

## The Factors Influencing Establishment of Demonstration Farmers' Cooperatives in China

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Development of farmers' cooperatives is vital for agricultural development in China. The demonstration farmer cooperatives represent the level of economic development hence integration of farmer cooperatives will have a positive impact on agricultural economy. The overall objective of the study was to investigate the regional, sectorial; and industrial distribution patterns of farmer cooperatives and estimate the factors influencing the establishment of demonstration farmer cooperatives. The main influencing factors were analyzed by the least square method in order to study the distribution characteristics. Looking at the cross section among different enterprises in agriculture, highest number of farmer cooperatives belongs to crop sector followed by livestock, agricultural machinery, fishing and forestry industry. Among the demonstration cooperatives in crop production, highest number of farmer cooperatives' is in vegetable sector while the grain sector has the least number of demonstration cooperatives. Regional distribution shows that farmer cooperatives in livestock sector are more concentrated in the country's western region. According to the regression analysis factors such as number of rural population, per capita crop sown area and urban agricultural employment showed significant effect on development of farmer cooperatives. The urbanization to promote farmer per capita planting area has expanded as a result of the development of demonstration farmers' cooperatives. Also an increase of urban agricultural employment and development of demonstration farmers' cooperatives showed an inverse relationship. The formation of demonstration cooperatives can be an integral part of regional social planning in underdeveloped areas in each region.

**Key Words:** China, demonstration cooperatives, farmers' cooperatives, influencing factors, least square method, regional distribution

### Introduction

There is a significant growth in farmer cooperatives in China during past decade. According to Zuhui (2015), this growth is from about 100,000 in 2006 to 484,300 cooperatives in 2011. Total of 38.7 million farmers have become members of farmer cooperatives accounting for 15.5% of all farmers in China. Farmer cooperatives represent various industries in agriculture and livestock sector. Development of farmer cooperatives is vital for agricultural development in China. The demonstration cooperatives have been highlighted as an important part of the Central Committee's Document No.1 for many years (from 2009 to 2015).

In order to promote the development of farmer cooperatives, the Ministry of Agriculture (MOA) and All-China Federation of Supply and Marketing Cooperatives (ACFSMC) carried out and evaluation and construction of the demonstration farmers cooperatives in 2011. Further in July 2013, the State Council with the approval of the Ministry of agriculture took the lead role in establishment of farmer cooperatives

nationwide under the inter-ministerial joint conference system. Following year, the joint meeting identified 3,759 farmers' cooperatives as the national demonstration farmers' cooperatives. Given the importance of farmer cooperatives, this paper explores the geographic and sectoral distribution, main characteristics and factors influencing the development of farmer cooperatives. First part of the paper discusses the geographical and sectoral distribution characteristics and management entities of farmer cooperatives. The final part of the paper devoted for investigating factors influencing the development of farmer cooperatives.

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**Distribution characteristics of the demonstration farmers cooperatives**

By the end of 2014, the national registration of farmers’ professional cooperatives amounted to 1.29 million which was 31.18% higher than previous year. According to DRESM (2015), total of 1.14 million farmer cooperatives were identified in 8 provinces (i.e. Shandong, Henan, Hebei, Shanxi, Jiangsu, Anhui, Jilin and Inner Mongolia) which is accounted as 51.5% of the total farmer cooperatives in China. The cropping, live-stock, service, forestry, fishery cooperatives accounted for 50.6%, 25%, 8.2%, 3.5% and 5.8% respectively in the above provinces.

Based on the type of services provided by agricultural cooperatives, 53.3% of the cooperative can be classified under trade, industry and agriculture integrated into one organization. Agricultural cooperatives that provide services account for 28.0% while purchasing, warehousing, transportation, processing and other ser-vice based cooperative accounted for 3.7%, 0.9%, 2.7%, 2.0% and 9.4% respectively. Among service providers, agricultural machinery, plant protection, soil and fertilizer accounted for 62.1%, 12.2%, and 4.4% respectively. Based on commodity perspective, grain and vegetable cooperatives accounted for 35.6% and 18.3% respectively. In live-stock sector, swine, cattle and sheep cooperatives accounted for 34.8%, 20.3%, and 5.1% respectively.

