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Empirical Study on Formation Path of Family Farms in Different Environments from the Perspective of ANT

Yanchun CHEN¹, Suisheng ZHAO¹, Gong CHENG^{2*}, Huiwen SHANG², Yongke ZHAO³

1. Sanmenxia City Branch of Henan Tobacco Company, Sanmenxia 472000, China; 2. Xuchang City Branch of Henan Tobacco Company, Xuchang 461000, China; 3. Henan Agricultural University, Zhengzhou 450000, China

Abstract Family farm is an essential modern agricultural micro economic organization. With accelerated advance of rural land circulation and large-scale management, family farm gradually becomes an important choice for modern agricultural management. With ANT as theoretical basis, this paper analyzed formation of family farms in the joint action of endogenous and exogenous forces. Besides, it analyzed Fengsheng Tobacco Family Farm of Guyue Town in Zhucheng City of Shandong Province and Li Chunfeng's Family Farm in Songjiang District of Shanghai. Research indicates that different regional environments bring about different actors and also different formation paths for family farms.

Key words Family farms, Formation path, Actor - Network - Theory (ANT)

With numerous farmers becoming migrant workers, a new "middle farmer class" forms on the basis of spontaneous land circulation in rural areas^[1]. Emergence of the middle farmer class speeds up formation of "capital-labor intensive" family farms. Various drawbacks of farmers in fund financing, organization network, and material assets make endogenous forces of family farms weak, while exogenous forces (such as government department, agricultural leading enterprises, and financial capital) are strong. As a result, endogenous forces of family farms are neglected. The Actor - Network - Theory (ANT) is an approach to social theory and research, originating in the field of science studies, which treats objects as part of social networks. It focuses on interdependence and mutual relationship. According to ANT, various social associations are developed through human, natural and social relations. In ANT, the actor network not only includes social relations, but also stresses human and non-human relations between actors. Based on ANT, we will focus on characteristics of interrelation of economic factors, interactive balance of endogenous and exogenous forces, and stress how various actors promote formation of family farms through jointly building the actor network.

1 Framework of case study

1.1 Building of the actor network In 1986, Michel Callon firstly introduced the concept of the actor network in *The Sociology of an Actor-Network: Case of the Electric Vehicle*. In *On the Methods of Long Distance Control, Vessels, Navigation and the Portuguese Route to India*, John Law suggested building network of human and non-human actors to realize long distance control. In

1988, Bruno Latour showed how the actor network is successfully established on the basis of analyzing extension of Pasteur Microbiology Laboratory and changes of French social structure. At this point, three key elements, actor (especially non-human actor), translation and network connection, are elaborated. The building of an actor network includes defining problems to be solved in the network, recruiting related members and incorporating members to this network, controlling acts of actors through simplifying groups attracted, finally integrating all elements in the network. As a social relation network theory, ANT focuses on dynamically describing formation of network. The building of an actor network means the formation of a relatively stable network structural system.

1.2 Framework for case study of formation path of family farms based on ANT Successful building and excellent operation of family farm actor network are basis of formation and development of family farms. Besides, successful building of family farm actor network also promotes development of actors in the network and further promotes development of entire regional social economy. Theoretical basis for using ANT in analyzing family farms includes following three aspects:

(i) Combination of endogenous and exogenous forces. In the formation of family farms, stressing combination of endogenous and exogenous forces conforms more to characteristics of building of family farms. Based on ANT viewpoints, family farms are formed using act of actors in the network to replace internal and external partition in space and connecting actors through the actor network.

(ii) Equal status of human and non-human factors. In the combined endogenous and exogenous forces promoting formation of family farms, it stresses local resources drawing support from external resources to build family farms. Equally treating non-human factors with human factors and combining human and non-human factors to become a heterogeneous actor network means operation of family farms.

(iii) Joint construction of actor network, family farm, and

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* Corresponding author. E-mail: pingcuizhao@163.com

rural environment. The formation of family farm actor network is interactive with rural environment of family farms. Various element entities in the regional environment build actor network of

family farms, while formation of family farms will exert certain influence on their surrounding environment based on connection of regional environment.

