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A case study of Chinese agro-technical extension system

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ABSTRACT

The purpose of the paper is to provide a better understanding of organizational patterns and service functions of Chinese AES (Agriculture Extension System) through dissecting the real live situations of extension organization at county level. By analyzing present institution and organizational constitution, the following points are discovered: extension system at county level is completed in organization and strong in functions. Administrative interventions in most extension activities and financial deficiency are primary barriers to develop client-orient extension methods. Too fragmented system and inflexible methods are principal reasons for lowering efficiency and effectiveness of extension performance. Improving farmers' decision-making ability and promoting farmers' participation in extension activities are expected.

Key words: agricultural extension, decision making, extension performance, China

RAZISKAVA SISTEMA AGRO-TEHNIČNEGA POSPEŠEVANJA NA KITAJSKEM

IZVLEČEK

Namen dela je raziskava in predstavitev organizacijske sheme in nalog kitajske pospeševalne službe, z razčlenjenjem dejanskih situacij v okrožjih. Ugotovimo lahko, da je organizacija izpopolnjena in ustrezno učinkovita. Pomanjkanje finančnih sredstev omejuje možnosti razvoja pospeševalnih metod, prijaznih do uporabnika. Preveč razdrobljena organizacijska shema in razmeroma toge metode omejujejo učinkovitost delovanja. Pričakuje se izboljšanje procesa odločanja pri kmetih in njihovo ustreznejše sodelovanje pri procesih pospeševanja.

Ključne besede: kmetijsko pospeševanje, odločanje, uspešnost pospeševanja, Kitajska

1 INTRODUCTION

After entering WTO, the challenges Chinese agriculture has been facing to are how to enhance agricultural productivity and improve qualities of farming products to raise the international competitiveness. All of these, to great extent, rely on not only agro-technology progress and innovations but also how to diffuse these technologies

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efficiently and effectively. As an agricultural country with over eight hundred million rural population, China possesses a huge public extension service network with more than 385 thousand public extension staff. Though the role of public sector in agricultural extension services have been worldwide questioned since the early 1990s (M. William 1993), and the changes of public role were appealed (Diana Carney, 1995 and John Farrington, 1995), public sector in China has been dominant since its inception, whether this part could run efficiently determines entire extension system running successfully. Thus, reassessing and recognizing the patterns and functions of public extension services in China are of significance for better understanding Chinese agriculture and its perspective.

China has established a completed public extension system, in order, institutions at central, provincial, city, county and township level. Here, we take public extension service at county level as study focus for following reasons: firstly, public extension institutions at county level generally carry out extension projects at fields and contact directly with farmers and research institutions, thus it is a substantial intermediary that provides the straightest way for bridging farmers and researches ^[1]. Secondly, in the view of the county's role in carrying out national agro-production strategies, Chinese government, by building up an integrated extension system, puts the emphasis of extension reform on at and below county level to strengthen service functions. The third, county extension center not only takes responsibilities to arrange local agricultural production plans but also manage all extension activities, including the projects from national ones, thus is an actual performer of national extension projects. In addition, a comprehensive understanding to agro-extension at county level is also helpful to understand well how Chinese agricultural policies, strategies and plans are carried out.

The agricultural extension system at county level in 1980s was studied by Dr. Jorgen Delman (1990). Dr. Delman presented extension system in the middle of 1980s when Chinese rural reform started. However, great changes had happened in the system during past decade. In the late 1980s, in the excuse of "financial independence", most local governments cut partly or entirely budget for extension system, push public extension services forward to commercialized ones—self-support by fee-based services. This resulted directly in more than half professional and qualified extension staff moving out and some counties even dismissed extension stations, public sector was almost paralyzed. Direct outcome of paralyzed public services was of stagnancy in agricultural production in successive years in the early 1990s. Against this situation, Chinese government had made great efforts to restore and reorganize extension system. In 1993, the central government issued the "Regulation of Chinese Agricultural Technical Extension", which focus mainly on reforming organization and strengthening service functions at county and township level, through integrating various separated extension stations, such as seed station, agro-management station, agro-tech extension station etc., into one extension center. Up to 1996, Agricultural Technical Extension Centers (ATECs) were established and operated stably in over 65 % of total counties, and the services functions have been extended and completed gradually (A Study of Agricultural Extension Investment Policy, 1998)., Reorganized public sector has been run more than ten years, however how is the system operation going on? Are there any problems or limitations on this system?

