Promoting urban-rural spatial integration is a process of system reform and system innovation, which needs a healthy macro economic environment. Firstly, we should keep the macro economy stable basically, mitigate the impact of international financial crisis on China; secondly, we should change the developmental model of economy, strengthen the energy-saving and emission-reduction, change the existing economic developmental model which mainly focuses on investment, lower the tax rate, spur domestic consumption, and develop enormous rural consumption market; thirdly, we should adjust and optimize the industrial structure, develop vigorously the service industry, and change the existing situation of economy depending on driving industries; fourthly, we should reform the monopolized industries and public institutions, and encourage the private enterprises to participate in the reform and reshuffle of state-owned enterprises and institutions<sup>[8]</sup>.

The development of urban-rural spatial integration should choose people-oriented principle. Firstly, we should adopt various measures to create a production and life environment for human kind. So China should protect agriculture, establish natural conservation area, introduce agricultural landscape for new city construction, and keep ecological balance so as to make human kind survive and develop better; secondly, we should elevate human's quality, strengthen the sense of responsibility and raise the awareness of sustainable development. The level of economic development in China is not high, the development of urbanization and industrialization has also stepped into the medium stage, and the main task currently is to develop econo-

my, but the experience tells us that developing economy is to meet people's material need, and protecting environment is to sustain the foundation of human's survival and development.

**3.2 The urban-rural coordinated planning is the prerequisite of realizing urban-rural spatial integration** China has myriad cities and towns, and vast rural areas. In the macro regulation of coordinating urban-rural development, the government always takes the urban-rural coordinated planning as an important instrument. We should break the administrative boundary, build effective regional coordination mechanism. In the mean time, we should not only pay attention to the balanced development of city and village and the balanced development of society and environment, but also pay attention to the close relationship of urban development, resources allocation and industrial structural change. In addition, we should conduct unified planning in the perspective of entirety of urban-rural region. All these are the prerequisites of realizing urban-rural integration. We need to use urban-rural overall planning and land use planning to control urban-rural land use, so as to bring about the mutual connection of urban development and rural development, preclude the boundless and disorderly urban sprawl, and protect agricultural development. We should construct highly advanced traffic system, shorten the distance between city and village, facilitate people's travelling and transportation of cargo, so as to make society and economy prosper in the entire region.

Currently, most of China's cities and small towns enact developmental planning. The new socialist village construction is carried out in full swing across China, and many cities even have conducted adjustments for many times. But being that the legal binding force of urban-rural developmental planning in China is weak and the phenomenon of arbitrary modification is ubiquitous, it is difficult to implement the planning. Only by legislating and strengthening the binding force of planning can we ensure the authority of planning. The coordinated urban-rural planning, related with people's benefit, is not only the business of planning experts and government, but also needs the participation and acknowledgement of the public. The planning in western countries must pass the city residents' deliberation procedure, which is worthy of learning and reference. We should fully transform the function of government, choose people-oriented principle, fully respect benefit of the public, increasingly strengthen awareness of service, reinforce the participation and supervision of the public in urban-rural planning, and guide the public to improve developmental environment.

**3.3 Exerting the function of government is the key to realizing urban-rural spatial integration** For the developing country, like China, coordinating urban-rural spatial development requires the government to support and protect agriculture, village and farmer. Some people believe the force of market, and hold that the dual urban-rural structure of western developed countries will disappear along with the socio-economic development, while China can dissolve urban-rural dual structure by quickening the pace of urbanization in order to realize the rapid integration of urban space and rural space. This thought is inadvisable and detrimental. The development of market economy is not entirely laissez-faire, and the factors of

public goods, externality, monopoly and information asymmetry sometimes make the market economy disorderly. As regards the impeding factors impacting sustainable socio-economic development in the process of free competition, the government, as the representative of social public benefit, should try to regulate and redress these factors. The urban-rural spatial development has the internal law, and it also needs the external guidance and support. Those western countries all try their best to protect urban-rural spatial development in terms of legislation, policy, scientific technology and education.

In addition, due to the agriculture with the characteristics of externality and commonweal, the agricultural production period is long and the elasticity of demand and supply of agricultural products is small, thus the adjustments of market on agriculture have great limitation. In the process of developing urban-rural spatial integration, the support and participation of government in rural reform and rural modern construction profoundly influence the social participation degree and transformation degree of rural appearance. In the light of the international environment and domestic environment, China's solving urban-rural dual structure must depend on the vigorous action of government. The government should adopt effective measures to support the development of agriculture and village, and elevate the production ability and competitiveness of agriculture and village.

**3.4 Promoting agricultural industrialization is the approach of realizing urban-rural spatial integration** The experience of urban-rural spatial development of developed countries tells us that highly advanced urbanization has not eliminated agriculture yet. Village, as the place of agricultural production and a form of human kind settlements, will not disappear wholly. On the contrary, the healthy development of agriculture is the basis and prerequisite of promoting the coordinated development of industrialization and urbanization. China should reinforce the optimization and adjustment of agricultural industry and the structure of products as well as the support of agricultural industrialized management in terms of the specific policy and capital investment. Under the situation of the current agriculture tending to be marketized, we should organize the scattered farmers by the contract farming of leading enterprises, in order to solve farmers' worry of "planting easily and selling hardly"; we should give play to the role of market in directing and coordinating production, guide farmers to grow the crops with the optimized structure and optimized species, and solve farmers' problems of profit increment in the field of production and circulation in international and domestic market. Meanwhile, we should further implement the developmental strategy of "using city to lead village, using industry to promote agriculture". We should further conduct land system innovation, take specialization, scale and intensiveness as developmental direction, make agriculture become strong, nurture agricultural leading enterprises increasingly, and promote the comprehensive ability of agriculture. We should also promote vigorously the agricultural industrialized management, promote the agricultural comprehensive benefit and comparative benefit, transform the traditional agriculture into modern agriculture, and propel the further improvement of new village construction<sup>[8]</sup>.