Table 1 Basis for dividing endogenous and exogenous factors

Factors	Endogenous	Exogenous	Combination of endogenous and exogenous factors
Policies	Development demand of local industry	Promotion of state administration	Combined local common understanding and state promotion
Funds	Self fund or local capital	External fund inflow	Combined local and external funds
Resources	Local natural environment, infrastructure, culture, and planting tradition, <i>etc</i>	External technologies and knowledge	Mixed type (selling local resources or comprehensively using external resources)
Participants	Farmers, rural elites, village cadres, and ordinary farmer households	Outside entities (agriculture-related enterprises, agricultural service organizations)	Combined use of local and outside human resources.
Results	Farmers obtain returns to scale and create more jobs	Transferring surplus labor and promoting development of agricultural service organizations	Stressing combination with external market, realizing prosperous rural economy

2 Case study of family farms on the basis of using ANT in different environments

2.1 Basis for selection of family farms Considering major points of this study, we select family farms on following principles. (i) Best qualified principle. According to survey results of the Ministry of Agriculture in 2013, in 33 pilot provinces (regions) determined by the Ministry of Agriculture for standardization of rural land circulation and service, we selected the best qualified family farms from land circulation scale, production and management situation, and organization and management structure. (ii) Representative principle. This principle includes two points. Firstly, family farms are distributed in many fields, those engaged in planting and animal husbandry account for 80%, so they are representative, and we selected family farms in the range of planting and animal husbandry. Secondly, since research focuses on formation path of family farms in different environments, different regional environments cultivate different family farm builders. In other words, family farm builders are closely related with specific regional environment. Therefore, we selected family farms with different types of builders as case family farms. In line with the above principles and results of field survey and interview, we finally selected two family farms, *i. e.* Fengsheng Tobacco Family Farm of Guyue Town in Zhucheng City of Shandong Province and Li Chunfeng's Family Farm in Songjiang District of Shanghai.

2.2 Formation path of Fengsheng Tobacco Family Farm in Zhucheng City Fengsheng Tobacco Family Farm is the first registered tobacco family farm in Yanjiazhuang Village, Guyue Town, Zhucheng City of Shandong Province. In 2009, farmer Wang Ruli resigned from his transport work which he has done for 12 years. He sold 6 trucks and started circulating land and planting tobacco. By the end of 2013, he circulated a total of 75.3 hm² land and planted 57.3 hm² high quality yellow tobacco. With crop rotation of tobacco and grain, the annual profit of Fengsheng Tobacco Family Farm is more than 1 million yuan. Scale management solves the problem of idle farmland. Through developing order production and extending deep processing of grain, Fengsheng Family Farm

realized net income of more than 2 million yuan in 2013. From field survey of Fengsheng Tobacco Family Farm, we found that it was built mainly under the influence of local tobacco planting tradition and policies. Key factors include organization and management ability of farmer, support of tobacco company, coordination of village committee, and cooperation of local farmer households. Summarizing the above factors, we can obtain endogenous and exogenous factors of formation of Wang Ruli's Fengsheng Tobacco Family Farm, as listed in Table 2.

(i) Farmer status. Wang Ruli stated working in transport industry in 1997. He had 6 trucks and has established his truck team, showing strong organization and coordination ability. This is also the essential precondition for his boldness of breaking restraints of objective conditions, expanding flue-cured tobacco scale, and founding a family farm.

(ii) Policy support. After issue of tobacco industry regulating policy, "lifting level of tobacco and promoting scale planting of flue-cured tobacco" becomes inevitable path for development of tobacco industry in Shandong Province. With increase of transfer of rural surplus labor, superior labor of flue-cured tobacco constantly loses and farmer's enthusiasm of planting tobacco declines. Government and tobacco departments have to take a series of measures, such as increasing subsidy for land circulation, loosening loan conditions, arranging agriculture-related funds for farms reaching certain scale, improving farmland and water conservancy facilities, to stabilize local tobacco production.

(iii) Fund source. Fund of Wang Ruli comes mainly from his savings, partly from loan of credit cooperatives, the proportion of both is 9:1. In general, he accumulated much funds for large scale planting of flue-cured tobacco.