The study is to provide a better understanding of organizational patterns and service functions of Chinese AES through dissecting the real live situations of extension organization at county level. Here, the case study provides a perspective from county's angle on current practice, performance and problems as well as challenges that current public extension system confronts to. The study is composed of four parts. After introduction, the second part is served to present the current agricultural situation in Wuhe county and draw out the outline of Wuhe agriculture extension system through a description of entire extension system. The third part is concentrated on elucidating pattern and function of agro-technical extension service at county level by demonstrating organizational structure, developing strategies and extension measures. Finally, some issues, limitations and problems in public sector of extension system will be clarified.

2 OVERVIEW OF AES IN WUHE COUNTY

2.1 Resources Endowment and Current Situation

Wuhe County is located in Huang-Huaihai plain area, one of Chinese main grain production region. The county is administrated under the Benbu city, Anhui province. The third biggest river in China- Huaihe River crosses the county and irrigates most of cultivating land along the river. In 2003, Wuhe had a population of 704 thousand with rural population of 624 thousand and agricultural labor force of 397 thousand. The total areas are 1580 km², of which 48.7 percent are cultivated, 7.1 percent are devoted to fishery, and others are for forestry. The double cropping index is relatively high, 205 % in 2001, 227 % in 2002. About 92 per cent of cultivated areas are irrigated, and 90.6 percent are cultivated by machinery. The county was designated as a "base county" for grain production in 1985 and thereafter was one of "the one hundred base counties for grain production" designated by the central government. In 2002, the county was again designated as "producing base for organic farming products (vegetable and fruits)". With 68 per cent of total sown areas devoted to crop production, the county is of grain base, mainly rice and wheat, the major cash crops are cotton, peanuts, rapeseed and watermelon. Within agriculture, planting farming is of dominance.

Table 1 presents a comparison of indicators in farming size, net income^[2] and yield, among provincial, national and Wuhe County in 2002. For per farming population, both farming size and net income in Wuhe County were just above the provincial average, and slightly below national average. Quite high yield is attributable to higher double cultivating index. Comprehensively, Wuhe County is agricultural one, fairly on the average if measured by both provincial and national standards.

Table 1. Comparison of Farming Size, Net Income and Yield in 2002*

	Size (ha)	Net Income (Yuan)	Yield (kg/ha)
Wuhe	0.15	2328	7225**
Province	0.10	2118	-
Nation	0.14	2476	4894

Notes: *: Because of flood, net income in 2003 is unable to be compared.

* *: The number is the yield only for grain, excluding cash crop.

Source: The data of Wuhe County, *Wuhe Agricultural Statistics Reports 2003*. Provincial and national data, *Chinese Agricultural Statistics Year Book 2003*.

2.2 Outline of AES in Wuhe County

Table 2. Agricultural Technology Management System in Wuhe County

Unit	Responsibilities
Government System	
Commission of S & T	Coordinating extension activities among different Bureau
Bureau of Agriculture	
Agro-Technical Extension Center	Disseminating advanced cultivating technologies (Detailed is described in Section 3)
Agricultural Middle School	Training young farmers providing course for GCP*
Seed Station (Seed Company)	Introducing and supplying improved seed
Bureau of Farming Machinery	
Farming Machinery Station	Introducing and supplying new farming machinery
Bureau of Forestry	
Forestry Station	Introducing fast-growing variety of trees, preventing insects and disease of forest
Bureau of Livestock Husbandry	
Fishery Extension Station	Improving fishes' breeds, introducing new cultivation technology
Veterinary Station	Improving breeds of poultry and livestock, preventing disease for poultry and livestock
Bureau of Water Management	
Irrigation Station	Water resource management, introducing innovation in irrigation, providing support in integrated technical diffusion
Cotton Office	Introducing improved seed and management in cotton production
Silk Office	Instructing production technology and management in silkworm
Farmer Trade Associations:	
Fruit growing association	
Vegetable growing association	
Livestock research association	
Forestry study association	
Cotton Growing study group	

