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Research on the Scale Management of Agriculture in Anhui based on the Network Data Mining

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Abstract: Data mining is a new field which has a great application prospect, which involves the database, artificial intelligence, statistics, pattern recognition, and other cross disciplines knowledge. In this paper, the author analyses the scale management of agriculture in Anhui province based on the network data mining. With the effectiveness of the scale of the land in Anhui region has become increasingly apparent, the farmers’ land management awareness has gradually strengthened. But at present, the market level of land scale operation is low. In the land transfer market, there is no corresponding land transfer policy system constraint. On this basis, we put forward suggestions to promote agricultural scale management.

Key words: Data mining, Collaborative algorithm, Agriculture scale management, Agricultural modernization

1. INTRODUCTION

With the continuous deepening of China’s economic reform, the scope of the role of the market is more and more wide. China’s agriculture is also proposed from the mixed agriculture to the professional development of agriculture to achieve the modernization of agriculture(Bittner,2013). According to the description of American economist Todaro, modern agriculture can be summarized as two basic characteristics: the capital, technology investment, the implementation of the management system of enterprise. And the realization of these two are based on the scale of agricultural production. The general definition of scale is to control the input of production factors in order to minimize the production cost and maximize the benefits(Kerselaers,2013). For a long time, China’s agriculture is built on a foundation of unlimited labor intensive investment on the mode of production, the direct consequence is that the per capita arable land area is less, a serious shortage of capital inputs, so that our country agriculture long-term stay in the small scale of production, the production unit of the lack of self accumulation and self-development strength level and this has become a major problem hindering agriculture transformation to modern agriculture(Hernandez,2015). In the classical economics, the production unit can only reach a certain scale, and the scale benefit can be obtained, so that the production cost can be reduced. But in China, the average land ownership of the household responsibility system, the super small scale of agriculture has neither the capacity nor the development of accumulation, the accumulation of power.

Agriculture is a complex giant system, the application of information technology in agriculture to promote agricultural information data. China's vast land, soil types, crop resources, how to make science and technology more effectively serve the agriculture, is related to the beneficial to the people's livelihood event. In the past more than and 10 years in China to spend huge sums of money the various agricultural census data, has established crop resources, land resources, agricultural environment and other large database(Tang,2015). Accumulated a large number of agricultural information data, the explosive growth of the new data, hidden behind a lot of more important information, due to the lack of useful tools, the data has been collected far beyond human processing capacity(Sok,2015). Therefore, the use of new technology to change data into knowledge is facing large database management information system, database data mining technology into a more advanced stage, it can not only query and traversal of the past data, and can find out the potential link between the past data, thereby promoting the transmission of information to people. The application of the data from the low level and simple search, to enhance the knowledge from data mining, decision support.

2. APPLICATION OF DATA MINING IN AGRICULTURE

2.1. Data mining

Data mining is a new area with the application of data in the research prospects, data mining is from the large, incomplete, fuzzy and random data application in the extraction of implicit, people do not know in advance, but is potentially useful information and knowledge(Yazdanpanah,2015). The data mining technology was first applied in the field of Commerce on customer information data analysis, with the awareness and understanding of the deeper and in the practical application of the significant economic benefits, the application of data mining technology in various fields has been developing rapidly. Data mining involves the intersection of database, artificial intelligence, statistics, pattern recognition and other fields(Hodge,2015). At present, artificial neural network, decision tree, genetic algorithm, neighborhood algorithm and programming derivation
are often used in data mining. Application of these techniques can be completed on the data of the characteristics of the distinction, correlation analysis, classification and prediction, clustering analysis, outlier analysis, evolution analysis and other mining functions. In addition to data mining knowledge after explanation, can be directly applied in the actual system, to assist in the solving process, or to provide expert, expert knowledge system has been modified, can also be used as a new knowledge transfer to the application system in the knowledge base. The structure of data mining system is shown in Figure 1.

