Innovation System and Transformation of the Agricultural Sector in China, With the Case of Shouguang City

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Abstract

This paper reviews the evolution of agricultural innovation system in China in the past 50 years. The paper then identifies several problems that block the development currently. A case study of Shouguang city shows a possible way in which transformation of agricultural sector is proceeding. It argues that organizational and institutional innovation are crucial, so that simplified imitation would not work for absorption of experiences successful elsewhere. Local conditions must be incorporated for particular regions in the effort for agricultural transformation.

Key words: Agriculture; Innovation system; Transformation

1. Introduction

China was in history a great agriculture-dominated economy, with splendid techniques and land productivity in the world. However, for many reasons, China was left far behind in agricultural production and agricultural science and technology in the past two centuries. Since the foundation of PRC in 1949, a huge agricultural technology innovation system was set up and agricultural production was largely developed. Especially under the opening and reform policies of the 1980s and 1990s, the agricultural sector of China grew rapidly. It has not only provided adequate foodstuff to the 1.2 billion people, but also played important role in the national economic development. As one of the largest developing countries, China offers an interesting case in the international context.

The development of agricultural innovation system is closely related to agricultural production and rural economy . As early as in 1950s, China had established a nationwide system for agricultural technology, which has been continued to the present time although with some interruptions and re-organizations throughout the decades. However today China is

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encountered with a number of problems in relation to the agriculture sector and the technology system of:

1, A restructuring of the agricultural innovation system is indispensable to change it as inherited from the planning time to be suitable to a market-based agriculture and rural economy.
2, The advancement of agricultural production structure and production organization is unavoidable in face of surplus in traditional agricultural outputs.
3, The stagnation in income increase of peasants has to be dealt with.
4, The serious situation of unemployment of rural population is one of the challenges to economic and technology policy makers in China.
5, The problem in waste of valuable natural resources and the environmental deterioration are to be handled for the sustainable development of China in the 21st century.

Section 2 outlines the development of the China's agricultural sector in the past half-century. Section 3 introduces the evolution of the agricultural technology system. Section 4 illustrates the problems that China is now facing with the agriculture sector as well as rural economy. Section 5 gives a case of Shouguang city, Shandong province, to illustrate feasible approaches to the necessary transformation. Section 6 sums up the issues discussed in the paper.

2. Evolution of China's Agriculture

2.1 1920s-1952

The first half of the 20th century was the destruction of agricultural production and rural economy in China, because of the intrusion of cheap foodstuff from developed countries and because of deteriorated land tenure relationship. The import of foodstuff in the period of 1927 to 1937 was 7.7 times of that imported in1864 to 1911. About 115 million acres land, or half of the cultivated land was controlled by landlords. Poor peasants, accounting for 90 percent of rural population, owned only 20-30% the land. Thereafter the World-War II and following civil war destroyed the agricultural resources further, the Chinese economy as whole fell in

collapse.

In 1950, immediately after the foundation of People's Republic of China the first land reform was carried out upon the Law of the People's Republic of China on Land Reform. According to this Law, 115 million acres land and related productive materials were distributed to 300 million landless peasants.

Since 1951, the government was promoting for farmer collective teams, which was the beginning of socialist agricultural production organizations. From 1949 to 1952, 8 million such collective teams were established, in which 45 million peasant families, or 40 percent of the total peasant families were involved. As a result of land reform, agricultural production increased greatly. Food crops that were purchased from farmers was 15 million tons in 1949, and it rose to 30 million tons in 1952.

2.2 1953-1977

In 1953, China launched the first Five-Year Plan. Since then till the end of the 1970s, national resource allocation was largely biased for industry; and surplus from agricultural production was also channeled for the large scale of industrialization.

During this period, socialist agricultural organization proceeded to become larger in collective groups and greater in collective properties. Increasingly more land turned to be collectively managed and to be used following the collective organization moved from the so-called "Primary" (1953) to the "Advanced" (1955) forms. Collective agricultural production showed advantages, which boosted the agricultural production rapidly until 1957.