Source: Interview to officer of Agricultural Bureau.

Note: * The Green Certificate Program (GCP) means: to develop technical and managerial skills in those desiring to enter or continue a career in farming; to provide the means for certifying the achievement of skills by a formalized practical testing system; and to increase the knowledge in farm management and improve human resource planning in agriculture.

AES in Wuhe County is composed of two blocks: public services system and private sector. Table 2 shows the broader framework of the agricultural technology management system in public sector. This public sector covers almost all agro-related departments that are under control of local government, and institutions are organized in a hierarchical system. Irrigation Station, Aquatic Farming Station and Livestock and Veterinary Station were set up in the middle of 1970s. Agro-technical Extension Station, Agricultural Management Station, Agricultural Machinery Station and Forestry Station were built up in the early 1980s. Some of these stations were integrated into Agro-Technical Extension Center (ATEC) in 1994. The rest stations, cotton office and silkworm breeding office, were set up mainly as a response to local economic development after 1990.

Of these technical extension stations, ATEC, farming machinery station and irrigation station serve mainly for planting farming, ATEC takes in principal charge of diffusion of cultivating technologies and is responsible to coordinate with irrigation and farming machinery stations in some integrated extension projects. The other specialized extension stations, such as fishery station, forestry station, livestock station, serve to provide professional technical services to their clients in their own scope. Table 2 indicates a strong disciplinary division within the agricultural technology management system. These seven extension stations are designated different functions and administrated by seven corresponding governmental bureaus respectively. Such separation in functions was with intention of strengthening the capacity of related extension interventions and improving efficiency in operation, through the way of each taking own responsibility.

2.3 Personnel Composition in AES

Extension personnel and their qualification both at county and town level in Wuhe County are shown in table 3. Corresponding to this composition, total numbers of agricultural technical extension staffs in county are 330, in which 132 (40%) for agro-technical extension (cultivating practices) and agricultural management, 48 (14.5%) for farming machinery, 60 (18.2%) for irrigation services, 35 (11%) for livestock husbandry, 29 (9%) for forestry, 26 (8%) for fishery. Of total staff, as shown in table 3, senior agronomists account for 13.1%, agronomists for 25.7%, junior (associate) agronomists for 41.0%, others for 20.2%. Above data demonstrate that personnel structure in Wuhe County is professionally better if compared with national average level. Combined ATEC and TAEC with irrigation station and farming machinery station, the extension staff served for planting farming account for 72.7%. This number confirmed from another angle that traditional planting farming still occupied overwhelmingly dominant position in Wuhe County.

The private sector is mainly composed of farmers' trade associations, such as fruit growing association, livestock research association, vegetable study association, forestry study association, cotton study association, etc. These associations are organized on the farmers' willingness and sponsored in fact by some departments of local government, though in principle its non-government nature. There are other agro-related companies who sell agro-chemicals such as insecticide, pesticide or bio-products. This part provides simple services and currently only take a small proportion to whole extension system. The private sector has expanded service range and been developed very quickly in last years,

and undoubtedly will play more and more important role in extension services. In this article, however, it has to be by-passed for the reason of out of this study's topic.