**Figure 1. Data mining system**

- **Database**: Data warehouse or other information base is one or a set of databases, data warehouses or other types of information database, it can be data cleaning and integration.
- **Database or data warehouse server**: According to the user’s data mining request, the database or data warehouse server is responsible for the extraction of relevant data.
- **Knowledge base**: Domain knowledge is used to guide the search or assessment of the results of the degree of interest.
- **Data mining engine**: Is a basic part of the data mining system, which is composed of a function of the touch, used for characteristic, correlation, classification, clustering analysis and evolution and deviation analysis.
- **Touch evaluation module**: Usually it makes the interest measure and interacts with the data mining module in order to focus the search on the interesting touch.
- **User interface layer**: According to the decision makers need to submit the relevant operating orders, get feedback from the results.

Collaborative filtering algorithm is the mainstream in this field. As a content based algorithm, collaborative filtering has a considerable advantage in accuracy, but it can not be cold start, recommend homogeneity and low efficiency, so it still has a lot of problems. Therefore, the field of network science has never stopped the study of
the law of the network nodes, in order to find a more efficient algorithm. The Pearson correlation coefficient calculation user u and user v similarity formula is as follows:

\[
sim(u, v) = \frac{\sum_{i \in I(u) \cap I(v)} (R_{ui} - \bar{R}_u)(R_{vi} - \bar{R}_v)}{\sqrt{\sum_{i \in I(u)} (R_{ui} - \bar{R}_u)^2} \sqrt{\sum_{i \in I(v)} (R_{vi} - \bar{R}_v)^2}}
\]

In the score matrix, each line represents the score vector of each user, and the similarity formula is as follows:

\[
sim(u, v) = \cos(u, v) = \frac{\sum_{i} R_{ui}R_{vi}}{\|u\| \|v\|} = \frac{\sum_{i} R_{ui}R_{vi}}{\sqrt{\sum_{i} R_{ui}^2} \sqrt{\sum_{i} R_{vi}^2}}
\]

Predict the user i on the project u score, the calculation formula is as follows:

\[
P(u, i) = \frac{\sum_{v \in \mathcal{V}(y(i))} \sim(u, v) \times R_{vi}}{\sum_{v \in \mathcal{V}(y(i))} \sim(u, v)}
\]

2.2. Data mining technology in the field of Agriculture

China is a large agricultural country, agricultural areas of the database contains vast amounts of raw information from different sources, including a large number of fuzzy, incomplete, with noise and redundant information. Using database mining technology to excavate a large amount of agricultural data, it can be effectively used to find out the relationship between the various factors in the vast data(Rudel, 2014). It is very important to find some new laws that guide the agricultural production, which is produced by the dynamic change of the factors. In addition, due to the characteristics of agriculture, such as soil type, many crop species complex, frequent occurrence of pests and diseases and diseases like changing relationship and the impact of fertilizer, density and climate between each other, makes large, multi dimensional, dynamic and uncertain characteristics of database and knowledge base about them. The particularity of agricultural data mining is determined.

Figure 3. Cloud computing data mining

Agriculture and natural environment is closely related to the agricultural industry, not only to provide the necessary information for human life at the same time, a large area of crops for the regulation of the global ecological system and regional ecological system plays an important role, China attaches great importance to the agricultural environment, over the years have carried out a large number of basic conditions of agricultural environmental monitoring and investigation, the accumulation of a large amount of data on the basic agricultural
detection of sewage irrigation, food safety, ecological and other aspects of law standard, using the technology of data warehouse and data mining on agricultural environmental data accumulation, it is easy to from statistical methods are hard to achieve results. For example, according to the data accumulated and constantly collected, combined with the soil environment background and farming habits, etc., can be used to dig out the cause of the difference in the quality of the environment in different regions. According to the data of environmental quality in agricultural soil and crop growth conditions of knowledge, to dig out the quality of agricultural products, agricultural products and analysis of the cause of the deterioration of the quality of environmental or ecological potential, which can better provide favorable guidance for agricultural production and agricultural protection. In addition, data mining is used for agricultural product quality analysis, provide a favorable basis for drug selection and fertilizer production base of agricultural products, the use of data mining technology can obtain more agricultural environmental information management, can make the production staff to develop a more accurate and reasonable management decision.