(iv) Resource advantages. Fengsheng Family Farm is situated in Guyue Town where there are excellent natural conditions suitable for planting flue-cured tobacco. Local area has a long history of planting flue-cured tobacco. The local flue-cured tobacco is high in quality and yield. These resource advantages are endogenous factors for formation of flue-cured tobacco planting family farms.

(v) Participants. Participants include farmers, tobacco company, village cadres, flue-cured tobacco cooperatives, and ordinary farmer households. According to the principle of farmer family as subject of family farms, tobacco company and flue-cured tobacco cooperatives are exogenous factors, while the rest are endogenous factors.

(vi) Results of founding. Fengsheng Tobacco Family Farm relies on tobacco production ecological village and people enriching project, the planting scale of flue-cured tobacco is up to 57.3 hm². For stabilizing local flue-cured tobacco planting, it plays an important role. Large-scale management solves the problem of idle farmland due to migrant work. Farmers taking their land on lease obtain stable rent and can be liberated from farmland and do migrant work. In addition, founding of family farms increases supporting fund input for local agriculture. Farms introduce modern enterprise management mode, adopt mechanized operation, and accordingly family farms become real rural economy entities of in-

dependent management and self development.

2.3 The actor network promoting formation of Fengsheng Tobacco Family Farm in Zhucheng City

2.3.1 Actor and obligatory passage point (OPP). Subject promoting formation of Fengsheng Tobacco Family Farm is the actor forming the actor network, including tobacco company, farms, flue-cured tobacco cooperatives, village cadres, ordinary farmer households of Zhucheng City, as well as local characteristic tobaccos. In these actors, yellow tobacco belongs to non-human factor and others are human factors (including individuals and organizations). The OPP of these entities is that "believing that founding tobacco family farm can stabilize local tobacco planting scale and promoting local rural social development, and every entity can obtain its benefit". Entities and OPP of founding Fengsheng Tobacco Family Farm are as shown in Fig. 1, which also indicates obstacles to be removed by entities for realizing their objectives in the process of building the network.

Table 2 Essential factors influencing formation of Fengsheng Tobacco Family Farm in Zhucheng City

Factors	Contents	Endogenous	Exogenous
Farmers	① Strong intension of agricultural management	✓	
	② High management and coordination ability	✓	
Policies	① State issuing laws and regulations, and policies to encourage development of family farms		✓
	② Adjustment of agricultural industrial structure and acceleration of rural labor transfer		✓
	③ Tobacco industry issuing policy of promoting tobacco development		✓
Funds	① Funds accumulated by farmers	✓	
	② Credit support		✓
	③ Funds supported by tobacco company		✓
Resources	① Local planting tradition and flue-cured tobacco planting technology	✓	
	② Establishment of service organizations like tobacco farmer cooperatives		✓
	③ Factory buildings, facilities and technologies provided by tobacco company		✓
	④ Natural environment resources favorable for production of flue-cured tobacco	✓	
Participants	① Tobacco company in Zhucheng City		✓
	② Tobacco farmer specialized cooperatives		✓
	③ Farmers	✓	
	④ Village committees	✓	
	⑤ Ordinary farmer households	✓	
Results	① Expanded flue-cured tobacco planting scale		✓
	② Increased efficiency of family management	✓	
	③ Promoted increase of farmers' income and prosperity of rural economy	✓	

2.3.2 Translation process. The most important section in analyzing the actor network is translation. In line with five key elements of translation, we also make further discussion from five aspects.

(i) Problem presentation. Common problem for action entities is "how to found the tobacco family farm". To solve this problem, the actor network framework is gradually formed. (ii) Call-up. In this network, every actor must be assigned with tasks that are mutually acceptable. (iii) Benefit granting. Benefit granting is the means of entities stabilizing tasks of other actors. (iv) Mobility. As monopoly enterprise, tobacco company has high mobility for village cadres; as rural elites, farmers have prestige in rural areas and so they have high mobility; building of family farm conforms to benefit of flue-cured cooperatives. Cooperatives need providing

specialized services for farms and call-up ability of cooperative members makes land circulation more easily realized. (v) Objection. In the actor network of tobacco family farm, great background difference between actor entities leads to existence of objection, which is the motive force for changes of network. According to the above analysis, we plotted the actor network chart (Fig. 2), reflecting formation path of Fengsheng Tobacco Family Farm.