Table 3. Professional Structure of Extension Staff

	No. of Staff	Senior Title		Middle Title		Junior Title		Technicians & non-tech.	
		No. & %	country %	No. & %	country %	No. & %	country %	No. & %	country %
ATEC	33	6 (18.2)	5.47	10 (30.3)	22.1	17 (51.5)	36.0	0	36.5
TATEC	99	4 (4.1)	0.45	9 (9.1)	12.6	65 (65.7)	54.8	21 (21.1)	32.2
ATES*	330	43 (13.1)	-	85 (25.7)	-	135 (41.0)	-	67 (20.3)	-

Note *: Agro-related Technical Extension Staff under county. Figures in brackets show a percentage of the item in total staffs.

Source: Interview on the spot and Zhengyu Sun (2000).

Apparently, Agricultural Technical Extension System in Wuhe County possesses a completed organization and reasonable personnel structure. The system has strong ability to provide services involved every aspects of agricultural production. The responsibilities of these extension institutions tell us that, however, all of these concern with production services and technical matters, none of them concerns to after harvest service, that is, the service in marketing and trading information. The problem comes out: who provides the information service and could the farmers with extremely small farming size afford the marketing risk by themselves without public marketing information service? In addition, the separation in disciplines is very detailed, this does not lead to successful extension activities as they expected, just in opposite, too separated organizations had been proved to lower the efficiency and effectiveness of extension system.

3 AGRO-TECHNICAL EXTENSION CENTER (ATEC)

3.1 Organization and Personnel Constitution

The Wuhe ATEC, which was integrated in 1994, is located on the outskirts of the Wuhe downtown. The office building, which was sponsored by FAO Fund, is next door to the County Agricultural Bureau, with five floors, office facilities, a simple library and reading room, class rooms for training, simple laboratory facilities as well as various vehicles, etc.

At County level, except one administrative official, 32 out of 33 staff are professionals in ATEC, senior agronomists (namely, senior titles) account for 18.2%, agronomists (middle titles) for 30.3%, junior (associate) agronomists for 51.5%, others for 21.1%. Under county, TATECs have 4 senior titles, account for 4.1%; 9 middle titles, for 9.1 %; and 65 junior titles, for 65.7% and 21 technicians, for 21.1% of total 99 staff. The fact that all these staffs were graduated from agricultural universities, colleges (or at least agricultural high school), provides a basic guarantee that extension staff have had common senses of agricultural extension.

Besides public extension agents above mentioned, each administrative village has one technical group owning three to five farmer technicians, and each natural village has one farmer technician and several demonstration households. Totally, the county has about 500 farmer technicians and 2500 demonstration households. Up to 2000, 250 farmers have been awarded the "Certificate for Green Farming" through the ATEC training program. Professional staff in county and township plus farmers' technicians and farming demonstration households in villages consist of a fine-meshed extension service network in Wuhe county.

3.2 Financial Situation

The ATEC in Wuhe is administratively under Agricultural Bureau. In principle, Bureau of Agriculture should finance all outlay for ATEC, including cost for operation, activity and compensation. In fact, due to local financial difficulty that is also popular in most counties of China, not more than 60% of total budget for ATEC per year could be fulfilled during last 5 years. This part offers mainly to cover operation costs (salary, welfare etc.) whereas rests should be earned from other sources: project funds, profits from fee-based services and commercial activities. In 2002, the total budgeted government outlay in Wuhe was 86 million Yuan, of which 16 percent were invested in agriculture. The budget for agricultural extension was approximately 2.75 million Yuan, i.e. 3.2 percent of the total budget, and 22 percent of the total outlay for agriculture. But only 1.82 million Yuan, i.e. around 66 percent of the 2.75 million Yuan budgeted for extension, were fulfilled by county government to cover operational costs, whereas the remaining 0.93 million Yuan came from various other sources: project funds, profits from fee-based services and proceeds from commercial crops taxes. The government allocation for activity costs amounted to an average 300 Yuan (less than 40 U.S. dollars) per extension technicians, which was one-sixth of total outlay needed for performing extension projects on a yearly base. It is obviously far not enough to cover the activities' cost. Therefore, agricultural extension activities depend to great extent on the capacity of the ATEC to take on projects from outside, which are carried out with funds for various activities including selling services and goods to farmers. In Wuhe case, from 2001 to 2003, ATEC activities fund relied partly on undertaking extension projects from superior governments, averagely 10 items for each year, and partly on the profits from business activities, total profit reached 2.7 million Yuan in 2002.