Figure 4. Data mining analysis

3. THEORETICAL RESEARCH ON THE SCALE MANAGEMENT OF AGRICULTURE

3.1. The necessity of agricultural scale management

As China's large population base, the absolute number of population growth is large, adequate food supply is the first element to ensure the stability of the country. But because the development of the city and other reasons for the occupation of agricultural land, the cultivated land resources in China decreased year by year, and the reserve of arable land is less, so the production efficiency of the existing cultivated land improvement is particularly important, which requires extensive use in agriculture to agricultural science and technology. Under the current domestic operating system in our country, as the main body of the farmers, for modern science and technology, they lack the ability to apply, and lack of motivation. China's agricultural labor force low levels of education, acceptance and utilization ability of agricultural science and technology of the weak is an indisputable fact; in addition, farmers under the existing system also lacks the active utilization of agricultural science and technology motivation, Chinese farmers generally to land as the basic guarantee of life, and will increase revenue and improve the living level of hope in the non-agricultural income. Under the rational choice of farmers, seeking to obtain stable income is the first choice of farmland, and the use of agricultural science and technology, such as new varieties of sowing, the use of new fertilizers and so there is a certain risk. Even if successful, because the area of cultivated land from a single small, profit is not much, if it fails, the risk is to take the family for a year without food and clothing. This is probably also our country agricultural science and technology promotion is difficult, agricultural science and technology invention use low important reason. The goal of the state is more difficult to be consistent with the goal of the micro target of the peasant household.
After entering WTO, China's economy has become more integrated into the world economy, and agriculture is no exception. The influx of foreign agricultural products, the impact on China's agriculture is very obvious. Backward agricultural production, the small scale of production, and the production is too scattered, unable to control the production process, the quality of agricultural products and agricultural products safety can be guaranteed, which led to China's agricultural products in terms of price competition at a disadvantage.

Agriculture is different from the labor intensive industry, it is difficult to rely on investment to obtain the output and quality of the competitive advantage in the infinite labor, because in the agricultural production process, the natural role tends to occupy the leading position, so in agricultural production, beyond the marginal benefits must labor is very low, sometimes even zero benefit. Small scale agricultural production organization form, not only will reduce the efficiency of the agricultural labor force, but also affect the output efficiency of land. In fact, not the wrong scale before the reform and opening up, China's agricultural production efficiency and allocation, but not scientific planning system and egalitarianism denied the labor enthusiasm of farmers. Therefore, it is necessary to comprehensively enhance the comprehensive production capacity and market competitiveness of China's agriculture, and the scale of operation is an inevitable choice.

3.2. Problems in agricultural scale management

In the development of agricultural industrialization operation of vertical integration in China driven, through the development of enterprises and industry associations and other economic organizations, in order to realize the agricultural products as a link to the scale of operation, set up a bridge between farmers and market dispersion between. But there are still some problems in this mode of operation.

- The lack of stable cooperation and benefit sharing mechanism between economic entities: The development of agricultural industrialization, fundamentally speaking, only to solve the problem of primary agricultural products for farmers to sell, farmers need to go to the market to find the object, so save a lot of market transaction costs. Not only have the common interests of enterprises and farmers of all economic, and have their own personal interests, and the lack of law, and in the face of agriculture from nature and market risks, enterprises and farmers are the existence of a large number of breach, the opportunism behavior has brought the enormous influence for both production and income expectations.

- Enterprises, the association of weak economic strength, leading role is not strong: As China's agricultural industrialization development time is not long, leading enterprises and other economic cooperation organization is still in the primary stage of development, the promotion of the whole agriculture is very limited. So, at present only vigorously promote the development of agricultural enterprises, continue to expand the scale of enterprises, in order to lay a solid foundation for the development of the industrialization of agriculture, in order to promote

- The weak position of farmers has not been completely changed: The development of agricultural industrialization, so that farmers from the past alone into the market into a business, but in the process of trading and farmers, the strong position of the enterprise is very obvious. Due to the economic strength is not equal to enterprise, farmers can only breach of corporate mismanagement and humiliation, even sometimes encounter the market risk will be passed on to farmers. Even though the mode of agricultural industrialization with joint stock cooperation, the farmers' land is internalized in
the enterprise, but because of the defects of the Commission and the agency itself, the interests of the farmers are often infringed.