In 1958, the Chinese government launched a new programme for the foundation of People's Communes for agricultural production, which was characterized with Yi Da Er Gong (which means the large scale of production organization of Commune and the high level of communization of previous peasants' private property). In the end of 1958, 740 thousand collective organizations were recombined into 26 thousand People's Communes. 12 thousand farmer families, or 99% of the total were involved. In the People's Communes, agricultural income distribution was so exactly averagely made to individual farmers, that farmers had no motive to work hard.. As a result, agricultural outputs decreased by 14% in 1959. It reduced further by another 12% and 2.5% in 1960 and 1961.

Table 1. Output of Main Agriculture Products (1953-1961)

(thousand tons)

	1952	1958	1959	1960	1961
Food	163920	200000	170000	143500	147500
Cotton	1304	1969	1709	1063	800
Oil plants	4190	4770	4100	1940	1810
Sugar	7590	15630	12150	9860	5010
Jute	3060	268	222	202	123
Tobacco	220	387	331	186	96
Pod	123	118	125	89	42
Tea	82	135	152	136	79
Fruit	2440	3900	4250	3980	2840

In 1962, some adjustment was made to change the executive function down from the level of “People’s Commune” to the lower level of “Production Brigade” among the Production Team, Production Brigade, and People’s Commune structure. Nevertheless until the end of the Cultural Revolution, the land collective land property and thereupon that management of collective production was kept. Production of agriculture had been in stagnation under the institution, and the provision of foodstuff and other agricultural products was in shortage for two decades.

2.3 1978-1992

In 1978, the Third Plenary Session of the 11th Central Committee of the Chinese Communist Party decided to finalize Cultural Revolution and emphasize the importance to manage economic development following economic rules. Household Contract-Responsibility System appeared as a replacement of collective production system. In 1983, the government announced that peasants are to be granted as long as 15 years for land use contract, which accelerated the spread of HCRS as a main form of agricultural production organization. By 1984, the organization of People’s Communes had nearly totally disappeared. Accordingly, agriculture output increased by 42.23□ in 1978-1984.

Table 2. Output of Main Agricultural Products (□)

	1953-1957	1958-1978	1979-1984
Food	3.54	2.15	4.96
Cotton	4.96	1.34	19.33
Oil plants	0.01	1.04	14.75
Sugar	9.38	3.36	12.31
Tea	6.43	4.24	7.52
Pod	-1.86	3.42	7.79
Tobacco	2.89	6.96	6.58
Fruit	5.86	3.41	6.97
Pork, beef and mutton	3.32	3.71	10.28
Aquatic product	13.32	1.93	4.85

With rapid increase of agricultural production, food shortage, which existed for decades, was eventually over. Large surplus of food products led to new problems that peasants were difficult in selling out their harvest. Low price, as well as large amount of waste, hurt both rural people and rural economy. Thus, reforms began to take place. Market mechanisms were introduced to change the state monopolized procurement and distribution of food products. Agriculture kept an increase of 4.65% per year during this period.

2.4 1993 to present-

In 1992, socialist market system was set as objective of Chinese economy institutional reform. In order to enhance peasants' expectation in land use and to encourage investment to agriculture, government modified relating land institutions. In 1993, the Chinese government granted another 30 years of land contract after the maturity of the previous granted 15 years from 1983. Trade on contracted land use right was also legally permitted. Agricultural development in China entered a new period.