The financial problems of the agricultural extension organization in Wuhe are by no means unique, the similar embarrassments in agricultural investment have been troubles nationwide. A national survey at county level in 1996 showed that, about 60% extension fund came from local budget, 20% from various projects fund, 20 % from commercial activities (A Study of Policy in Agricultural Extension Investment, 1998). It also coincided with the situation of financial difficulty in agricultural extension system worldwide in 1980s and 1990s (William M Rivera, 1991; Peter Bloome, 1993). Severe outcome resulted from financial deficiency was that a lot of "able man" either moved out of extension system or were allured to engage business rather than doing extension, this undermined the foundation of public extension system and made situation of shortage of qualified extension staff worse. The problem that had been appealed since the early 1990s is still severe even after 10 years.

3.3 Objectives and Tasks

There are two kinds of strategic objectives; one has been written down and posted on the one wall in ATEC office as follows: 1) Accelerate the adjustment of farming production structure, to promote process of agricultural industrialization; 2) Enforce the dissemination of appropriate agricultural technologies, make great efforts to raise the rate of S&T contribution to agriculture production (In Wuhe case, targeting 43% in 2000, 45% in 2001); 3) Continue to enforce comprehensive agricultural extension network, especially at and below township level; 4) Achieve production targets for major crops as planned by the local government.

Table 4 Main extension projects in 2001, and 2003

2001	1)	Testing and introducing edible cactus
	2)	Program for mulch film (maize, watermelon, peanuts)
	3)	Breeding and spreading out-of-toxin sweet potato
	4)	Making good use of stalks (chopping stalks and put back to field for improving soil condition; using chopped stalks as cattle's feedstuff)
	5)	Prevention of underground insects (mainly grub)
	6)	Intercropping cultivation practices
	7)	Introducing improved varieties and quality farming products, such as wheat for special use, rice, rapeseed low in erucic acid, out-of-toxin sweet potato etc.
	8)	Trial of organic farming products* (vegetable, 7ha)
	9)	Scientific cultivating method (rice: dry-raising seedling and sparse planting; wheat: sparse planting; cotton: transplanting with soil added nutrition, etc.)
2003	1)	Building up the production base for organic farming products (mainly fruits and vegetable), including compiling technical schedule and train material)
	2)	Spreading mulch film to most crops, goal: over 40 thousand ha
	3)	Strengthening program for introducing improved varieties and quality farming products
	4)	Making good use of stalks
	5)	Reinforcing plant prevention of underground insects, focus on those against peanuts and soya bean
	6)	Expanding areas of intercropping cultivation, building up production base
	7)	Testing soil nutrition and Formulated fertilizer applying technology
	8)	Scientific cultivating method (rice: dry-raising seedling and sparse planting; wheat: sparse planting; cotton: transplanting with soil added nutrition, etc.)
	9)	General survey for crop disease and insect pests, drawing up the quarantine atlas
	10)	Investigation and protection of wild bean resources

Note: * In China, "Wu Gonghai farming products" implies the farming products with less application of fertilizer, insecticides and biochem-products.

Source: Annual Work Reports, 2002, 2003, Wuhe Agro-tech Extension Center, Wuhe Agriculture Bureau.

On another wall, there are something more detailed:

- (1) Perform extension projects from central, province and local governments; (2) Instruction, demonstration and dissemination of new cultivating technology; (3) Arrange on-the-spot demonstration and instruction of new practices for local government.