**Regional distribution of demonstration cooperatives**

In addition to Hong Kong, Macao and Taiwan regions, the other provinces have demonstration cooperatives; however, there is a wide variation in distribution. For example, the largest number of demonstration co-operatives (213) is found in Shandong Province which accounted for 5.67%. Henan Province has 192 (accounting for 5.11%) followed by Jiangsu (178), Sichuan (175), Anhui (171), Hebei (170), Shanxi (164) and Hubei (156). Among the eight provinces with the largest number of cooperatives (except for Jilin and Inner Mongolia), the other provinces are ranked in the top eight regions for demonstration cooperatives. The numbers of demonstration cooperatives in the top ten provinces are mainly distributed in east, central, north and southwest China, where the economic development is higher (Fig. 1). The three provinces of central china are among the top ten provinces having most number of farmer cooperatives, however, all provinces of the north-east, southern and northwest are out of the top ten. Overall, the number of cooperatives distributed in economically developed areas is higher than economically underdeveloped areas. However, this observation is not applicable for some provinces. Except for the city of Beijing, Tianjin, Shanghai, Guangdong, Zhejiang, Fujian and other provinces with higher economic level are out of the top ten. Given this, it is it is important to explore factors such as level of economic development, regional industrial structure, scale of production area, population etc. that may have influence the establishment of demonstration co-operatives.

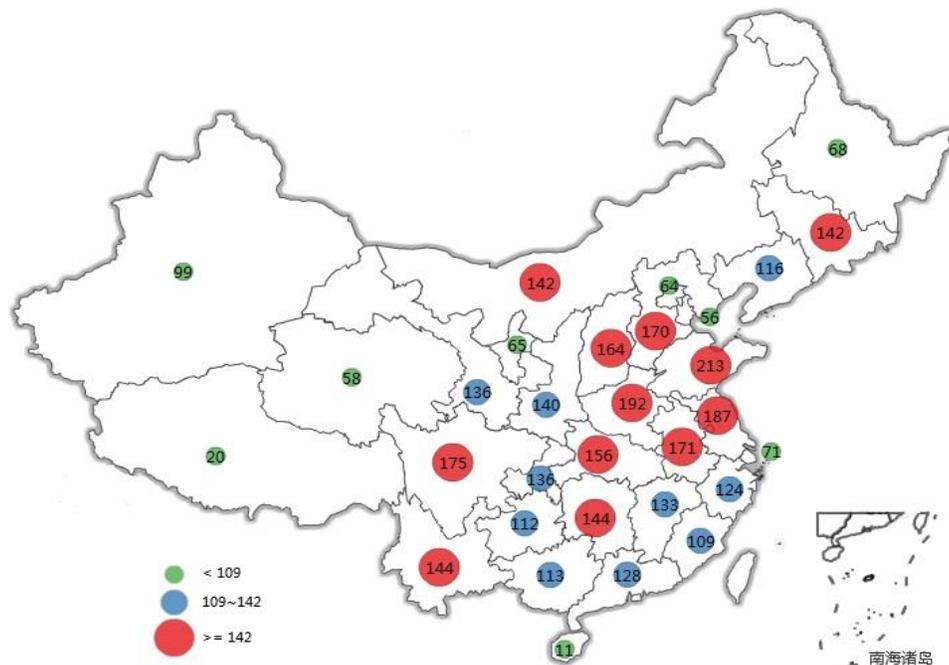


Figure 1: Regional distribution of demonstration cooperatives

Comparing the above mentioned demonstration cooperatives, with the first batch of demonstration cooperatives by the MOA in 2011, a significant difference was observed in ranking of some provinces. For example, Zhejiang province ranked from the original first (824 in number, accounting for 12.37%) into eighteenth (124, accounting for 3.30%) and, Yunnan province (14) which was in third lowest but later has changed to tenth (144 in number, accounting for 3.83% of the total). The sample Standard Deviation (SD) was 49.90 in 2014, which is significantly lesser than the SD of 196.65 in 2011. Considering the

evaluation performed by the in-ter-ministerial joint meeting, which include Ministry of Forestry (MOF) and ACFSMC, the evaluation of this batch of demonstration cooperatives seems more comprehensive compared to 2011.

Table 1 shows the distribution of demonstration cooperatives of MOA, MOF and SCFSMC. The distribution shows that 2,970 cooperatives falls under the MOA while 366 and 432 belongs to MOF and SCFSMC respectively. The percentage wise distribution was 79.01%, 9.74% and 11.25% respectively for Agriculture, Forestry and SCFSMC respectively.

