THE EMERGING ROLES OF THE UNIVERSITIES AND COLLEGES IN AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT IN CHINA

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Introduction

Agricultural education, research and Extension are facing great challenges in terms of democracy, decentralization, and the issues of population, resources and environment in nearly all countries. It is especially the case in the Peoples Republic of China (PRC) where the centralized planning economy is being replaced by a market economy after 15 years of reform efforts. This paper attempts to illustrate the emerging role of agricultural universities and colleges in the national efforts for agricultural Extension and rural development in China.

After briefly reviewing the historical evolution of agricultural Extension in China, the authors provide information on changes since 1949. The developments are discussed in terms of the objectives of Extension, the institutional settings, the approaches followed, the main types of technologies disseminated and the consequences. These provide a background to understand the reasons for Chinese agricultural universities and colleges to develop their Extension functions.

Several approaches are described for the Extension activities of the universities and colleges. Finally, the endeavor of Beijing Agricultural University are introduced. The paper is concluded by providing some implications for the development of the Extension roles of Chinese universities and colleges.

Agricultural Extension in China: The Historical Evolution and Reform Since 1980

China, one of the earliest countries to develop agriculture in the world, has a very long history of agricultural Extension. Since the Zhou Dynasty (about 1100-841 B.C.) some officers specialized in agricultural administration and Extension. Named as "Quan Nong Guan (the Officer to encourage farming)", they were assigned at all levels from the central down to local governments. According to historical records Emperor Han Wu Di of the Western Han Dynasty (206 B.C.- A.D. 24) gave an order to disseminate to the whole country the "Dai" land technology (an improved ridge farming method) and new farm implements developed or innovated by Zhao Guo, a high officer for agricultural administration at the time. In both the Southern and Northern Dynasties and Tang Dynasty some books on agricultural technology were published. Among them the most famous is the "Qi Min Yao Shu (Key Skills for the People or an Agricultural Encyclopedia)" written by Jia Sixie in 6th century A.D. In about the latter half of 10th century A.D., the Song Dynasty recruited "Nong Shi (agricultural teachers)" at the county level, who were not paid officers but Extensionists or farmer technicians living in the villages to advise farmers with technologies and improved varieties. The Chinese term "Tui Guang (Extension)" has been used in agriculture
since the Song Dynasty. In the beginning of the 18th century contrast experiments and demonstration for improved varieties and double cropping of rice were implemented in south China (Yang Shimou 1987; S. Wittwer et al. 1987).

The institutionalized agricultural Extension has been developed since the turn of the 20th century. A first Extension organization for cotton production was set up in Jiangsu Province in 1924. After the issue of the first national regulation of Extension by the government in 1929, Extension organizations were established in 16 provinces. Agricultural experimental farms were set up at the central and provincial levels. Regulations of county agricultural Extension were issued in 1945 and then 586 county Extension stations were established in 17 provinces. There were 2,446 government agricultural Extensionists throughout the nation (396 at central level, 550 provincial and 1,500 county level) by the end of 1948. In addition, about 700 whole- and part-time Extension staff worked in public or private agricultural institutions (J. Delman 1991, Yang Shimou 1987).

The universities and colleges started their agricultural Extension activities in China during the 1920s'. The Jinling University and Southeast National University (now the Central University) in Jiangsu Province and Guangdong National University (now the Yet-Sun University) in Guangdong Province set up successively their own agricultural Extension sections in the period. The staff promoted the use of improved varieties and pest control, edited pamphlets for training, gave lectures and made demonstrations. Some of them were involved in the experimental campaign for rural community development run by non-governmental organizations in Hebei, Jiangsu, etc. Provinces in the 1930s' (Nie Chuang et al. 1993). University staff members who had graduated from U.S. institutions, tried to adopt the model of the land-grant university system for Extension activities. But the universities or colleges played only a limited role in the national agricultural Extension due to the war with Japan and the internal political revolution at that time.