Table 3. Growth Rate of Agricultural Output 1978-1999

Year	1978	1979	1980	1981	1982	1983	1984		Annual rate
Rate		7.5	1.4	5.8	11.3	7.8	12.3		7.6
Year	1985	1986	1987	1988	1989	1990	1991	1992	
Rate	3.4	3.4	5.8	3.9	3.1	7.6	3.7	6.4	4.65
Year	1993	1994	1995	1996	1997	1998	1999		
Rate	7.8	8.6	10.9	9.4	6.7	6	4.7		7.7

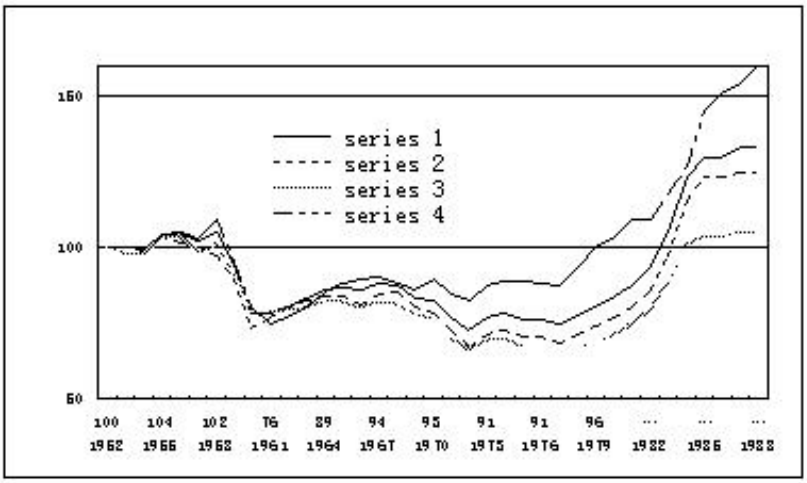

Figure 1. Total Factor Productivity Index

Source□LiIN Yifu 1992: pp33-34.

Four sets of data are from different authors, among which the third one was made by Hayami and Ruttan. The TFP (Total Factor Productivity) increased between 1952 and 1958, and then stagnated between 1962 and 1978 when was the period of People's Communes. After 1979, agriculture kept continuous increase.

3.Evolution of Agricultural Innovation System in China

3.1 1949-1958

Since 1949 the Chinese government made great effort for the development of agricultural technology. By 1958, a comprehensive system of technology service had come into being. 4549 technology diffusion stations had been set up, covering 55% of all counties.

3.2 1959-1973

Owing to the changes in political environment and in national priority of economic development, agricultural technology services system was damaged in this period. 1/3 of technology diffusion stations were shut down between 1959 and 1961 when China was in the hit of famine. In Cultural Revolution (1966-1976), many establishments of technology development and technology diffusion were closed. This was a bad period for agricultural technology persons as well, for many of them suffered either dismissal or even persecution.

3.3 1974-1978

In 1974 the State Council decided to renew agricultural technology system to avoid an overthrow of it. At four levels of county, commune, brigade and production team, technological service was rehabilitated. Up to the end of 1975, 1,140 counties resumed or newly established institutions for agriculture technology and relating R&D institutes. 26,872 Communes had set up agricultural technology diffusion stations. More than 300 thousand Brigades established agricultural technology diffusion teams, and 2.2 million Production Teams organized agricultural technology groups. Since 1976, the government annually allocated special funds to finance the four-level agricultural technology system.

3.4 1979-1985

Market reform and the change of agricultural production organization broke the basis of collective production as well as the technology system, which was developed based on collective organization of production. Internal links of the technological system were broken and technical manpower left. Peasants who now work individually based on contract could not get basic training for agriculture technique.

3.5 1985 to present

New mechanisms for agricultural technology are emerging. Public technological service tends to take the responsibility for new product breeding, technology diffusion, and coordination functions. Private enterprises and foreign companies are playing important roles in agriculture technological innovation.

At present, there are about 1,600 independent agricultural R&D institutes in China, with employment of nearly 147 thousand. Among them, 44.6 thousand are R&D scientists and engineers. There are 84 agriculture universities and colleges and over 300 specialized agricultural schools all over China. Agricultural technology associations also emerge quickly. There are around 100 thousand technology associations containing 3 million members.