Table 1 Distribution of demonstration cooperatives

Province	MOA	MOF	ACFSMC	Total	Province	MOA	MOF	ACFSMC	Total
Shandong	170	16	27	213	Guangdong	110	7	11	128
Henan	151	16	25	192	Zhejiang	97	13	14	124
Jiangsu	150	10	27	187	Liaoning	88	15	13	116
Sichuan	130	18	27	175	Guangxi	87	18	8	113
Anhui	142	15	14	171	Guizhou	93	19		112
Hebei	129	15	26	170	Fujian	74	19	16	109
Shanxi	135	21	8	164	Xinjiang	64	12	23	99
Hubei	125	15	16	156	Shanghai	66	4	1	71
Hunan	110	18	16	144	Heilongjiang	62	1	5	68
Yunnan	99	18	27	144	Ningxia	50	6	9	65
Inner Mongolia	110	12	20	142	Beijing	55	5	4	64
Jilin	121	12	9	142	Qinghai	50		8	58
Shanxi	110	15	15	140	Tianjin	50	5	1	56
Chongqing	98	12	26	136	Tibet	20			20
Gansu	110	15	11	136	Hainan	10		1	11
Jiangxi	104	14	15	133	TOTAL	2970	366	423	3759

### Management of demonstration cooperatives

Accordingly, the number of demonstration cooperatives belongs to MOA is the highest. In addition to Xinjiang, Fujian and Yunnan accounted for 64.65%, 67.89% and 68.75% development cooperatives respectively. These observations clearly show that MOA plays major role in establishment and management of demonstration cooperatives in China.

The MOF managed cooperatives are mostly belongs to Fujian, Guizhou and Guangxi (which is known as national forestry province). These three provinces comprise of 17.43%, 16.96% and 15.93% cooperatives respectively. Due to the differences of geographical

conditions as well as resources distribution, the proportion cooperatives in some other provinces are relatively low or even missing in few provinces. The ACFSMC managed farmer cooperatives are mainly in Xinjiang, Chongqing and Yunnan, which account for 23.23%, 19.12% and 18.75% respectively. Except for the city of Beijing, Tianjin and Shanghai, the least number of development cooperatives are in Shanxi, Guangxi and Heilongjiang provinces which account for 4.88%, 7.08% and 7.35%.

The number of demonstration cooperatives belongs to ACFSMC is higher compared to MOF (for example, ACFSMC manage 114,000 cooperatives while MOF manage about 150,000 cooperatives). This reflects the

higher managerial efficiency of ACFSMC compared to MOF. However still there seems to be a considerable gap in terms of the function of the ACFSMC, which is the country’s largest rural cooperative organization, hence the central government has put forward proposals to improve grassroots organizations of ACFSMC to better lead and manage farmer cooperatives (Jianhua, 2015).

**Sectoral distribution of demonstration cooperatives**

Among the demonstration cooperatives, the number of n cooperatives in crop sector is 2,264 which account for 60.23%. The number of cooperatives falls under both crop and livestock is 140 (3.72%); animal husbandry 778 (20.70%); forestry 132 (3.51%) and fishing sector 164 (4.36%). In addition, the agricultural machinery, handicraft and the other cooperatives accounted for 5.53%, 0.51% and 1.41% respectively. This structure is similar to the first batch of demonstration farmer specialized cooperatives in 2011. In 2011, the demonstration cooperatives in crop and animal husbandry sector accounted for 57.2% and 24.3% respectively. The fishing, forestry and the other

cooperatives account for only 18.5%. The main reason that causes the higher proportion of the cooperatives in crop production sector is due to higher number of farmer associated in that industry (Qinghai, 2007).

**Distribution of cooperatives in crop production sector**

According to the classification of cooperatives by MOA and given the multiple nature of some cooperatives, crop along with the mixed-cooperatives in fruit and vegetable are classified into single group. Therefore, the cooperatives in cropping sector is divided into grain, vegetable, fruit, cotton, tea, oil plants, herbs and other crop categories. The cooperatives in grain, vegetables and fruit account for 80.39% of the cooperatives in cropping sector.

Grain cooperatives are mainly concentrated in main grain producing areas (Fig. 2). The 13 major grain producing areas in the country consist of 280 demonstration cooperatives accounting for 66.35% of the grain demonstration cooperatives. For example, Jilin Province alone accounted for 10.19% of grain specific demonstration cooperatives.