Since the establishment of P.R.C. in 1949 agricultural Extension has evolved through four stages in terms of institutional changes: the establishment and development of agricultural Extension, 1949 - 1965; the development of four-level network for agricultural scientific experiments during the "cultural revolution", 1966 - 1977; the establishment of agricultural technological centers at different levels, 1978 - 1987; and the multi-sectoral and decentralized development of agricultural Extension, since 1988.

In 1952 the Ministry of Agriculture requested that agricultural Extension stations should be set up in every district (an administrative level between county and township at that time). The objectives for the Extension stations and the roles, functions and responsibilities of the Extensionists were further clarified in 1955 by the Ministry of Agriculture. By the end of 1956 there were 16,466 stations established and 94,219 staff recruited. On the average there was one station with five staff in each district except the remote mountainous areas (Yang Shimou 1987).

The main objective of the government for agricultural Extension in the 1950s was to achieve food security. In the beginning the main approaches were to summarize the experiences of the farmers, especially the model farmers, make adaptive experiments, demonstrations and disseminations. The technical contents of Extension in those years included local improved varieties, cultivation methods, fertilization and new farm implements. The package technologies for rice, wheat and maize were formed based on the farmers' experiences, including seed selection, use of improved varieties, rational dense planting, increase of fertilizer, nursery of strong seedlings, rational irrigation and pest control (Zhu Dehui et al. 1989). Walking plough, double-furrow plough and water-well saved the labor force greatly. The grain yield per ha. increased from 0.8 ton in 1949 up to 1.5 ton in 1957 according to the national statistics (Ma
Zhanyuan et al. 1989).

After the 3-year natural disaster (1959 - 1961) an Extension campaign was executed throughout the whole country. Many agricultural researchers and about 70% of the Extension staff worked at the grassroots level. They made three kinds of combinations: 1) among leaders, farmers, scientists and technicians; 2) among experimentations, demonstrations and disseminations; and 3) among research, teaching and training. About one million farmer technicians came out in the whole country, organizing experimental groups in the villages (named brigade under the commune system at that time), producing seeds of improved varieties and planting model fields. Some of them learned the technical packages by which 7.5 tons of rice, 3.75 tons of wheat or 0.75 ton of cotton could be produced per ha (Yan Shimou 1987).

After adopting the Soviet Union's model, Chinese universities and colleges were entrusted only the tasks of education and limited roles in research. Their role in agricultural Extension was stopped in the early 1950s. According to the arrangements, research was mainly the responsibility of the academies and institutes while Extension was carried out by the government organizations. The university staff role in Extension was limited to only demonstrations or giving advice to the farmers nearby their experimental stations. The teachers and students were requested to go to the countryside in some years not for doing Extension or giving training but being laborers to get re-education.

After the beginning years of the fierce cultural revolution, started in 1966, a form of Extension system, the so-called "four-level agricultural scientific experimental network", was brought about in Huarong County, Hunan Province 1969. It consisted of agricultural scientific institutes at county level, agricultural scientific stations at commune (township at present) level, agricultural scientific teams at brigade (village at present) level, and agricultural scientific groups at production team (villager group at present) level. The government decided to promote this kind of institution throughout the whole country. About 1,140 counties had set up the institutes, 26,872 communes the stations, 332,233 brigades the teams and 224 million teams the groups by the end of 1975.

During the 10 years of cultural revolution the roles of science and scientists, including university teachers, were discriminated against. The approaches to Extension turned to more top-down by means of administrative instruments. The focus was still to increase the yield of stable food crops and meet the food security needs. Some of the results of the green revolution, such as improved varieties of wheat and rice, were introduced into China. The inputs of fertilizers and irrigation were increased accordingly. But the commune system destroyed completely the farmers' motivations in most of the areas. Crop yields still stagnated. More than 200 million rural population, about 25% of the total, were living under the poverty line by the end of the revolution.