2.3.3 Equal status of human and non-human factors. From actor of network and the translation process, we can observe role of each actor, but it is still not able to clearly see equal status of human and non-human actors. In the process of building actor network for Fengsheng Tobacco Family Farm in Zhucheng City, flue-cured production enjoys the equal status with tobacco company,

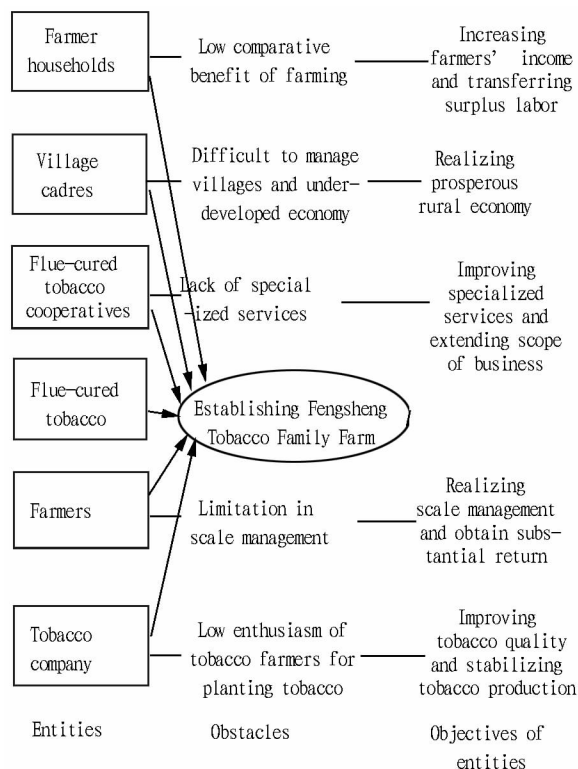


Fig.1 Relevant entities and OPP for establishing Fengsheng Tobacco Family Farm

village cadres, flue-cured tobacco cooperatives, and ordinary farmer households. Scale planting of flue-cured tobacco stabilizes local flue-cured tobacco production, improves quality of tobacco, and satisfies demand of tobacco company for raw materials. It transfers rural surplus labor, solves the problem of idle farmland, carries out mechanized operation, increases labor productivity, and promotes rural economic development. Crop rotation of grain and flue-cured tobacco brings economic benefit and satisfies economic demand of farmers. Benefits of participants are coordinated with founding of family farms, making founding of family farm becoming possible. Therefore, in the formation of tobacco family farm, flue-cured tobacco plays the equal status as other human entities.

2.3.4 Network operation analysis. From the above actor network chart, we see that government plays relatively powerful role in regional development through actively supporting development of tobacco industry. However, it is weak in building family farms, which is mainly remote managed through relevant agricultural policies. Active propaganda of village cadres of Yanjiazhuang where Fengsheng Tobacco Family Farm is situated greatly accelerates founding of the family farm, while area managers consisted of rural elites greatly helped family farm make organization and management. Tobacco company of Zhucheng City is an important leader in the founding of family farm, it provides factory building, equipment and technologies, so it is one of the most powerful dominant forces in the actor network. Tobacco farmer cooperatives promote cooperative members to circulate land, concentrate on agricultural

machinery service, production employment, and baking services; after circulating land, ordinary farmer households become industrial workers and obtain steady land rent and migrant work brings them with stable income. Crop rotation of tobacco field ensures soil fertility, ensures grain production, and supplies stable raw materials for tobacco. Intensive operation and large scale production increases labor productivity, constantly improves farmland water conservancy, and promotes development of rural economic society.

2.4 Formation path of Li Chunfeng's planting and breeding combined family farm Li Chunfeng's planting and breeding combined family farm was built in 2008. Its planting scale rose from 7.8 hm² to 13.3 hm², land contractual period is 5 years. In 2011, government invested 600000 yuan to build 0.2 hm² modern pig farm. The live pig available for sale annually is up to 1500, realizing profit of more than 70000 yuan. In 2013, the development of this family farm became stable and Li Chunfeng gradually obtained return for about 200000 yuan.

