

A study on the changes of the policy of science and technology commissioner

—Quantitative analysis based on policy texts

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Keywords: Science and technology commissioner, policy text, policy change, quantitative analysis.

Abstract: In order to sort out and analyse the evolution of the policy of sci-tech special commissioners in China, this paper takes 415 sci-tech special commissioners policy documents issued by the central and local governments from 2002 to 2019 as samples, and uses the methods of co-word analysis and cluster analysis, to determine the high-frequency theme words of the policy texts in different stages, to realize the interpretation of the policy changes, and to summarize the four stages of the development of sci-tech commissioner's policy, from 2002 to 2005, from 2006 to 2009, from 2010 to 2015, from 2016 to 2019, the pilot exploration stage, the comprehensive extension stage, the sustainable development stage, and the deepening promotion stage.

1. Introduction

China's science and Technology Commissioner System originated from Nanping City in Fujian Province in 1999. It is an innovative system for rural working mechanism and agricultural science and technology development. Over the past 20 years, China's system of special commissioners for Science and Technology has achieved fruitful results. At present, China has taken the lead in setting up 11,500 enterprises or cooperatives, set up more than 30,000 interest communities, and led to an increase of more than 10.1 million farmers' incomes, an average of 26,200 advanced and applicable technologies are transformed and demonstrated each year, making outstanding contributions to the development of agriculture and rich peasants through science and technology. [1]

The term "special commissioner for Science and technology" refers to the scientific and technological personnel who are selected by the government through certain procedures to serve the needs of rural development for science and technology, and who are engaged in scientific and technological services, innovation and entrepreneurship and the construction of industrial bases at the grass-roots level, it plays an important role in promoting the transformation of scientific and technological achievements, the adjustment of industrial structure, the innovation of system reform and the sustainable and healthy development of economy. [2] At present, China is in the decisive stage of building the well-off society in an all-round way. The task of rural economic and social development is arduous and arduous. It is urgent to drive innovation, play a supporting role in science and technology, inject new impetus and increase new momentum.

Today, when the competitiveness of the agricultural base is not strong and the comparative advantage is gradually lost, the paper sorts out and analyzes the context of the changes of the policies of sci-tech special commissioners in China, systematically presenting the focus, development law and Development Direction of the policies of sci-tech special commissioners at various stages, it is of great significance to carry out the system of Special Commissioner for Science and technology, strengthen the service capacity of county science and technology innovation, and resolutely win the battle against poverty. In view of this, this paper attempts to use the quantitative analysis method of policy text to explore the development law and the changing process of this kind of policy, to summarize its changing characteristics and predict its developing trend. Therefore, it makes a beneficial exploration to the development of the sci-tech Special Commissioner System.[3]

2. The source and selection of policy texts

The policy texts of this article is mainly from the official website of the Ministry of Science and Technology of the People's Republic of China, the Government of the People's Republic of China, the Department of science and technology, the Bureau of science and technology of official website, the Peking University Magic Weapon and the Chinese Legal Resources Bank. Besides, there are very few policy texts are from the website of the information center to complement the aforementioned missing website and database.

Search these sites and databases with the subject line "technology special commissioner". For the overlapping policy texts with low content relevance, this paper screened them. The following 6 situations will not be included in the scope of this study: documents forwarded by government departments at all levels; letters, replies; work arrangements, meeting notice, training notice; documents on the establishment of the leading group and the adjustment of the personnel; and other documents without concrete measures and substance. After careful screening, a total of 415 policy texts were included in the scope of this study, spanning the period from 2002 to 2019, the document forms mainly include notice, opinion, plan, method, detailed rules, decision, announcement, plan, guidance, announcement and so on 10 kinds.

3. Co-word cluster analysis

3.1. Pilot exploration phase: 2002-2005

In May 2002, the Ministry of Science and Technology summarized the practical experience of science and technology commissioners in Nanping, Fujian, and launched the pilot work of science and technology commissioners in the five northwestern provinces and regions of Ningxia, Shaanxi, Gansu, Qinghai and Xinjiang. This is the first time since the Nanping of Fujian, the practice of sci-tech special envoy in the second area marks that the sci-tech special envoy system of our country has entered the experimental stage. In December 2004, the Ministry of Science and Technology and the Ministry of Personnel jointly issued the "opinions on launching the grass-roots entrepreneurship initiative of science and technology commissioners, the pilot work", which provides a policy guarantee for the implementation of the National Science and Technology Commissioners' pilot work.