The objectives and tasks above-mentioned are general description, and could be found in many counties ^[3]. The first fourth, to great extent, are the local version of central government's strategic objective of "Two Transformations in agriculture and one promotion", that is, "the transformation of traditional agriculture to modern agriculture, transformation of self-sufficient agriculture to commodity-based agriculture, promote agriculture industrialization". The latter three items are the

official, there are no operational meanings. In Wuhe case, as a matter of fact, there are detailed items for extension objectives. For instance, extension projects in 2002 and 2003 were elaborated in table 4.

It is apparent that in the tasks of Wuhe ATEC, carrying out the plans designated from superior government was preferred for both the administration and finance reasons. The strategy reflects that China still gives the first priority to farming production rather than improvement of rural life standard in rural economic development. Limited by the framework of technical term, there is no concerning about how to foster and improve farmers' abilities in making-decision and farming management or simply developing human resources, women's education for improving home life and nutrition as well as children's nurture, so that bettering the whole rural life quality. This shows a big gap in extension mission between China and developed countries^[4]. The lack of developing human resources (HR) is an apparent flaw in the strategies of Chinese agricultural extension. However, the situation changed gradually, the training courses for "Certificate for Green Farming", which has been developed nationwide since the late 1990s, should be considered as kinds of fostering rural human resources, even though not writing down definitely into developing strategies.

3.4 Extension Coverage

The extension coverage is presented in table 5 for last several years. In 1998, over 60 percent of total sown areas were covered by various kinds of extension activities, the figure rose to 77 in 2000, 199 in 2001. The high coverage illustrates the strong capacity and effectiveness of the agricultural extension organization in diffusing agricultural technology at country level. The steep rise in coverage areas in 2001 is attributable to introduction of improved varieties and quality farming products (refer to table 4). Whereas such large-scale activities are mainly for responding to Chinese entering WTO, which made the governments feel the imperative of survival to replace traditional farming products with high quality ones.

Table 5. Areas of Extension Coverage and Shares

	Total*	Diversified	Grain	Cash Crop	Thousand ha, % TCA**
1998	71.33 (60.0%)	8.57	36.00	10.09	16.67(23.4%)
1999	80.67 (69.8%)	5.78	38.23	13.33	23.33(28.9%)
2000	124.00 (77.4%)	9.27	50.33	23.33	41.07(33.1%)
2001	286.67***(199.4%)	26.67	51.33	33.00	66.67

Notes: *: Figures in brackets in this column are percentages sharing total sown areas.

** : Figures in brackets in this column are the TCA's percentages in extension coverage.

***: The data included areas overlapped by various extension activities. This number stayed the same high level for 2002 and 2003

Source: Interview on the spot and Annually Work Reports, 1998, 1999, 2000. Wuhe Bureau of Agriculture.

Table 6 presents extension projects executed by purposes since 1998. In annual extension projects, grain production was given an extreme priority till 2000^[5]. However, the planting areas for cash crop and diversified farming expanded gradually, the rate of grain to cash crop to feedstuff descended from 54.7:36.9:8.7 in 2001 to 47:35.8:17.2 in 2002 (by interview). An annual increase of non-grain crop in farming

production reflects a slow but evident turning from self-sufficient farming toward more commercial one in rural economic development at county level.

Table 6. Extension Projects by Different Purposes

	Total	Grain	Cash Crop	Diversified	Others
1997	7	4	2	0	1
1998	15	6	3	3	3
1999	23	7	6	4	6
2000	38				

Note: 1) In total 38 extension projects in 2000, 23 items for dissemination, 7 for demonstration, 5 for testing and examining, 2 for research, and 1 for others (by interview).

2) After 2000, extension projects were more comprehensive, covered most grain, cash crop and diversified planting, such as intercropping of wheat- watermelon - peanuts (by interview).

Source: Interview on the spot and Annual Work Report, 1998,1999, 2000. Wuhe Bureau of Agriculture.