This family farm is mainly influenced by agricultural industrial reform policies of local government. Major factors influencing formation of planting and breeding combined family farm are listed in Table 3.

Compared with Fengsheng Tobacco Family Farm in Zhucheng City, Li Chunfeng's Family Farm is mainly launched by local government and the farmer is selected and appointed by local government. (i) Farmer status. Farmers of family farms in Songjiang District need receive special training and pass examination, and only those qualified may contract farmland. In thirty years of age, Li Chunfeng resigned from high salary work in a joint venture corporation. Besides, he received higher education and is easy to accept advanced agricultural technology, so he is outstanding in the operation of family. (ii) Policy support. Songjiang District encourages land circulation and increases subsidy through industrial reform policies, and regulates operation and management of family farms through training and examination, and takes strict management of family farms. (iii) Fund source. After the village committee implementing "Reverse Rent through Inverse Contract", farmers provide land rent at 3 900 kg/hm² rice for village committee, while funds for construction of breeding farm and improvement of farmland and water conservancy facilities are provided by local government, so family farm has little pressure of funds. (iv) Resource advantage. Land of Songjiang District is flat and fertile. Besides, there is rich water resource and the geographical position is superior, quite suitable for agricultural development. In addition, as a traditional agricultural area of Shanghai, Songjiang farmers have rich planting and breeding experience. These are endogenous factors. (v) Participants. Participants include Songjiang District government, Songlin Breeding Enterprise, village committee, production and service organizations, ordinary farmer households. Songjiang District government is exogenous factor and others are endogenous factors. (vi) Results of founding the family farm. Planting and breeding combined family farm greatly im-

proves grain productivity, stabilizes grain supply of surrounding cities, and standardized live pig breeding reduces occurrence of epidemic diseases and ensures food safety. Sound development of Li Chunfeng's Planting and Breeding Family Farm increases annual income per capita of local residents. According to division of

above factors, similar to Fengsheng Tobacco Family Farm in Zhucheng City, Li Chunfeng's Family Farm is also the result of endogenous and exogenous factors and belongs to the family farm dependent on both endogenous and exogenous factors.

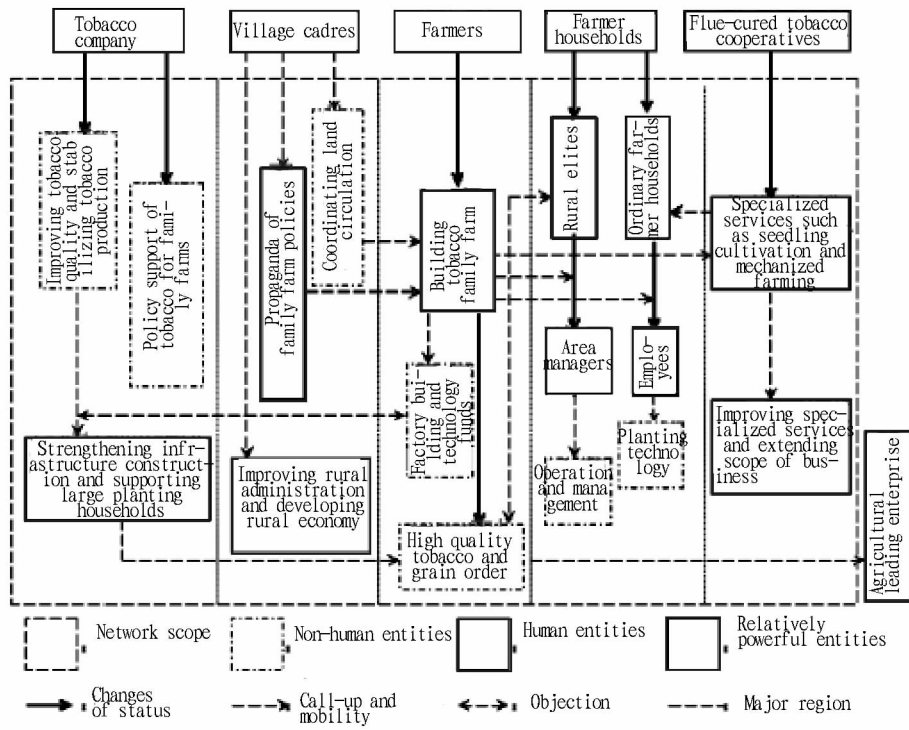


Fig.2 The actor network for building Fengsheng Tobacco Family Farm

Table 3 Major factors influencing formation of planting and breeding combined family farm