4.Problems

4.1 The agricultural innovation system founded in plan economy should evolve to adapt market economy

Compared to industrial technological innovation, agricultural technological innovation has more regional characters, limited by local natural condition and cultural tradition. Agricultural innovation has to involve lots of tacit knowledge, which is hard to be transmitted. Thus, agricultural technological innovation system calls for strong support system, which includes market system, technology training and diffusion, rural finance support, etc. National investment in agriculture technology in 1996 was only □3.8 billion, which was equal to a quarter of technology investment in Netherlands. In most developed countries, R&D input accounts for 1% of agricultural production value. While in China this ratio is mere 0.2%, even much lower than the average 0.5% in developing countries.

At present, the institutions for agricultural technology remain under the influence of planned economy; many aspects in management of human resource, financial program and the ways in which the government plays a role are to be reformed.

4.2 Surplus of agricultural production and low efficient organization calls for adjustment of product structure and organization

Since middle of 1990s, agricultural production structure tend to be inappropriate. Compared to year 1978, production of foodstuff, cotton and oil crops in 1998 increased by 66%, 110% and 420% respectively. Shortage of high quality product has taken place of shortage of food as the major problem in China's agriculture, in spite of the fact that high quality products like meat, eggs and aquatic product had increased by 495%, 550% and 480%. Large surplus of food crops suggested the necessity for the adjustment of agricultural structure.

In 1993, peasants were granted another 30 years of land property, and trade on contracted land use right was also legally permitted, which in theory made large scale of agricultural production no longer impossible. But large-scale agricultural production could barely be carried on, because cultivated land per person is very small. Large scale of agricultural production based on concentrated land use would cause unemployment and other serious social problems.

Table 4. Land Provision: Cultivated Land Per Person in Comparison (hectares)

	China	Japan	Thailand	Indonesia	India
1966	0.14	0.05	0.36	0.17	0.32
1972	0.12	0.04	0.35	0.15	0.28
1978	0.10	0.04	0.36	0.13	0.25
1984	0.11	0.04	0.35	0.11	0.22
1990	0.11	0.03	0.31	0.11	0.19
1996	0.10	0.03	0.28	0.09	0.17

Therefore, adjustment is necessary both in product structure and in production organization. China's agriculture has to move towards diversification and industrialization.

4.3 Peasants' income increases too slowly

In spite of production increase, peasants' income increases very slowly, and it even decreased in 1997, 1998 and 1999. In 2001, annual income per person of peasant was around □2000, which was just adequate for basic living condition and simple reproduction. Today, there are still 14.6 million rural people getting less than □500 per person annually. 90.3 million people get annual income between □500 and □1,000 per person, and 310.8 million get between □1000 and □2000 per person.

Table 5 Annual Increases in Peasants' Per Person Income

	Before 1978	1978-1984	1985-1988	1988-1991	1992-2000
Increase rate	n.a.	17.7%	4.9%	1.9%	4.6%

To the reasons for peasants' low income, one broadly accepted view is the heavy burden that peasants are taking. In China, farmers pay □120 billion as annual taxes, and in terms of per person taxation of farmers is 30 times higher than that of urban resident. This is also a reflection of Chinese industrialization policy, which takes away most of agricultural residual to support industrial development. However, many people believe it is now the time to stop large capital flows from agriculture to industry. Instead, industry is no longer infant, and should feed agriculture in turn.

Other reasons include improper structure of agricultural product and small scale of

production. They prevent farmers from reducing production costs. And overmuch production with low quality product depress price and also push down income of peasants.

Too much surplus of rural labor is also one of crucial reasons. And it is also one of primary problems in agriculture development.

4.4 Large Surplus of Rural Labor

In rural region, surplus labor increases every year. The problem of employment is one of the serious challenges that the agricultural development of China has to face in the 21st century.

As a traditional agricultural nation, China has a large rural population, which accounts for 70 percent of total population. Since 1999, rural labor increases by more than 5.43 million per year, and the overall surplus of rural labor reached 150-200 million. Although large and middle-sized cities have accepted more than 80 million rural labor, the speed of urbanization could hardly catch up with population growth, and urbanization could not solve unemployment problem at least in short future.