Since the end of the cultural revolution the government has reemphasized agricultural education, research and Extension. Since the end of the 1970s, along with the political and economic reform, the agricultural Extension system was changed. The institutional structures changed greatly in rural areas. The commune system was replaced by the farm household responsibility system. The individual farmers became the decision-makers to use the land, allocate their resources and distribute the incomes. The brigades and production teams were disintegrated. So the former four-level network for Extension did not function again and the farmer technicians were busy at farming in their own field. Based on these considerations the Ministry of Agriculture decided to reinforce the Extension at the county level. Agricultural Technical Extension Centers (CATEC) were requested to be established in each county, which combined the former technical Extension station, soil & fertilizer station, plant protection station, seed station, research institute and technical training school of the county all together to carry out the agricultural (actually only crop
production) Extension integratedly (See Fig.1). By the end of 1990 1,286 counties out of the total of about 2,000 had set up their CATEC, about 220,000 townships their TATES (Township Agricultural Technical Extension Station). See Figure 2

Along with the rural reform and development of market economy it has become more and more difficult for the centralized governmental Extension organizations to meet all the demands of farmers for comprehensive services. Decentralized, multi-sectoral and leveled Extension service systems were developed around the middle of 1980's especially since 1988 when the government decided to initiate programs for comprehensive agricultural development which covered almost all the regions in China.

Other centers for animal husbandry, fishery and agricultural machinery were also requested to be set up respectively:

1. Service organizations affiliated with banks, credit cooperatives and insurance organizations. These are mainly for the financial services which production requires.

2. The service provided by research institutes and universities and colleges. Many of the staff were involved in the contract service together with the local Extensionists. About 1,100 counties assigned Deputy Mayors for Service and Technical management. Most of them came from institutes or universities.

3. Farmer self-organizations for service. According to a survey by the Ministry of Agriculture about 77,000 associations for commodity production and/or research and 419,000 specialized production service organizations were organized by farmers privately or cooperatively by the end of 1990.

Community service organizations were developed at township and village levels. The village organizations provided the fine seeds and other inputs, technical advice, plant protection, farm machinery, irrigation and electricity services partially or as a whole. These kinds of organizations were much more developed in the coastal areas such as Jiangsu and Shandong Provinces compared with the less-developed areas in middle and western areas in China. According to a survey in Jiangsu Province 20% of the villages could provide whole-packaged services, 50% some parts of services while 20% only one or none of the services. In the less developed areas the economic capacity is very weak at the village levels. So the services are mainly provided by the township Extension stations, which are still problematic due to the same economic reason.

**Provincial Government Service Organizations Concerned with Agriculture**

Service organizations of agricultural institutions

Besides Extension service for crop production there are Extension institutions for animal production, fishery, farming machinery and farm management under their administrative guidance respectively. By the end of 1991 there were about 214,600 units of state Extension for different commodities or services, 327 at provincial level, 2,445 at prefectural/municipality level, about 18,000 at county level and 189,000 at township level. Totally there were about 1.17 millions technicians or staff, 40% of whom were state technicians.
* NATEC = National Agric. Tech. Ext. Center;  

Figure 1. The Government Extension Organizations for Crop Production in China.
*NCS&T = National Commission for Science and Technology
NCE = National Commission for Education
AKIS = Agricultural Knowledge & Information System
NCP = National Commission for Planning
Ag = Agriculture; WC = Water Conservancy; Fr = Forestry

Figure 2. The Agricultural Knowledge & Information System (AKIS) in China.
There are 18,000 service units at county level with 370,000 staff and 30,000 units at district or township levels with 500,000 staff.

Service organizations affiliated with Forestry institution

There are 1,335 county Extension stations with 19,500 staff and 35,000 units at township level with 150,000 staff.

Service organizations affiliated with the sections of the Supply & Market Cooperatives, Commercial Dept. and Export Department

These are mainly for the services of pre- and post-production e.g. inputs supply, product purchasing, processing, storage, transportation, and export. There are branches of S&M Cooperative in every townships, even some villages. So-called Hospitals of Crops for plant protection have been set up in most of townships in recent years.