This phase of the relevant policy collection, a total of 20 policies collected, a relatively small number, is also in the initial stage. The 20 policy texts were analyzed for word frequency, and 16 high frequency words were selected, as shown in table 1.

Table 1 2002-2005 high frequency words and word frequency of sci-tech commissioner policy

Number	High-frequency word	Word frequency	Number	High-frequency word	Word frequency
1	technology	1167	9	staff	147
2	commissioner	727	10	pilot	144
3	technique	235	11	launch	114
4	project	191	12	develop	113
5	agriculture	190	13	peasant	89
6	village	167	14	economy	87
7	service	157	15	extend	64
8	unit	150	16	achievement	46

Based on the analysis of word frequency, the correlation coefficient matrix and the dissimilarity coefficient matrix of 16 high frequency words are established. And the clustering analysis of high frequency words is carried out by combining the dissimilarity coefficient matrix, using the method of intergroup connection and Euclidean distance, the family tree is shown in figure 1. It is found that the 16 high-frequency words in this stage can be divided into three categories: project, unit, pilot, extension, special agent, technology, achievement, rural area, development, agriculture and economy, the category will be named "grass-roots pilot and 'three rural issues' "; services, personnel,

development, technology, the category will be named "subject and technology services. "; farmers, named the category "service object".

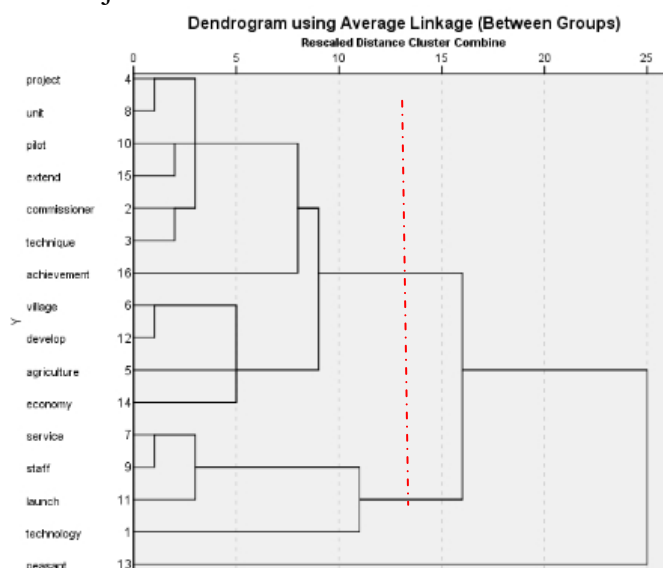


Figure 1 Dendrogram of high frequency words in sci-tech commissioner policy from 2002 to 2005

Put the 16 high-frequency words in the context of 20 policy texts, understand the deep connotation of each category of high-frequency words, integrate with each other, analyze and summarize the focus and characteristics of the policy in detail. Combined with co-word cluster analysis, and referring to the specific policy content, the policy of sci-tech Commissioner in this stage presents the following characteristics:

- The experimental work of sci-tech commissioners started at the grass-roots level and was promoted from the point to the whole country, emphasizing the important role that sci-tech commissioners played in solving the problems of "three rural issues". The science and technology commissioner System originates from the innovation of practice and the creation of grass-roots units. Summarizing the "Nanping experience," the Ministry of Science and Technology launched a pilot project for science and technology commissioners in the five northwestern provinces of Ningxia, Gansu, Qinghai, Shaanxi and Xinjiang, forming a grass-roots pilot project layout with "provincial-level units and county-level field work", and gradually extended to other provinces, as of 2004, 267 counties in 23 provinces have carried out the pilot work of science and technology commissioner. [4] At this stage, the relevant policies focus on the grass-roots pilot work deployment, focus on the pilot work of exploration and practical experience, system building has not yet reached the national level. Based on the relevant policy texts, the special commissioner system of science and technology is set up to promote the development of agricultural and rural economy and solve the problems of "agriculture, countryside and farmers". The selection and deployment of science and technology commissioners to serve in the village is to strengthen the close integration of science and technology with the economy. Through this connection between science and technology and production, the key role of science and technology talents in the development of rural economy will be brought into full play, it is conducive to forming a long-term mechanism to solve the "three rural" problems by relying on science and technology, and to promote the sustained, rapid and healthy development of agriculture and rural economy.