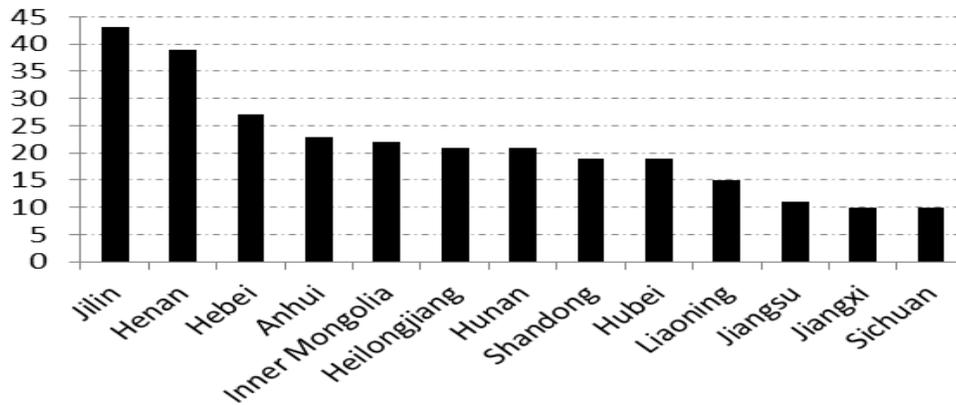


Figure 2: Distribution of grain demonstration cooperatives

In 2014, China’s grain acreage (278 million acres) and the number of cooperative (18.01% of national cooperatives) were much higher compared to the acreage under vegetable production (49.4 million acres) and number of cooperatives (9.26% of national cooperatives). However, the number of grain demonstration cooperatives was only 11.23%, which was lower than the 17.45% of the demonstration cooperatives in vegetable sector (excluding the demonstration cooperatives in fruit and vegetable which account for 4.26%). This difference might be due to two reasons. Firstly, compared to vegetables, grain is more suitable for large-scale production which result greater production

area with less number of farms. Secondly, the grain has an inelastic demand hence this relatively stable market condition lead to less number of cooperative memberships.

The demonstration cooperatives in vegetable production sector are mostly distributed in eastern China, accounting for 37.35%. Hebei, Shandong, Jiangsu, Zhejiang, Guangdong are the main provinces which are abundant in country’s forestry resource. The vegetable production is mainly under greenhouse condition hence less vulnerable to weather effects. However, due to transportation needs, marketing risks, post-harvest losses etc., there is greater interest to form

cooperatives in this sector (Qinghai, 2007). In addition, the aggregation of leading enterprises in eastern China has contributed to the higher proportion of vegetables in eastern China (youyan et al. 2009). Contrary to the demonstration cooperatives in vegetable sector, the demonstration cooperative in fruit sector accounted for 42.61% in the western region. The fruit is planted in larger area and the production is influenced by geological and climatic conditions. Some provinces which are famous as major fruit producing areas comprise of higher number of demonstration cooperative. The apple, kiwi, pomegranates, walnuts are typical representative fruits producing in provinces such as Shaanxi, Shanxi, and Yunnan.

### **Distribution of cooperatives in livestock sector**

The distribution of cooperatives in livestock sector differs from the demonstration cooperatives in crop-ping sector, where most number of demonstration cooperatives in livestock sector is in western region than in the east. The eastern, central and western regions accounted for 30.72%, 24.04% and 45.24% of demonstration cooperatives in livestock sector respectively. The country's western region is famous for its large herds of cattle and sheep.

The livestock sector includes swine, cattle, sheep, poultry and other livestock. Honey bee also included as a part of animal husbandry. Among the cooperatives in livestock sector, the highest number represent in swine sector (216) accounting 27.76%, followed by poultry sector (196 in chicken & egg and 163 in flocks and herds altogether accounted for 73.01%). This structure is consistent with the structure of the meat industry in China. For example, in 2013, per capita consumption of pork, poultry, cattle & sheep were 19.8, 6.4 and 2.4 kg respectively. Obviously, the structure and market demand are closely related to the type and number of demonstration cooperatives.

The distribution of swine and poultry farms is limited by the availability of resources. However, this resource advantage doesn't play significant influence as a factor in formation of cooperatives. Comparatively, the market demand is more important than resource advantage, however given that relatively stable market in livestock sector, the difference of number of regional demonstration cooperative is small. The number of demonstration cooperatives in swine and poultry is higher in western region than in east and central region (Fig. 3). This difference is also due to number of provinces in each region.