The Emerging Role of Universities and Colleges in Agricultural Extension and Rural Development in China

One example of the emerging role of the agricultural colleges and universities may be seen by looking at the case of Beijing Agricultural University (BAU) and its Center for Integrated Agricultural Development in the involvement in Extension and rural development.

One tradition of BAU since its founding has been to link theory with practice and to serve the people with education and scientific research. The crop science and animal science programs developed by this University have played an important role in the agricultural production of North China, especially the Beijing Municipality, since the 1950s. By the '70s such kind of work entered a new stage. One of the prominent features was the integrated control of saline alkaline affected soils on the Huanghe, Huaihe and Haihe plain.

A great change happened in the '80s when a wind of reform swept over the Chinese rural areas, including principally a readjustment of the farmers' relationships to production and the rapid development of agricultural production. The farm household responsibility system made the farmer the principal decision-maker in agricultural production and enterprise. The great enthusiasm of the farmer for a better life and better income became a challenge to agricultural universities and scientific research institutions, and it was necessary for BAU to consider a new model for the university to more adequately serve the agricultural and rural development needs.

Facing the new situation of rural economic development, BAU decided to extend its functions for agricultural Extension and rural development involving state-of-art technology and a new administrative unit within the University.

The traditional duties of China's agricultural university included only teaching and scientific research, but the new model adds Extension and development of new technology, thereby forming a 4-pillar, instead of a 2-pillar, system. It was true that some professors had been involved in Extension and developmental work, but such work was done only in spare time. That arrangement was far from meeting the ever-increasing demand for the development of rural commercial economy. The faculty have very heavy loads for teaching and research which doesn't allow them to pay much attention to Extension; furthermore, the Extension and development nowadays requires systematic work. A new discipline of science, called Extension or rural development, has been utilized in the advanced countries. The administrative leaders for BAU recognized the need to establish a specialized unit to carry out agricultural Extension and development.

According to the idea of this new model, a center for agricultural Extension (Center for Integrated Agricultural Development, CIAD), a high tech
development company (NTDC) and a college for continued education (CCE) were established in 1988. The CCE was responsible for training of personnel sent by the Ministry of Agriculture, Ministry of Personnel, as well as by the local governments.

The main task of the NTDC is to transfer the results of scientific research of the university into commercial utilization. This could be done through joint development and transfer of technology. Two convincing examples were the development of Yield Increasing Bacteria, and Seed Coating Agent.

The activities of the CIAD included Extension, training and information service. With these implements, the members of BAU were involved directly into the integrated development of the rural area. They are mainly young masters degree holders and lecturers. Faculties from departments and colleges who worked on shared responsibility were integrated into the system.

The direct involvement of agricultural colleges or universities in Extension and rural development work should complement and supplement the local Extension work. The work of the colleges and universities should be characterized by integration, training, and demonstration. Integration of science and technology is essential for farmers, the agricultural sector, and rural industries. For example, the integration of elite cultivar, soil management, fertilization, irrigation, cash crop production, feed production, animal production and processing. The integration of packaged technology, management practices, and marketing information rather than isolated bits of technology as developed by researchers.

The goal of training, as provided by the university, includes technology, management and the elevation of the general intellectual level of the farmer. And the demonstrations are an indispensable part of the process, leading to the above goals, for it is through demonstration that farmers may be convinced of the appropriateness of new technology and the new knowledge.

The four fundamental concepts used by BAU in its direct involvement in agricultural and rural economic development since 1988 are as follows:

a. The incorporation of personnel with sole and shared responsibilities. A team of persons with sole responsibilities was established. The main tasks of this team includes: 1) Integrated Extension and development work; 2) Extension of integrated technology on large areas; 3) Multi-disciplinary consultation and training; 4) Sending technology deputy county chiefs for training; and 5) Organization of specialists for target problems and decision making in the localities. The tasks of the shared responsibility members are mainly the Extension and demonstration of the results of their scientific research.