- Natural person as the main body, various forms of scientific and technological services. The science and technology commissioners are mainly natural persons, mostly from scientific research and technology promotion units and retired professional and technical personnel. The rural sci-tech special staff work mainly takes the project as the carrier, combines the agricultural sci-tech entry, the agricultural technology contract, the agricultural sci-tech achievements promotion and the agricultural industrialization base construction and so on the project implementation, develops the sci-tech service. The introduction of advanced and applicable technologies, fine varieties and production and development projects into rural areas and the popularization of low-cost agricultural

science and technology in a direct and convenient way. In this stage, the main body of the sci-tech Commissioner is single, and the service forms are various, but it is still in the exploratory stage, and has not formed a scientific and reasonable operation mode.

- Supply and demand meet, two-way choice, scientific and technological services must meet the needs of the broad masses of farmers. In order to ensure the accuracy, effectiveness and long-term nature of the work of the science and technology commissioner, the principle of "supply and demand meet, two-way selection" must be carried out. On the basis of understanding the technological needs of farmers, scientific and rational allocation of resources, the organic combination of talents, technology, information, management and rural resources with various characteristics, and the provision of scientific and technological services to farmers, forming an interactive mechanism for the interests of science and technology commissioners and farmers, and establishing a community of interests, so as to provide strong scientific and technological support for increasing agricultural production and farmers' income. It is an effective measure to solve the general problem of lack of technology, information and service in poor rural areas, and it is also an effective way to solve the problem of idle scientific and technological personnel and the disconnection between technology and agriculture.

3.2. Comprehensive promotion phase: 2006-2009

In 2006, the Ministry of Science and Technology organized the "National Conference on the pilot work of science and technology commissioners," which ended the pilot work phase of China's science and Technology Commissioners, and deployed the tasks of the next phase, entering a new phase of comprehensive promotion. During this period, the central and local governments promulgated 70 policies in succession. The word frequency of 70 policy texts was analyzed, and 17 high frequency words were selected, as shown in Table 2.

Table 2 2006-2009 high frequency words and word frequency of sci-tech commissioner policy

Number	High-frequency word	Word frequency	Number	High-frequency word	Word frequency
1	technology	4794	10	project	505
2	commissioner	3169	11	develop	502
3	enterprise	1023	12	organization	445
4	technique	959	13	launch	437
5	agriculture	821	14	staff	435
6	service	763	15	action	324
7	undertaking	711	16	economy	319
8	village	694	17	peasant	318
9	unit	640			

Compared with the previous stage, high-frequency words such as organization, enterprise, undertaking and action have been added in this stage, which reflects the new trend of policy development. Combined with co-word cluster analysis, high-frequency words in this stage can be divided into 4 categories, see figure 2. The 17 high-frequency words mentioned above were put into the context of 70 policy texts of this period. After analysis, the new characteristics of the policy of sci-tech commissioner policies in this period are as follows:

- Further strengthen the organization and management, improve the degree of organization. In combination with relevant policies, the policy for sci-tech special commissioners at this stage further strengthens the organization and management on the basis of emphasizing the establishment of a leading group for the coordination of sci-tech special commissioners' work, and implements the principle of combining city and county, with county as the main body, gradually establish the assessment, training and incentive mechanism of sci-tech special commissioners to make their work, objectives and management more organized and standardized, and fully mobilize their work enthusiasm. At the same time, we will foster diversified service organizations and cooperate with scientific research institutes and agricultural universities in the transformation and demonstration of

agricultural scientific and technological achievements, we will guide agro-related enterprises, agro-industrial management organizations, farmers' cooperative economic organizations and intermediary organizations to participate in the extension of agricultural science and technology, provide diversified services, and improve the degree of farmers' organization. The work of special science and technology personnel goes hand in hand with the system construction, and the system construction is improving day by day.