Table 6. Rural labor in China (million)

	1990	1995	1998	1999	2000
Rural Population	895.9	916.7	919.6	922.2	928.2
Rural labor	420.1	450.4	464.3	459.0	479.6

4.5 In 21st century, Chinese people will be in great short of nature resources

With the shortage of natural resources and the increase of population, China's agriculture is under pressure to upgrade production technology and to improve product structure. In Warring States Period, arable land per person in China is 0.77 hm^2, in Tang Dynasty 0.62 hm^2, in Ming Dynasty 0.38 hm^2, in 1834 0.19 hm^2, and in 1949 0.18 hm^2. From 1978 to 1994, arable land decreased by 4.59 million hm^2. And it is estimated that in year 2030, arable land per person will fall down to 0.05 hm^2. (see Table 4)

Water is also a bottleneck of agriculture development, which is hard to be solved with traditional technology. Water resource per person in China is 2200 m^3, and will decrease by 25%-30% when the population surges up to 1.6 billion. At present, there is an annual gap of 36-50 billion m^3 in water supply, which brings loss of □180-200 billion every year.

5.Case: the large vegetable market of Shouguang city in Shandong Province

Shouguang is a small city with history of more than 2100 years, and it was ever one of the poorest counties in Shandong, while the turning point appeared with the reform program. Now Shouguang is known as " Hometown of Vegetable in China", with GDP of □13.2 billion. And income per person in Shouguang is □4,302, far high than average income of Chinese peasants. Shouguang people has devoted more than 53,000 hm^2 to growing vegetables with annual yields of over 4 million tons, which are being sold well in more than 200 cities domestically. Shouguang is also a leading vegetable exporter in China.

The process of development includes 4 phases.

Phase 1. (1978-1984) Reform pushing

During this period, Shouguang initiated the programs for vegetable plantation, which was set as the priority of local economic development.

At the beginning, Shouguang chose vegetable industry as priority according to three advantages that they possess. Firstly, there is a long history and tradition of vegetable planting in Shouguang. In fact, the leek provided by Shouguang in wintertime was historically as tribute to the Chinese Imperatorial Royalty. Secondly, with the increase of income, people consume more and more vegetables, which was a great chance for vegetable market. Thirdly, the profit of vegetable industry is higher than food crops like rice and wheat. By 1982, the plantation area of vegetable rose from 87 thousand Mu[1] to 240 thousand Mu and the income per person in Shouguang also doubled (from □150 to □300).

In the winter of 1983, production of vegetables in Shouguang exceeded 450 million kilograms. However, local peasants still sold their vegetables individually. Local market could not consume so much, and they were not sold out of Shouguang. Thus more than 50 million kilograms vegetables rot away soon, which meant more than □1 million of loss. The failure of vegetable selling deeply hurt both peasants and local government. In 1984, they invested □50 thousand to build up a vegetable market in Shouguang.

[1] Mu: a unit of area in China. 15 Mu is equal to 1 hm^2.

Phase 2. (1985-1988) Market pulling

In this period, the vegetable market developed rather rapidly that made Shouguang accumulated their “original capital” for further development.

The local government used both political and economical methods to absorb more peasants and customers into the new market. Shengli oil field for example, one of the major oil fields in China, become a main customer and helped for the early growth of the market. More than ten small agricultural product markets were then set up around the central wholesale market, with which a market network emerging in the city. By 1989, the vegetable plantation expanded to 360 thousand Mu. The market there was also known as one of “biggest ten” in China.

Although Shouguang had gained great success till then, peasants were still worrying about the production of vegetables in wintertime. They desired to supply more fresh vegetables in this season to fulfill the huge demand, while the production was restricted. Traditional greenhouse consumed too much coal and produced serious pollution (6 ton coal per Mu every winter). The small room of them also made mechanical production impossible. Nevertheless, traditional greenhouse could not keep adequate degree, so that supply of vegetables in winter was far below market demand. Thus, greenhouse technological innovation became the bottleneck to the production of wintertime.