Factors	Contents	Endogenous	Exogenous
Farmers	① Rich experience of agricultural production technologies ② High operating and management ability	✓ ✓	
Policies	① State issuing laws and regulations, and policies to encourage development of family farms ② Adjustment of agricultural industrial structure		✓ ✓
Funds	① Funds accumulated by farmers ② Government support	✓ ✓	✓ ✓
Resources	① Local superior geographical position and suitable agricultural production conditions ② Establishment of service organizations like tobacco farmer cooperatives ③ Farmland and water conservancy facilities and breeding buildings supplied by government ④ New breeding modes of agricultural leading enterprises	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Participants	① Songjiang District government ② Shanghai Songlin Breeding Enterprise ③ Farmers ④ Village committees ⑤ Production and service organizations	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓
Results	① Stabilized grain supply and ensured grain security ② Increased efficiency of family management ③ Promoted increase of farmers' income and prosperity of rural economy	✓ ✓ ✓	✓ ✓ ✓

2.5 Analysis on the actor network promoting formation of Li Chunfeng's Planting and Breeding Combined Family Farm

(i) Actor and obligatory passage point (OPP). Entities and OPP of founding Planting and Breeding Combined Family Farm are as shown in Fig. 3, which also indicates obstacles to be removed by entities for realizing their objectives in the process of building

the network. (ii) Process of translation. The process of translation and mutual relationship of actors in the actor network for building Planting and Breeding Combined Family Farm are illustrated in Fig. 4. This chart reflects formation path of Planting and Breeding Combined Family Farm. (iii) Equal status of human and non-human factors. In the process of building actor network

for this family farm, each actor plays an equal role. Specifically, grain and live pig products enjoy equal status as township government, agricultural leading enterprises, village cadres, farmers, and ordinary farmer households. To reduce urban and rural dual economic difference, Songjiang District changed agricultural development idea, expanded land operation scale, finally realized ensured grain production. Shanghai Songlin Breeding Enterprise cooperates with family farm, realizing expansion of breeding scale and ensuring food safety of livestock products. For local agricultural machinery and plant protection service organizations, it is easier to connect with family farm, to improve mechanization level and increase grain yield per unit area. Excellent geographical condition and natural resources of Songjiang District are indispensable for building the family farm. (iv) Analysis of network operation. Songjiang District government mainly provides corresponding policy support, guides village committee to implement "Reverse Rent through Inverse Contract", introduces "company + farmer household" development mode, so the government is important leader of planting and breeding combined family farm. Agricultural leading enterprise increases operation and management ability of family farm, but it is relatively weak in this network. Rural elites become farmers and consolidate subject position of family farm. Apart from farmers, other rural elites are central members promoting founding of family farm. Building agricultural machinery cooperatives provide convenience for experience of farmers.

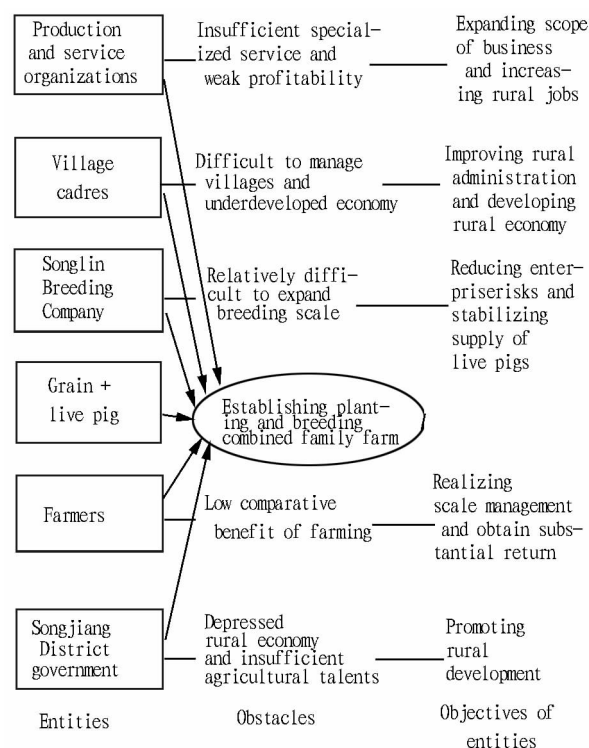


Fig. 3 Relevant entities and OPP for establishing Planting and Breeding Combined Family Farm