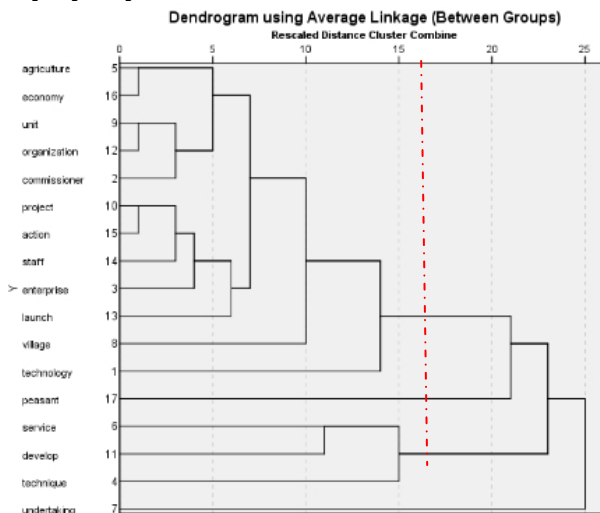


Figure 2 Dendrogram of high frequency words in sci-tech commissioner policy from 2006 to 2009

- Expand the scope of services, enterprises into the scope of service objects. The recipients of this stage have already expanded from farmers with simple technical needs to agricultural processing and circulation enterprises, large-scale farming and breeding enterprises, processing industries and circulation households, professional households, and modern science and technology demonstration parks, encouraging scientific and technological personnel to go deep into the production lines of enterprises, and gradually form an integrated industrial chain of trade, industry and agriculture with "leading enterprises + intermediary organizations (associations, cooperatives) + farmers" , giving full play to the leading role of leading enterprises in radiation, the Intermediary Organization's Information Service Function, causes the agricultural production management the industrialization level, the market competitive power to obtain the further enhancement, realizes the farmer and the scientific and technological personnel's win-win.

- The role of information technology is becoming increasingly prominent. Scientific and technological personnel cannot meet the needs of agricultural production informatization development only by mastering production technology, which requires scientific and technological personnel to provide information service as well as production service. We should fully apply information network technology, vigorously develop and utilize information resources, and provide market and technology information services for farmers in a timely manner. Science and Technology Commissioner should actively participate in computer training, to understand and master the application of information network technology, know how to make good use of modern information technology information services. For the rural areas receiving services, it is necessary to further improve the level of rural information services. We will continue to innovate service means, gradually establish information network for the work of sci-tech special commissioners, and use modern information technology to guide their work.

- The pioneering work of the science and technology commissioner was initially carried out. Supporting the establishment of agricultural science and technology-based enterprises, encouraging agricultural science and technology commissioners to lead, establish and assist in the establishment of agricultural science and technology-based enterprises, and to take equity stakes in agricultural enterprises with technological achievements and their own funds, or to participate in the operation of Agricultural Science and technology enterprises by means of consulting services, operation and management, and obtain legal income. In addition, the phase of the policy clearly stated that the

Science and Technology Commissioner to lead, the establishment of enterprises, and the state in the policy to give priority support.

3.3. Sustained development phase: 2010-2015

In 2010-2015, the central and local governments promulgated a total of 187 policies under the theme of science and technology commissioners, a significant increase over the previous period. These policies were analyzed for word frequency and 15 high frequency words were selected as shown in Table 3.

Table 3 2010-2015 high frequency words and word frequency of sci-tech commissioner policy

Number	High-frequency word	Word frequency	Number	High-frequency word	Word frequency
1	technology	8120	9	project	1173
2	commissioner	5779	10	agriculture	1087
3	undertaking	1766	11	develop	869
4	technique	1590	12	launch	866
5	village	1578	13	declare	804
6	service	1558	14	organization	768
7	unit	1413	15	action	617
8	enterprise	1218			

Most of the high-frequency words in 2006-2009 were also high-frequency words in 2010-2015, and a new high-frequency word, declaration, was added at this stage. Combined with cluster analysis, the high-frequency words in this stage can be divided into 3 categories, and 15 high-frequency words can be put into the specific context of 187 policies in this stage. According to the analysis, the policy of sci-tech commissioner policy at this stage has the following characteristics:

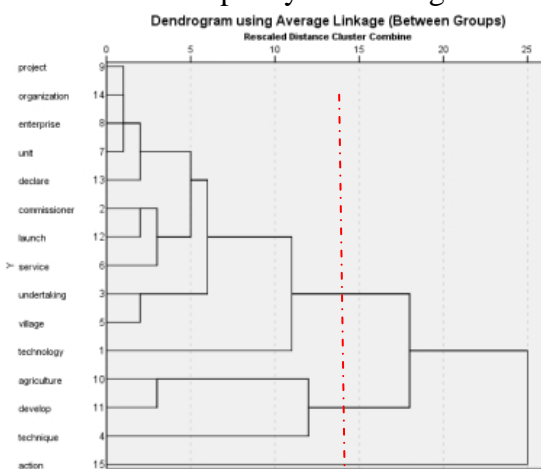


Figure 3 Dendrogram of high frequency words in sci-tech commissioner policy from 2010 to 2015