**3.5 Perfecting social security system is the basis of realizing urban-rural spatial integration** The social security is an important approach to realize the second-time distribution, and a high level social security system can lower poverty rate to a certain extent and preclude the polarization. The social security system of urban-rural integration narrows the gap between city and village, and plays the positive role in promoting rural urbanized construction. Along with the implementation of related policies on urban-rural integration, China's social security system has made a great progress, but there are still many problems as follows: firstly, the coverage range of China's social security is narrow; the system is not so sound; the basis of management is very weak; there is great pressure of capital defrayal; there is unreasonable security and treatment of part of the social groups; especially the problems of imbalanced and interconnected development of urban-rural social security loom large. Secondly, the rural social security is still weak. The rural minimum living standard system has just been established, and the basic living standard of impoverished farmers is yet to be improved; the matching capital of new rural cooperation medical system is scanty and the security level is low; the new rural social pension system has not been orientated, and there is outstanding system blank in the aspect of rural pension system.

Along with the rapid process of urbanization and non-agricultural development, the farmers' farmland per capita in China dwindles, and the security function of land gradually degenerates; in addition, the aging of rural population and small rural families also impair the family security function. The current expenditure of rural medical care and education is exorbitant, inhibiting farmers' will of consumption, which makes the economic development depend on investment and export excessively. So, establishing perfect social security system of urban-rural integration, is not only conducive to strengthening impoverished farmers' consumption ability and promote economic development, but also conducive to the orderly transfer of rural surplus labor forces and rational circulation of urban-rural means of production so as to promote the economic development and social harmony. The central and local government should raise fund of social security from multiple channels, in order to form extensive-coverage, multiple layered, sustainable and high-efficiency social security system. By the urban-rural integration construction, we should try to realize the transfer and continuation of social security relations across provinces and cities, and increasingly perfect urban-rural basic pension system, basic medical security system and social aid system and so on, in order to make people get support when they are old, get medical care when they are ill, get help when they are helpless, get relief when they are poor, and get schooling when they are young.

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$$P_{1N}^* = \frac{a + x_{02} + C_{01} - C_{02} - x_{01}}{2}$$

Using the above solving results, we can get the profit level of retailers and suppliers  $-\pi_{1N}^*$  and  $\pi_{2N}^*$ .

$$\pi_{1N}^* = \frac{(a - C_{01} - C_{02} + x_{01} + x_{02})^2}{8b},$$

$$\pi_{2N}^* = \frac{(a - C_{01} - C_{02} + x_{01} + x_{02})^2}{16b}.$$

**3.2 With information sharing** When two behavioral main bodies are having information sharing, it is supposed that, through agreement, every main body gives the other the same information, that is,  $\Delta x_i = \Delta x_j = \Delta x$ ,  $\Delta x \in [0, \min(x_i, x_j)]$ . From the above solving process, we can get  $P_{1Y}^*$ ,  $P_{2Y}^*$ ,  $q_Y^*$  under the condition of information sharing:

$$q_Y^* = \frac{a - (C_{02} - x_{02} + P_1 - \Delta x)}{2b},$$

$$P_{1Y}^* = \frac{a + x_{02} + C_{01} - x_{01}}{2},$$

$$P_{2Y}^* = \frac{a + (C_{02} - x_{02} + P_1 - \Delta x)}{2}.$$

On the above basis, it can be further get the profit level  $-\pi_{1Y}^*$  and  $\pi_{2Y}^*$  of suppliers and retailers when they are having information sharing:

$$\pi_{1Y}^* = \frac{(a - C_{01} - C_{02} + x_{01} + x_{02} + 2\Delta x)^2}{8b},$$

$$\pi_{2Y}^* = \frac{(a - C_{01} - C_{02} + x_{01} + x_{02} + 2\Delta x)^2}{16b}.$$

And the differences of the profit level of retailers and suppliers before and after information sharing  $\Delta\pi_1$  and  $\Delta\pi_2$  are:

$$\Delta\pi_1 = \pi_{1Y}^* - \pi_{1N}^* = \frac{\Delta x^2}{2b},$$

$$\Delta\pi_2 = \pi_{2Y}^* - \pi_{2N}^* = \frac{\Delta x^2}{4b}.$$

We can get from the above that, information sharing between producers and suppliers can improve the profit level of producers and suppliers. That means information sharing can improve the profit of members attending the information sharing. But if we want to realize effective information sharing in green supply chain management mode, we should pay attention to three points: Firstly, the members of information sharing should include not only members in the green supply chain management but also consumers. Due to the limitations, cost of leaning and limited use of time, the consumers can't have the knowledge and ability of their consumed food. This provides possibilities for the products of traditional food industrial mode

to replace the products of higher green degree and occupy the market. Therefore, consumers should become the important members of information sharing in the green supply chain management mode. Secondly, the content of information sharing should contain not only stock information but also other knowledge and information, particularly contains relevant information sharing related to green technology and functions information of green product. Thirdly, the measures of information sharing should include not only formal communication but also informal communication.

## 4 Conclusions

Along with the penetration of low-carbon and environment protection idea, green supply chain management is the inevitable choice of the development of food industry. However, realizing information sharing is the key of green supply chain management. From the practical conditions, the information sharing among the members of supply chain faces various barriers, such as the information technology of enterprises is not enough and so on, some enterprises even intentionally set up barriers for they don't want to share information with others. For this reason, the enterprises of supply chain should change their inherent idea from the base, open to others, strengthen communications with other member enterprises and establish information platform to realize information sharing.

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