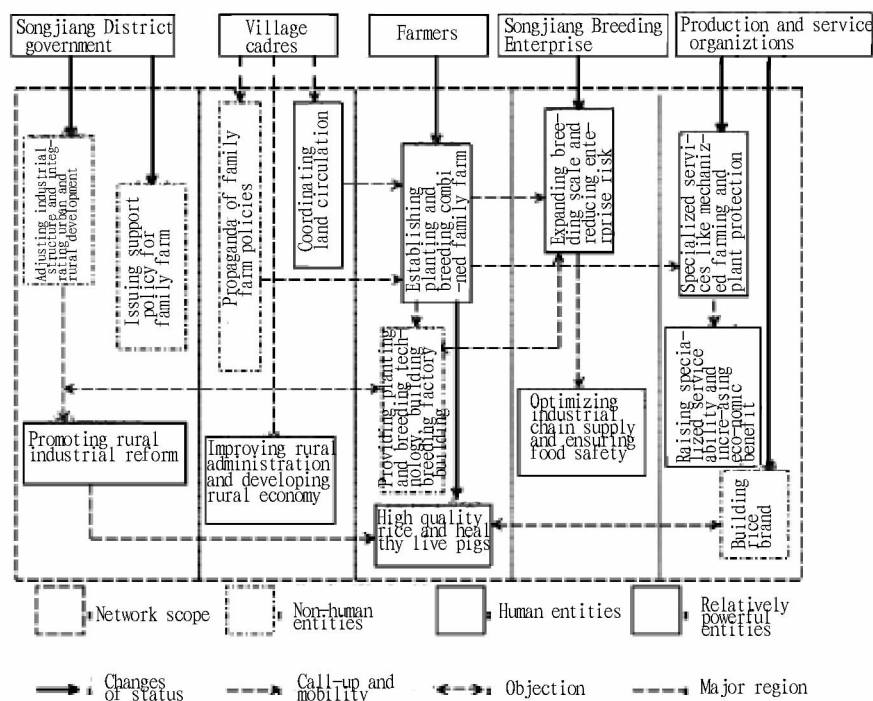


Fig. 4 Actor network for Planting and Breeding Combined Family Farm

3 Conclusions and implications

As a phenomenon in the development and evolution of agricultural production, family farm is evolved through the organic combination

of inborn endowment of agriculture, implanting and derivative features of agriculture. The formation of family farms is an arrangement of special environment institution, different environments es-

essentially different in induced factors and development modes of family farms.

(i) Changes in relative price of resources lead to increase of farmer households' labor productivity and expansion of specialized labor division, evolution of industrial organizations and endogenous demand of institutional change. Outflow of rural labor, rural land circulation, agricultural leading enterprises increasing input of agricultural production, as well as popularization of agricultural production technologies and machinery are exogenous forces. In the combined action of endogenous forces and exogenous forces, micro conditions of family farm become gradually mature and institutional environment is gradually created. Besides, in the process of formation of family farms, both non-human and human actors play important role. In other words, heterogeneous actor network consisting of human and non-human actors is the basis of formation of family farms.

(ii) In social environment of China, governments at all levels are always key actors with lawful granting rights. Since most rural areas are underdeveloped, farmers are relatively conservative, few farmers have enterpriser spirit, and farmers lack knowledge of family farms, involvement and influence of governments are essential in the process of establishing family farms. However, policy support of government must combine with micro environment of formation of family farms and should be consistent with development speed and progress of family farms. If basic condition of family farms is neglected and government policy support is relied

on solely, it is impossible to promote development of family farms, and it may lead to unfair market competition due to abuse of power.

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