- We will promote the transformation of science and technology services to those for science and technology entrepreneurship, and carry out in-depth science and technology entrepreneurship initiatives nationwide. Encouraging the majority of scientific and technological personnel to take an active part in the pioneering actions of special commissioners for science and technology, giving prominence to scientific and technological personnel in rural areas, strengthening the functions of scientific and technological services in pioneering work, and promoting the construction of a diversified system of scientific and technological services in rural areas, to provide farmers with income, employment and entrepreneurship, improve the livelihood of the people and other scientific and technological services. At this stage, with the further development of science and technology entrepreneurship, a new service model of leading and setting up economic entities was born, in which sci-tech commissioners invested to set up, lead and set up, contract rural enterprises, park bases or other economic entities, to promote the rural industrial restructuring, give full play to the pioneering role of scientific and technological personnel, fundamentally promote the development of

rural productivity.

- The combination of entrepreneurial chain, entrepreneurial base and entrepreneurial training base has gradually formed a vertical layout from the national level to the county level. In order to further optimize the entrepreneurial environment and raise the entrepreneurial capacity and level, the state attaches great importance to the cultivation and construction of entrepreneurial chains and entrepreneurial bases for sci-tech envoys, and has given preferential support to entrepreneurial chains and entrepreneurial training bases, a large number of science and technology commissioners have entered the key links of the start-up chain to carry out start-up services. In the process of science and technology entrepreneurship in rural areas, the entrepreneurial chain is an industrial carrier that guides sci-tech envoys into the key technical links of the first, second and third industries to carry out innovation and entrepreneurship. The entrepreneurial base is an important platform for gathering sci-tech envoys to display their entrepreneurial talents, the entrepreneurial training base is a strong hand to promote the entrepreneurial ability of sci-tech commissioners, and the combination of the three is complementary to each other, which provides strong support for sci-tech commissioners to carry out sci-tech entrepreneurship in rural areas.

- The main body of science and technology commissioner is more diversified and the service function is more specialized. With the perfection of the sci-tech commissioner system and the deepening of sci-tech entrepreneurship initiatives, the natural person sci-tech commissioner can no longer meet the demand for technical services from the development of rural industries, as a new type of service subject, legal science and technology commissioner and team science and technology commissioner are developing gradually, which makes the subject of science and technology commissioner more diversified. The service function of the corresponding sci-tech commissioner is more specific, such as management, technology, information, industry and so on.

3.4. Deep propulsion phase: 2016-2019

In 2016, the State Council issued the "opinions on the further implementation of the system of special commissioners for science and technology, " It has clearly defined the key tasks, policies and measures for the construction of the sci-tech stunt commissioner system from various aspects, such as institutional mechanism, scientific and technological services, business start-up support, precise poverty alleviation, etc. , so that China's science and technology commissioner system into a deep-going, innovative development of the new stage. During this period, the central and local governments promulgated 138 relevant policies one after another. Through word frequency analysis, a total of 12 high-frequency words were selected, as shown in table 4. The term innovation has been added to the previous phase. Through the concrete policy text, after the analysis, summarizes this stage science and technology special envoy policy characteristic as follows.

Table 4 2016-2019 high frequency words and word frequency of sci-tech commissioner policy

Number	High-frequency word	Word frequency	Number	High-frequency word	Word frequency
1	technology	9590	7	village	1536
2	commissioner	6085	8	innovation	1514
3	service	2319	9	unit	1478
4	agriculture	2049	10	enterprise	1275
5	undertaking	2017	11	launch	1143
6	technique	1659	12	develop	1031

- The construction of Science and Technology Commissioner System has risen to the national level. Faced with the requirements of the new situation, it is the first time to make an institutional arrangement on the work of sci-tech special commissioners at the national level. Based on serving "agriculture, rural areas and farmers" , we will deepen reform and strengthen institutional and mechanism innovation, strengthen classified guidance, provide classified guidance to public welfare services, rural entrepreneurship and other types of sci-tech envoys, and improve entrepreneurial ability and service level; We will respect grass-roots initiatives, adapt to local conditions, and establish and improve the input, guarantee, incentive and management mechanisms for sci-tech start-

ups in rural areas by sci-tech envoys who are suited to local conditions. Giving full play to the role of the coordinating and Guiding Group for Rural Science, technology and entrepreneurship actions of the Science and Technology Commissioner, and strengthening top-level design, overall planning and coordination, and supporting policies, so as to form an organizational system and long-term mechanism of departmental coordination and linkage between top and bottom, to provide organizational guarantee for the implementation of sci-tech Commissioner System. At this stage, China's Technology Commissioner System has gone from the local practice to the national level of institutional arrangements, showing a strong vitality.