The breeding of cattle and sheep is influenced by the distribution of forage resources and the consumption habits of the region (Yirong, 2013). Accordingly,

79.14% of the demonstration cooperatives are distributed in the western region in China. Inner Mongolia has 34, accounted for 20.86% of the total number of the demonstration cooperatives in cattle and sheep. Except for Shanxi, the all other provinces of the top eight belong to western region of the country.

### **Analysis of factors affecting the distribution of demonstration cooperatives**

The factors that affect the distribution of the demonstration cooperatives (Song & Zhao, 2013; Zuexia, 2011) can be summarized under three major categories. This includes status of agricultural economy, regional resource endowment and market demand. Accordingly, an empirical model can be formed as follows.

The number of demonstration cooperative (Y) is the explained variable and the explanatory variables include:

- a. Agricultural output (GDPA): value of agricultural, forestry, animal husbandry and fishery output in 2013. This variable is a measure of the scale of agricultural economy in the region
- b. Regional total population (TP) and regional per capita consumption (IC). The total population of the region and the consumption changes will impact the quantity and variety of agricultural products
- c. The number of rural population (RP), per capita crop sown area (AA), per capita meat supply (AM), per capita education level (EY) and urban agriculture, forestry, animal husbandry and fishery employment (EQ) are indicators to measure regional resource endowments.

The per capita level of Education (EY) is an important indicator to measure the level of regional human capital. On the basis of the reference to the statistical yearbook (NBSC, 2014) and Leangwen & Dzxue (2012), the education level in population can be divided into illiterate, semi-literate, elementary school, junior high school, high school, technical secondary school, junior college and above. The education years is given by 2, 6, 9, 12 and 16, respectively, and the weight is determined according to the proportion of the population.

The employment in agricultural, forestry, animal husbandry and fishery sector (EQ), is closely related to the management and sales of agricultural products there by affect the development of the cooperatives.

Based on the analysis, the descriptive statistics of the variables are presented in Table 2. The mean value of GDPA, TP, IC, RP, AA, AM, EY and EQ, were 3129, 4371, 15,889, 2001, 4.04, 137.47, 9.1 and 9.5 respectively.

Table 2. Descriptive statistics of the variables

Variable name	Maximum value	Minimum value	Mean	Median	Standard deviation
<i>GDPA</i>	8,750.00	128.00	3,128.85	2,699.50	2,230.70
<i>TP</i>	10,644.00	312.00	4,371.48	3,774.00	2,785.71
<i>IC</i>	39,223.00	6275.00	15,889.06	12,978.00	7,249.79
<i>RP</i>	5,290.00	238.00	2,000.71	1,722.00	1,392.38
<i>AA</i>	11.20	1.25	4.04	3.66	2.19
<i>AM</i>	285.20	48.32	137.47	134.50	50.78
<i>EY</i>	12.06	5.20	9.10	9.07	1.08
<i>EQ</i>	79.90	0.50	9.50	4.80	16.78

The least square method was used to perform regression analysis. Heteroscedasticity test was performed to test the validity of the model given cross section data. The white test doesn't show evidence of heteroskedasticity (The results shows that at significant level of 5%,

$nR^2=7.92 < 15.51=\chi^2_{0.052}(8)$ ). Therefore, OLS model was used to carry out regression analysis. The result of the regression model is given in Table 3.

Table 3. Initial regression results

Variable name	Regression coefficient	Standard error	T statistics	Prob.
GDPA	0.006713	0.007869	0.853088	0.4028
TP	0.003354	0.008367	0.400891	0.6924
IC	-0.000628	0.001522	-0.412338	0.6841
RP	0.012651	0.016281	0.777052	0.4454
AA	10.57405	3.751550	2.818582	0.0100
AM	-0.152272	0.121110	-1.257305	0.2218
EY	9.200187	7.371191	1.248128	0.2251
EQ	-1.456108	0.485438	-2.999574	0.0066

The goodness-of-fit of the models is 0.79 ( $F=10.44 > 2.4 = F_{0.05}(8, 22)$ ), which indicate the validity of linear regression effect and the linear equation in overall. According to the basic model, variables EQ, P and AA shows significant effect on number of

demonstration cooperatives. This may be due to presence of multi-collinearity in the model. Therefore, model was refined by excluding several variables namely, TP, IC, GDPA, AM, EY. Table 4 shows the results of the adjusted regression model.