Phase 3. (1989-1997) Innovation of greenhouse and the impact

This is a period of vegetable greenhouse innovation and associated vegetable production revolution

In 1989, Wang Leyi, chief of a village in Shouguang, invented vegetable warm house for plantation in wintertime, with the quality of low cost, none pollution, and high productivity. 17 families in his village earned more than □20 thousand at that winter, which greatly encouraged their neighbors in this and surrounding villages. More technologies and inventions were triggered. Supply of fresh vegetables especially in wintertime was improved greatly as the innovations spread further in the neighboring provinces.

The great potential in innovation by local people was released apparently. Traditionally peasants in Shouguang are talented. There are many “peasant experts” among 200-300

thousand local vegetable peasants. The communication among peasants is quite crucial for innovation. Through frequently knowledge exchange among individuals and associations, not only production but also quality of local vegetables was enhanced continuously. During this period, more than 3,300 local peasants were engaged as vegetable technicians in technical services for more than 20 provinces, and 50 among them were elected to be town leaders where they provided their services.

Shouguang was awarded with the honorable title as “Hometown of Vegetables in China” in 1995 and assigned as sample city of Modern Development of Agriculture by Shandong Prvince in 1997. By the end of 1996, Shouguang had 210 thousand greenhouses with the total plantation area being more than 500 thousand Mu, the yield of vegetables reached to 2.3 million tons and the sales □2 billion.

In response to competition from followers who grew as the technology spread, the government of Shouguang did more focusing on the development of market mechanisms and supporting system. More than 30 large specialized markets and 40 big food process enterprises were founded in the assistance of the government. Provision services of materials for greenhouse construction and vegetable production stretched to all towns and villages. A “technology market” which provides the services in exchange and dissemination of techniques for vegetable production was also established in support of the city Technology Service Center.

The Shouguang government strengthened sales relations in more than 200 cities including Beijing, Shenyang and Haerbin, etc. With the permission of the center government, particular arrangement for vegetable transportation, called as “Green Channel”, from Shouguang to Capital Beijing was established in 1995. The marketing network gradually developed to include “Green Channel”, “Blue Channel” (ocean shipping), “Sky Channel” (air transportation) and ”Internet Channel”.

Phase 4. (1997-now) Internationalization

Since 1997, Shouguang people turned to establish their international brand names.

As the domestic vegetable market gets saturated, also influenced by bad weather and non-tariff barriers like that from strict and rigorous standards, the vegetable industry of Shouguang has been under pressure.

The strategy of development in Shouguang therefore turned the focus onto high quality green vegetables. They invested □200 million to eliminate pollution and 10 million to set up 21 pollution-free production bases of 20 Mu. Now total planting acreage of green vegetables have reached to 200 thousand Mu, from which more than 100 species of vegetable passed the test of the National Development Center of Green Vegetables.

They also consolidated the acquisition of technologies from international sources for the local brand development, more than ten famous brands were established. Shouguang introduced over 500 varieties of vegetable from more than 30 countries, which include America, Japan, Israel, etc. Foreign companies bring about new planting technologies, new seeds, and provide training for peasants. From 2000 to 2003, they have successfully held four sessions of China (Shouguang) International Vegetable S&T Fair, which has attracted great attentions and positive responses from partners both home and abroad. In the fourth China (Shouguang) International Vegetable S&T Fair held in 2003, contracted investment achieved to □3 billion.

6.Conclusions

In this paper, we have reviewed the development of China's agriculture. We also illustrated the transformation of the agriculture sector through a case study of Shouguang. We now draw some conclusions as how to renovate the agriculture from now on.