- Double-wheel drive of innovation and entrepreneurship to create a space for innovation in agricultural and rural areas. In order to further implement the strategy of innovation-driven development, all localities should strengthen institutional and institutional innovation, and strive to create a professional and convenient environment for rural science and technology entrepreneurship, with innovation as a new growth engine, promoting the further development of the Science and Technology Commissioner System in China. Establishing the concept of innovative development and actively promoting the innovation of Agricultural Science and technology, a number of new practical technological achievements have been made in the cultivation of improved varieties, new fertilizer and medicine, processing and storage, disease prevention and control, facility agriculture, Internet of things in agriculture and intelligentization of equipment, soil improvement, dry farming, water-saving, grain-saving and loss-reducing, food safety and rural people's livelihood We will give full play to the role of various strategic alliances for innovation, strengthen the cultivation of innovative brands, and realize the coordinated development of technology, information, finance and industry. We will innovate service models and explore distinctive service mechanisms, assessment mechanisms, support mechanisms and management mechanisms, building a new service model of science and technology. Stimulate the majority of science and technology commissioner's enthusiasm for innovation and entrepreneurship, the formation of mass entrepreneurship, innovation, a good situation.

- The new socialized science and technology service system of agriculture has been continuously improved. Guided by the government's purchase of non-profit Agricultural Technical Services, we will accelerate the establishment of a new type of socialized agricultural science and technology service system that combines non-profit with profit-making and coordinates specialized and comprehensive services, to create a professional and convenient environment for sci-tech start-ups in rural areas, such as sci-tech envoys and college students, returning migrant workers, rural youth wealth leaders and local talents. We will deepen reform and construction of the agro-technical extension system at the grassroots level, support universities, research institutes and local governments in jointly building new rural development research institutes and demonstration bases for comprehensive agricultural services, and provide agro-technical services to rural areas. We will move forward with the pilot program of comprehensive reform of Supply and Marketing Cooperatives and build a platform of comprehensive services for farmers' production and life.

- We will accelerate the combination of scientific and technological entrepreneurship with targeted poverty alleviation in rural areas. Implementing targeted poverty reduction strategies, targeting the weak areas of science, technology and talents in poor areas, innovating the concept of poverty reduction, carrying out entrepreneurial poverty reduction, and accelerating the injection of modern factors of production such as science, technology, talents, management, information and capital. We will promote the solution of key technical problems in industrial development, enhance the ability of poor areas to innovate, start businesses and develop themselves, and speed up the process of shaking off poverty and becoming rich. Poverty alleviation became the focus of the work of the science and technology commissioner during this period, for example, the "notice on organizing the work of pairing up scientific and technological commissioners with impoverished villages" and the "notice on launching the work of docking scientific and technological commissioners with townships in deeply impoverished counties" , etc. All of them provide policy guarantee for solving the problem of "the last kilometer" of agricultural technology service.

4. Conclusion

The service concept runs through the whole policy development process, the service system is constantly improved, and the service mode is constantly innovative. The policy of science and technology commissioner has always adhered to the policy concept of service, providing technical services for agricultural and rural development; the management, information, technology, base construction, platform construction and other social service systems have been continuously improved; and from the "Nanping Experience" , to "Ningxia Model" , "Zhejiang Model" , and then to the "Guangdong Model" , explore a variety of forms of scientific and technological service model.[5] In order to adapt to the process of agricultural modernization, scientific and technological service model still need to innovate and improve.

Formed from the point to a comprehensive coverage of the Science and Technology Commissioner Policy System. Through the policy diffusion mode of "pilot-popularization" , the policy of science and technology envoys realized the "flower of innovation" from "spark" to national popularization, and rose from local practice to the institutional arrangement at the national level. It has gone through the policy process of "grass-roots pilot projects", "national extension", "sustained development" and "further development". And clearly put forward that by 2020, the poor village science and Technology Commissioner Science and Technology Services and entrepreneurship driven by the full coverage.

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