Data in Table 5 and 6 describe the efforts that extension organization in Wuhe County had made. Further interview confirmed that, of all those extension activities, fee-service extension activities were contracted on farmers' willingness, and farmers did benefit greatly from those activities. Most of the rest free-based services were mainly extension projects from local and upper governments (province or even central government). The data could not tell us, however, to what extent farmers had a choice in adopting the technology offered and whether they would benefit from these technologies. Moreover, it is impossible to assess which among the large-scale activities was proper one, which was meant to enforce the uses of technologies beyond the stage of extension, which was the implementation supervised by the ATEC on behalf of the governments to achieve planned targets.

3.5 Main Extension Measures

Similar to the extension activities in most countries, the ATEC-system employed a number of time-seasoned methods to diffuse technologies, such as demonstration on the spot, field inspections, village meetings, advisory services; propaganda / information through mass media (wired broadcast, films, video, radio and TV in county's broadcast), short term training courses; competitions, rewards, and administrative control. These methods are widely adopted by various extension projects. On the basis of these traditional activities, there are three extension measures having been practiced.

Technical Responsibility System: Here is worth to demonstrate the way of Technical Responsibility System or simply called Group Contract Approach. The approach has been very popular nationwide since the late 1980s and is mainly applied to carrying out large-scale extension projects planned by the central or provincial government. The contracts are signed between different levels and specific in extension targets, criteria for rewards and punishments. In Wuhe case, there are generally two kinds of contracts.

Technical Contract Approach: There is a fee-based service in extension activities called Technical Contract Approach. Fee-based services aim at those technologies that are

high economic returns and the techniques are not easy for farmers to grasp without instruction. Technical contracts are signed between field extension individuals, center /stations and farmers for the services (e.g. for plant protection) or as a part of the implementation process to make farmers participate in the extension. In contract, there are detailed items which link farmers and technicians closely with right, responsibility and economic interests. The principal implication of Technical Contract Approach is to set up an incentive mechanism that functions to encourage technicians to go to fields, contact to farmers frequently, ensure adoption of technologies and successful diffusion (Xu Fei & Takeya Hiroyuki, 2000).

Running Agro-business: Combining with technologies being diffused, special companies owned by the ATEC supply farmers with various farming materials needed by new technologies, such as plastic film, insecticide, pesticide, fertilizer, as well as bio-products. In an interview, the manager of the ATEC affirmed that the work emphasis was in principle on extension activities and majority of commercial activities was closely related to extension projects, generally were those farming materials needed by new technologies.

Attributing to great contributions to relieving financial deficiency, agro-related business activities were practiced well by county and township extension center. No data show how many staff engaged in and how much time they spend to these commercial activities, thus it is hard to evaluate the influence of these commercial activities to extension work.

These three approaches have been practiced since last two decades and are supposed to be going on for a while. Currently, there are some arguments and challenges that these three approaches have to be confronted to. Project-oriented extension was criticized for its coercionary nature and not respecting farmers' own right to land. Technical Contract Approach, happened between farmers and extension technicians, reflects mutual agreement on fee-services and caters to farmers' demand, thus more clients-oriented. But this method is hard to keep going on due to increasingly agro-technologies commercialization and thus getting free innovation from agro-research institutes and universities is more and more difficulty. Failure in prompt marketing information also makes farmers loss interest in technical contract. Besides being criticized business actions rather extension, running agro-business is facing more and more competitors: trading farming materials is no longer their exclusive privilege, small and private companies are more flexible in providing services; big and public agro-related companies start to pay more attention to after-service.

4 SUMMARY: EXISTING PROBLEMS AND LIMITATION

Experiences in Wuhe case demonstrates that Agro-tech Extension system at county level has been strengthened in organization and service functions through integrating several separated extension stations into current extension center. Meanwhile, the traditional projects-oriented and task-oriented extension methods have been reinforced by the new institution. Thus developing clients-oriented activities were impeded. Taking the whole system into consideration, there are some apparent flaws that may have influence on the system's survival and development.