Table 4. Adjusted regression results

Variable	Regression coefficient	Standard error	T statistics	Prob.
C	37.06387	13.63623	2.718043	0.0113
RP	0.028696	0.003498	8.203648	0.0000
AA	9.258699	3.384925	2.735275	0.0109
EQ	-1.116626	0.443878	-2.515616	0.0181

The Prob. of RP, AA and EQ's regression coefficients were less than 0.05 which shows significance effect. The goodness-of-fit of the models was 0.75 ( $F=26.34 > 2.96 = F_{0.05}(3, 27)$ ), which indicate validity of

regression effect and linear equation in overall. The final regression equation is shown as:

$$Y=37.06+0.03RP+9.26AA-1.12EQ$$

According to the model results, the corresponding regression coefficients of number of rural population, per capita crop sown area and urban agriculture, forestry, animal husbandry and fishery employment were 0.03, 9.26 and -1.12 respectively. This means that increase of the rural population and the per capita crop sown area will have positive effect for the development of the demonstration cooperatives. Taking into account the total amount of arable land, there is an inverse relationship between the two variables. In the process of urbanization in China, it's obvious that the negative effect caused by the decline of rural population, which is weaker compared to the positive effect of the increase of the per capita crop sown area. Therefore, the development of urbanization may promote the development of the demonstration cooperatives.

Regression coefficient for urban agriculture, forestry, animal husbandry and fishery employment shows negative relationship with total number of demonstration farmer cooperatives. In other words, the number of demonstration cooperatives with the urban agricultural employment growth shows negative correlation. The possible reason is the reduction of the workers who provide service to agricultural production and sales in the urban areas. Meanwhile, some agricultural product tasks can't be done by individual farmers, such as agricultural product packaging, inspection and quarantine, sales management and product transportation, etc. The market uncertainty factors motivate farmers to join the association to mitigate risk of market competition. As a membership of the cooperative, the cooperative can provide the agricultural products circulation service and extend the agricultural products chain for the membership, which provide incentives to promote the development of the demonstration cooperatives. In other words, the lower agriculture social services and higher market competition result higher trend for formation of cooperatives to mitigate risk.

Among the other explanatory variables, the regional population and regional per capita consumption level (which are responsible for demand), shows smaller coefficients and are significant. Accordingly, the regional total population and the per capita consumption impact on the development of the demonstration cooperatives are small. The development of the market information and transportation has weakened the need and space limitations to cooperatives.

The other explanatory variables (i.e. agricultural output, per capita meat supply, per capita education level) doesn't show significant effect for the number of development cooperatives. This result is consistent with conclusion of the Agricultural Ministry research group (MOA, 2006) and Shuai et al. (2014), which confirm that the regional economic and per capita GDP are not obviously lead to higher number of

cooperatives. The number of the demonstration cooperatives is not affected by the per capita meat supply and per capita education level

## Conclusion

The major purpose of the paper is to study the characteristics and distribution of farmer cooperatives and explore the factors affecting the development of farmer cooperatives in China. There are differences in types of farmer cooperatives based on agricultural enterprises and management entities of these cooperatives. Also variations in regional distribution patterns in types and number of cooperatives were observed. Regression results shows that factors such as the number of rural population and per capita crop sown area, have positive effect on development of demonstration cooperatives. According to the results, there was no significant relationship between the development of demonstration cooperatives and regional economy and per capita consumption. Insufficient number of urban agriculture in the field of employment will provide more space for the development of demonstration cooperatives. Especially in underdeveloped areas in each region, formation of demonstration cooperatives can be a part of regional social planning. This can be done under the support of the national urbanization and agricultural modernization strategy. In this study, only the demonstration cooperative types, its geographic and sectoral distribution and factors responsible for formation of demonstration co-operatives were analyzed. Better analysis could have been done with cooperatives on the scale of operation and structure of the agency quality index analysis, hence results generated from the study has its own limitations that can be addressed in future studies. The distribution of the demonstration cooperatives is a complex system problem, involves many factors hence selection of explanatory variables is difficult and exhaustive. There is a mutual relationship between the number of the demonstration cooperatives and some explanatory variables, such as agricultural output hence how to choose the influencing factors and to formulate a better empirical model needs to pay more attention in future research.

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