Figure 6. Agricultural modernization development

4. AGRICULTURAL SCALE MANAGEMENT IN ANHUI AREA

4.1. Theoretical basis of scale management

According to the basic theory of classical economics, realizing scale must first of production factors, the most important resource of agricultural land, so in recent years, the rational flow of Chinese scholars on how to realize the concentration of land is studied, but the results from the research point of view, focus on the use of land is currently in our country there are some difficulties. The main reason is: on the one hand, countries continue to strengthen the rural household contract responsibility system of the agricultural production organization form in the policy, to stabilize the rural economic development, such as the extension of the rural land contract period; on the other hand, according to statistics, China’s current land area of less than 5%. The causes of China’s land circulation is not strong in many aspects, such as basic social insurance in rural areas and narrow coverage, system of rural cooperative medical treatment in the experimental stage, the land for basic life safeguard function of farmers also can not be replaced completely; intermittent agricultural production part of farmers can realize non-agricultural employment, obtain the advantages of the social division of labor within the family; the abolition of agricultural tax and the implementation of the national grain subsidy policy, increase the income of farmers on the land policy expectations and the urban and rural household registration system and other factors, so that the farmers to give up land will is not strong, the classical economics of scale is the future direction of development.

Figure 7. Rural industry value-added proportion
According to the transaction cost theory of the new institutional economics, the idea of another agricultural scale production is to reduce the transaction cost between the farmers entering the market, and how to realize the docking between the small scale production and the big market. According to the view of institutional economics, small-scale agricultural production can not meet the demand of market economy. Because any market transactions will have cost, including collecting transaction object, contract negotiation, especially the cost of collecting information for the market economy is very high, farmers unable to bear the small scale of production, which is why with the development of market economy, part of farmers has gradually return to reason from the mixed economy of self-sufficient natural the state of the economy. The reasons for this phenomenon are in many aspects, such as the market economic system of our country is still in the process of perfecting the information channel is narrow, the time is not timely and not standardized; the most important reason is that the peasants in our country although people but not form a cohesive force, do not develop into powerful interests, without their own spokesmen for the interests in the market. So, how in the current household contract system, in all aspects of a production of agricultural products as a link, improving the degree of organization of farmers, the formation of peasant interest group is the institutional economics on the basic ideas and Strategies of agricultural scale operation in China's implementation.

4.2. Scale management of cultivated land in Anhui Province

The scale of cultivated land in Anhui Province, the low degree of concentration, land use scale slow development, the country, in the backward position, and the social and economic development of our province in agriculture and rural areas are closely related, its reason is in many aspects. The city is now in the transition from traditional agriculture to modern agriculture in the key period of Anhui area of land scale operation has been actively exploring and trying, in recent years, a lot of typical, with land scale management in Anhui area effect increasingly obvious, farmers' land scale management consciousness is gradually strengthened. Requirements, land scale management also increased, but the level of the market at present the land scale management is low. In the land transfer work, although in typical power, scale and speed of land circulation is accelerated, but mainly rely on some influential individuals or organizations to promote large-scale operation of land, far from forming a contiguous development trend. In the market of the land circulation policy, institutional constraints without the corresponding standard of land circulation, basically rely on the farmers to change the land use right of the land leasing price making, the transfer of land area and land transfer period and other aspects are not unified, randomness. In the land market, promote land circulation without intermediary institutions or departments involved, decentralized and no organization of farmers, the transaction cost is too large, the establishment of large-scale operation of the high cost of land.

1) More people and less pattern is difficult to change: Compared with the whole country, our province has a certain scale of farmers, the scale of farmland is very small. We use the reflection curve Lawrence national wealth income distribution uniformity and the calculation of land economics concentration index to reflect the degree of concentration distribution of arable land in our province. Lawrence curve of cultivated land in Anhui province distribution compared to the whole country, closer to the diagonal representation of cultivated land is evenly distributed in all levels of farmers. The curve is relatively flat. 87% of the arable land in the province is owned by farmers with less than 9 acres of arable land. From the arable land concentration index, the arable land concentration index in our province is 0.17, lower than the national average.