- 1) Too complicated and fragmented agro-tech extension system. The fragmented extension system makes implementation of extension projects more difficult and service efficiency down. Collaboration among different administrations have been proved being hard and even impossible in many cases. Also, overlapping duties across institutional boundaries cause obviously waste in human and technical resources.
- 2) Poor extension fund. Even insufficient budget for agricultural extension has happened worldwide in 1990s, financial difficulty at grassroots level in China is special outstanding. A direct outcome of severe fund shortage is the loss of professional staff and existing staff doing business rather than spreading technologies. Another outcome is that there is no money for staff to get retraining and refreshing knowledge.
- 3) Administrative intervention in extension. Most of extension services have been offered by way of administrative intervention. These are attributable to two reasons: a) the extension services they had been carrying out were mainly extension projects from upper governments, where the fund came from. b) These were large scale and "national strategy crops" projects. Having given high priority to project-oriented extension activities rather than farmers' needs reflects that extension system in China functions in fact a tool of carrying out government plans, policies and strategies.
- 4) No farmers' participation. Farmers, a subject of agro-tech application and farming management, were hardly participated in entire extension process, from making planning, carrying out and evaluating projects after accomplishment. Interview confirmed that, in project-oriented extension activities, no room left for farmers to choose no matter whether they would like. This built undoubtedly up a big gap between extension targets and farmers' needs. Farmers' participation in extension activities only happened in technical contract projects for cash crops, while it took only small portion of entire extension activities.
- 5) Lack of marketing information services. In on-the-spot survey, extension services were emphasized on technical aspects, rarely on marketing information, though there is a farming management extension division.
- 6) Failure in human resource development. Through whole system from top to bottom, there is no idea concerning fostering ability of farmers' decision-making in extension policy and strategy. Even though there are training programs for "Certificate for Green Farming", that is far from enough for thousands of farmers. Therefore, how to enhance farmers' production and management qualities is a main challenge faced by current extension system.

As a by-product of this study, some radical developments in Chinese agriculture at county level could be observed by making a comparison of extension projects, technologies, and agro-industrial structure before and after entering WTO: instead of improved traditional varieties and cultivating practices, diffusions are tending to more market-oriented ones (table 4), particularly to meet the international market needs; grain production are no longer main pursuit, with the weight of grain production down, cash crop production (53% of total sown area in 2002) is gradually taking dominant position. It is not definite to attribute these changes to entering WTO, also too early to say that Chinese agriculture at county has been on the way of

commercialized farming production, but it is worth to keep research eyes on the tendency of agricultural production and development of rural economy at county level.

Postscript: The primary survey was done in 1999. Afterwards, the telephone interviews were followed in 2002 and 2003 for supplements to view the changes before and after entering WTO. Here we give our special thanks to Foundation for Returned Oversea Students sponsored by Ministry of Education of China for the financial support (*Jiaowaisiliu*[2004]176). We have also appreciated Dr. Takeya Hiroyuki, Professor in Nagoya University of Japan for his constructive comments. We are greatly indebted to all extension staffs and officers in Wuhe County for their friendly and kindly support in interviews survey.

Notes:

- [1] Professor A M Kesseba defined extension system as an intermediary between research institutions and farmers, 1989 p.6.
- [2] At that time, the exchange rate as, one US dollar was equal to 8.4.Chinese Yuan.
- [3] In other surveys in which we participated, there were almost the same sentences posted on the office wall of county's Bureau of Agriculture in Guangdong province and Guangxi province.
- [4] If compared with agricultural extension strategy in Japan and Korean that have the similar cultural background with that in China, bettering rural life standard was put in the same priority as technologies dissemination even in the earlier extension strategies.
- [5] Despite planting areas for cash crop and diversified farming production expended gradually, the rate of grain to cash crop remained high level: 78.4:21.6 in 1996, 59.33: 40.67 in 1998 and 56.33: 43.67 in 2000.

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