6.1 Adjustment of agricultural organization

One approach to adjustment of agricultural production is to develop large agro-businesses whose production rests on large scale of operation hence with high efficiency. The reform on contracted use of land property permits transactions of land use rights that made it possible for such enterprises to grow, as long as peasants could find out employment opportunities after sold out the rights. Another approach might be more feasible, based on small-scale production of peasants who don't have to lose their land. It is so-called "firm (or/and agricultural production base) and peasants" (FBP) approach. A distribution or downstream process firm signs purchase contracts with individual peasants, meanwhile promises to provide materials and technology support to them. In this arrangement, the firm plays roles as seed breeder,

material supplier, technology instructor, and buyer of output from plantation. Thus, risks in technology and market that peasants face are reduced, and costs for maintaining quality supply of agricultural products that the forms confronted were lowered to some extent. The organization of base might have different ways. In some cases, local governments are involved heavily in the development of the base by means of political and monetary power. Farmer communities may also initiate the base organization, which often has cluster-like relations behind such communities.

The advantages of the FBP approach are that farmers preserve their contracted land use rights, meanwhile obtain stable and reliable material inputs and selling agreement for after-harvest. Farmers are also secure in having technical assistance during the production process. The FBP is hence in favor of experiments on new technologies and diffusion of new techniques.

The FBP approach has shown problems. On the one hand, farmers, as a weak group, sometimes get depressed for they were forced to accept unreasonable low prices set by firms. On the other hand, firms get losses when farmers were allured by other buyers offering better prices and infringed the implementation of contracts. This illustrates that coordination by the government for the enforcement of appropriate contracts is quite necessary.

6.2 Recognizing the bottleneck and making innovation

One crucial element is the policy and managerial capability in identifying bottlenecks in technology, capital, market and institutions. With limited resources, policies have to give guidance towards the most seriously pending issues, which if solved appropriately will bring about breakthroughs to transformation, or otherwise improvement will get blocked.

Institutional innovation, technological innovation, market innovation or combination of them is indispensable to get through the bottlenecks identified. Successful development should be based on active responses from the actors of the agricultural innovation system: peasants, firms, technological institutes and related government agents. In China, government could improve innovation greatly through providing various necessary service functions and through policies that encourage innovation. Local governments have been proactive to remove obstacles to agricultural transformation through policies in favor of market development,

technology development, importation of technology and capital.

6.3 Supporting systems and Complementarities

Policies that favor agricultural innovation alone do not ensure success in agricultural development if without supporting functions and complementarities. Shouguang developed strong supporting systems for the vegetable sector, including that for vegetable market, the provision of seed, pesticide, greenhouse construction materials, and that for technical and information services. The development of transportation and hotel, as well as downstream processing of agricultural products, were also important for the expansion of value-chains around the agriculture sector. Talents necessary for local development were introduced through various means, which work together with local persons including “peasant experts”. These are much like “complementary assets” mentioned by David J. Teece.

Teece (1986) argued that complementary assets are necessary for the realization of economic returns by a firm upon an innovative technology. This is obviously a systematic perspective. What is unique to the development or transition context is that many complementary assets do not exist beforehand. Policies have to consider the need for the creation of complementary activities and related institutions. All the market systems, the development of upstream and downstream manufactures, and expansion of services were so critical for the success in vegetable production innovation, and all these were to be attributed to the policy initiatives and coordination by the Shouguang government, although we have observed that much improvement is yet to be done.

Experiences of Shouguang were soon introduced around the country, but few got as successful as Shouguang was. Laizhou, a city 200 km. away from Shouguang, for example, established more than 30 thousand green houses in the thrust of “Learning from Shouguang”, while no more than 10% is survived now. Why the success of Shouguang could hardly be duplicated in other places even though the greenhouse techniques have been widely circulated? This seems showing that agricultural innovation is hard to be imitated or transplanted. The transformation of agricultural economy is a complicated process. Simplified imitation of a certain initiative working in somewhere else might very probably lead to a failure. The

learning of experiences elsewhere has to incorporate with local conditions and timing and opportunity play a part for success as well.

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