b. The incorporation of multi-disciplinary and single-disciplinary Extension. The objective of rural development has changed from self sufficiency to better income, leading to new demand for Extension work and different competencies. Sending a few scientists to a pilot village to do a few demonstrations is far from enough. In addition to knowledge of science and technology the new Extension workers should also acquire understanding of sociology, economics, and the process of change.

c. The integration of single Extension bases with the surrounding area. A region known as the 3-H region was targeted for BAU's Extension and development work. Integrated Extension bases were established. The Extension works were different from the base as compared to its diffusion area. The works on the diffusion area were mainly undertaken by local personnel trained by the university's Extension service.

d. The integration of internal work and the works of external local region. Through BAU's internal network of training,
demonstration and information service, in cooperation with local institutes of agricultural development, Extension and training, the results of the scientific achievements of BAU have become a constant flow toward the rural area, forming a university-locality cooperative working system for regional rural development. About 20 counties around Handan, Cangzhou and Hengshui prefectures of Hebei province have been included into this system, although the development was of different types, at different levels and on different scales.

The following are several approaches through which BAU has been involved for local rural development.

a. **Training**: This work was mainly done by the CCE (College for Continuing Education), with very good results. E.g., two training classes on farm management have been opened for Shunyi County of Beijing since 1988. The total number of trainees was 277, mostly directors from different farms in this County. The duration of training is 1.5 years. Sixteen courses were taught in each class including courses on agricultural technology, farm management and practice. Although most of the trainees were experienced agricultural workers, they found the training very helpful in the elevation of their theoretical levels, practical capabilities, creativity and initiative. Most of them have made new contributions after returning to their original places. For example, although part of Shunyi County was flooded in 1991, a good harvest was finally obtained through the efforts of these farm directors and their colleagues.

b. **Practical research**: The most outstanding example is the "Integrated management of the 3-H region of middle-to-low productivity" in which BAU played a leading role. The 3-H region, i.e., the Huanghe, Huaihe and Haihe river regions, form the largest plain in China, including 5 provinces and 2 municipalities. It is also one of the main areas for cereals and cotton, producing 60% of the cotton and 1/3 of the cereal of the whole of China's production. But drought, waterlogged, sandy and saline soils have been the main obstacle for better yields here for thousands of years.

BAU started the work of integrated transformation of saline soil in this area in the '70s. The work was included in a national project in the 6th 5-year plan. Entrusted by related institutions (including State Planning Commission, State Science and Technology Commission and the Ministry of Agriculture) BAU became the lead organization of a project for the improvement of the 3-H region in the 7th 5-year plan. A team including 1141 scientific researchers, among them about 200 were teachers from BAU's different colleges and departments, from 204 institutions scattered all over this region was organized. Twelve comprehensive experimental districts were established with an area of 217,000 mu including 28 sites for specific experiments, with an area of 750,000 mu. There were also 3.69 million mu in demonstration districts and 6.0 million mu in diffusion districts. The average yield per mu and average income per capita in 1989 in the experimental districts were 93% and 56% more than in 1985 respectively. The increase of forest coverage was 14% to 20%, and the reduction of area of saline soil was 70%, indicating outstanding social, economical and ecological effects.

Under the leadership of President Shi Yuanchun, a large quantity of manpower and resources of BAU have been devoted to this project. Two experimental stations, Quzhou and Longwanghe, were established. Two hundred faculty members and 500 graduate and undergraduate students (man-times) participated in the work and 18 research achievements obtained, five of which have been honored by national, provincial or ministerial awards. The area of Extension was 12 million mu, and the economical gain 420 million RMB.
c. **Integrated Extension and development**: With CIAD as the principal core, the different technological practices were blended at different Extension bases into various combinations suitable for different localities. The Extension of these technology combinations was implemented with the local government. In order to do this local cadres, technicians and advanced farmers were selected for further training provided by CIAD.