2) Slow development of rural industry: Arable land is relatively concentrated, there should be a large number of agricultural labor transfer from agriculture, the two or three industry to be able to provide a large number of employment opportunities. The main force of rural industrialization is the development of township enterprises, but in recent years, the township agricultural growth slowed down in our province, it is facing many problems, such as: enterprise benefit, landslide scale is difficult to expansion, the growth rate down, etc., The reason of low and decentralized rural industrialization in the province strategy, the enterprise overall quality and extensive management are closely related. The rural community economy in our province is not developed, the development of township industry is relatively backward, compared with other developed provinces in the country and rural areas, is still in the initial stage of industrialization, coupled with the low level of urbanization, based on the first and the two industry is highly developed on the basis of the rural third industry development condition is not mature

3) Peasant household's traditional idea: Due to the current development of rural industrialization, and agricultural labor force to non-agricultural industries have led to the rapid and complete transfer, but lead to the emergence of a large number of farmers. Farmers and industry in order to prevent those engaged in agriculture and non agriculture risk, not to lose their jobs, the land contract rights as a retreat, but also workers, seek self insurance. For these farmers, the main purpose of farming land is not to produce but to obtain a kind of welfare. In this case, the farmers and the production and operation of the mode of operation to strengthen the small scale of arable land management, becoming a major obstacle to the concentration of arable land.

4) Lack of perfect land circulation system: The existing land system is farmers contracted, collective ownership, the use of farmers on the land is free, under certain conditions can also be transferred, but the current rural land circulation scale is very small, because of the emergence of this situation, the system of rural land
circulation under the condition of market economy is not perfect, by administrative means land adjustment does not necessarily agree the inherent economic needs of farmers. At present, the land circulation in a spontaneous state, and most of them out of the market mechanism, the transfer behavior has not been standardized and legal protection, farmers can not obtain the corresponding income from transfer of land, so the majority of farmers are away from the land of desire.

4.3. Suggestions on the scale management of Agriculture

The scale of arable land must be developed along with the development of agricultural scale management, which is determined by the objective level of social and economic development. Agricultural industrialization according to the requirement of modern agriculture, optimize the allocation of production factors, the dispersion of the family business into a one-stop production management system, to maximize the overall efficiency and scale effect, it brings the development opportunity for the future of our province farmland scale management. The development prospect of the large-scale management of cultivated land in our province is good, hope and challenge. So we should face the situation, focus on the future, according to local conditions, promote the scale of cultivated land in the light of its general trend, our province business process actively and steadily.

1) Stable land contract relationship: To ensure the farmers’ right to land use is the premise of the concentration of arable land. Do not own the land use rights, which can make farmers treasure land, increase investment, improve the land output rate; also can not lift the farmers to keep the stability in rural areas; menace from the rear, but cannot play the role of the market mechanism, to achieve a reasonable transfer of land use rights. Therefore, giving farmers long-term and guaranteed land use rights, is the highlight of the farmer's market dominant position, so that the farmers under the condition of market economy to make the production and operation of independent and voluntary choices.

2) Speed up the transfer of rural surplus labor force: To meet the objective requirements of the development of the socialist market economy, breaking the dual social and economic structure. Transformation of the current rural industrialization strategy fundamentally and accelerate the process of rural city, urban-rural integration development, population, industrial layout is relatively concentrated in small and medium-sized city, the formation of industrial and densely populated areas, and on the basis of developing the third industry, promote the rapid and stable transfer of agricultural surplus labor, thus contributing to the relative concentration of land.

3) Promote farmers’ management to professional development: The key is to change the mode of production and operation of the industry farmers, if these and the arable land of farmers has been a reasonable and effective concentration, then the concentration of arable land in our province will be greatly improved. Therefore to carry out agricultural industrialization as an opportunity to encourage farmers and industry investment in agricultural industrialization ranks, become the grower, large farms, agricultural or agricultural products processing, transportation and trade and other non-agricultural large, and expand business scale, take the enterprise management of the road, a large force for the development of agricultural enterprises.

5. CONCLUSION

The general definition of scale is to control the input of production factors in order to minimize the production cost and maximize the benefits. For a long time, China's agriculture is a kind of intensive production based on the infinite input of labor force. The direct consequence is that the per capita possession of arable land is little, and the capital investment is seriously insufficient. The general definition of scale is to control the input of production factors in order to minimize the production cost and maximize the benefits. Agricultural industrialization can effectively promote the scale of agriculture production, but the nature of the transition is also very obvious, only to adapt to China's rural economic system change again before the partial adjustment of demand for production system of rural economic development. And the development of modern agriculture is the key to improve the level of agriculture in China and improve the life of farmers.

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