Results of 38 scientific research programs have been utilized in Extension and rural development since 1988. These have involved research by related departments or colleges. Faculty members and students were organized to participate in national integrated agricultural development projects. Experiments were carried out on an area of 0.5 million mu, diffused to an area of 29.25 million mu, leading to increases in yield for different crops, including 1,02 billion kg of cereals, 87 million kg of cotton, 64, million kg oil crops and 29 thousand tons of meat, increasing economic benefit of 1.113 billion RMB; 1.063 million mantimes of technicians and farmers have been trained, and 1.23 million copies of technical reference materials have been distributed, all in 4 years.

d. **Materials for fee**: Most of our services were conducted free of charge. But some of them were provided for a fee. These were principally for business of the NTDC, and has brought economic gains for the university. Examples include production of food-processing quantities of Gibberish Acid, Zearalanol (Raglro), Seed Coating Agent, as well as improved cultivars and better breeds of domestic fowls and animals.

e. **Consultation**: It has been a tradition for the scientists and professors of this university to undertake consultation work at different levels (provincial, municipal, prefectural and county level), with encouraging results.

f. **Role of deputy chief**: Many scientists of BAU have been assigned position of deputy county chiefs, or deputy mayors in counties or municipalities to be in charge of science and technology management.

### Some Reflections

The experiences gained by members of the Center Rural Development at Beijing Agricultural University through the Extension activities have been expressed through three key points. First, there is urgent need for multi-disciplinary Extension service. The traditional rural Extension service is usually based on single disciplines. But after the political and economic reform in the rural areas, this type of service can not satisfy the present demands from farmers and the rural communities. What the rural community really needs is an integrated service of multi-disciplines. The future Extension work should be oriented toward this direction.

Second, new demand will lead inevitably to new concepts. A former, and obsolete, conception of Extension work was that it is a low-level job, and could be undertaken by persons with inferior capability as compared with the teaching staff or researchers. But the new demand of the reformed rural people has endowed a completely new concept to the term "Extension", and only the most capable, most active and best informed persons could handle such a job.

And third, financial support for Extension is required. The involvement of agricultural colleges and universities in Extension can assist in the development of agriculture and the local economy, but the expense of their Extension activities needs financial support. And from where this support could come is a problem not yet solved.

### Some Suggestions for the Future

It is necessary that the agricultural colleges or universities take teaching, scientific research, Extension and development as a whole entity. Extension and development provide a bridge linking the university with the farmers and the rural area. The successful involvement of the
university in the local efforts, combining the agricultural education, research and Extension as a whole in assisting farmers and communities to achieve desired development, must depend upon the realization of the specialization of these functions within the universities. The experience of BAU in the last 10 years indicated that without a specialized Extension and development unit, there shall never be a breakthrough. After the establishment of CIAD of BAU in 1988, similar organizations were established in Hebei Agricultural University and other colleges and universities. It is suggested, therefore, that the National Education Committee and the Ministry of Agriculture could establish similar Extension service centers in a few selected agricultural colleges and universities, in cooperation with the various Extension organizations, to develop a better approach to provide services for agricultural and rural development.

The establishment of the Extension centers in agricultural universities should be based on the spirit of reform. Their work and the work of the local Extension services should be mutually complementary. Emphasis should be put on the integration of the results of scientific research of the university, so that programs could be adapted to local conditions and satisfy the different local demands, the consultation, training and information services.

It is suggested that the State Education Commission, the Ministry of Agriculture and the State Science and Technology Commission lend their support to the establishment of legislative-defined Extension districts with responsibility assigned to agricultural universities, colleges and research institutes. There are 66 agricultural colleges or universities and numerous agricultural schools in China. Pulling together, they will form a mighty force. If college responsibility for Extension districts could be legislatively defined and the problem of financial support solved by subsidies from land occupation tax, rural industries, tax on specific products, etc., then the work of Extension and rural development will be greatly strengthened. It is suggested that BAU could be the first experimental site of this new endeavor.

A university-technical school-agricultural middle school training system and a university-county-township-village information service, demonstration and Extension system should be established. This will develop gradually into a Chinese type of university-involved integrated agriculture-science-education entity.