

# Extension Education Methods

## Current Status of Agricultural Extension in China

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**SUMMARY.** Information on the history, legislative background, and current five levels (national, provincial, county, municipal, and township level) of the agricultural extension system in China are presented herein. In addition to the five levels, there are also six administrative agencies involved: Ministry of Agriculture, State Forestry Administration, Ministry of Science and Technology, Ministry of Education, National Agriculture Leadership Working Group, and National Development and Reform Commission. An example (Zhongfang Township, City of Luoyuan, Fuzhou County, Fujian Province) is given to illustrate the intricate network of the agricultural extension system. Major problems of the Chinese extension system include a complex and inefficient extension network, disconnection between the extension service and stakeholders' needs, and a "two-boss" dilemma for most extension agencies. However, some current success stories in Chinese agricultural extension may be applicable or provide useful tips to other countries including the United States.

Agricultural extension in China provides technology and applications related to all processes during agriculture production through experimentation, demonstration, training, and consulting (Yu, 2009). Agricultural extension worldwide functions as a bridge between research, government agencies, and farmers. In China, extension plays a similar role in vital agricultural development. The agricultural extension system is an integral part of the

national agricultural support and protection system and the agricultural social service system, which support a national strategy of developing agriculture through advances in science and technology. This paper describes the history of agricultural extension in China, the legislative background of the agricultural extension system, and the five levels within the current system, which is different from the American counterpart. Challenges within the current agricultural extension system in China are analyzed. Some challenges are not unique in Chinese agricultural extension system, and some solutions may be applicable to the 102-year-old American system, which is facing its own challenges (Henning et al., 2014).

## History of agricultural extension in China

Agricultural extension in China can be dated back to Qin dynasty (221–207 BCE) and Han dynasty (220–202 BCE), when positions called "Farming Advisor" were created within central and local governments. These advisors were created to provide technical support to farmers through demonstration, training, and outreach. Agricultural extension developed quickly after the establishment of the People's Republic of China in 1949, partly due to the rapid population increase after World War II and the civil war, low agricultural productivity, and natural disasters. The central government passed the Agricultural Technology Extension Act in 1953 (similar to the Smith-Lever Act of 1914 in the United States) to establish an agricultural extension system and form a network centered around technical information providers (Rong et al., 2012).

## Legislative background

Law of the People's Republic of China on the Popularization of Agricultural Technology (the law) set the legislative foundation for agricultural extension. It was passed at the second Session of the Eighth National People's Congress on 2 July 1993, and was amended in accordance with the Decision on Amending the Law of the People's Republic of China on the Popularization of Agricultural Technology passed at the 28th session of the Standing Committee of the Eleventh National People's Congress of the People's Republic of China on 31 Aug. 2012 (Xinhua News Agency, 2012).

The law was established with several objectives in mind: strengthen agricultural extension, promote technology transfer of agriculture research, strengthen the technological support system, promote agriculture and sustainable economic development of rural areas, and to achieve modernization of agriculture. "Popularization" in the title of the law refers to extension and outreach. "Agriculture technology" in the law refers to "research and technology that is applicable in crop production, forestry, animal husbandry, and fishery, including but not limited to, breeding, cultivation, fertility

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management, management of plant and animal diseases and insects, post-harvest, packaging, storage and shipping of agricultural products, quality and safety of agricultural products, agricultural hydrology, soil improvement and natural resource conservation, agricultural mechanics, aerospace, meteorology and information technology in agriculture, disaster prevention and relief, ecosystem protection, and energy development and utilization in rural areas.” The law requires the central government to increase financial input in agricultural extension and local governments to set aside budgets for agricultural extension with an expectation of annual increases. Previous (traditional) agricultural extension, in a narrow sense, aimed at only increasing agricultural productivity through adopting production technology, while current agricultural extension expands to more diverse topics such as financial stability of rural areas and environmental protection. For example, nutritional values of crops and financial feasibility have not been a focus for traditional extension, but would be under the current extension systems.

### Five levels of agricultural extension systems

There are five levels of agricultural extension in China: national, provincial, county, municipal, and township levels (Wang, 2011). The majority of agricultural extension is associated with the China Ministry of Agriculture [with an emphasis on food and fibers; the counterpart of U.S. Department of Agriculture (USDA) in China]. In addition, there are agricultural extension components within the State Forestry Administration (with an emphasis on forestry-related crops including woody ornamental crops; the counterpart of U.S. Forest Service in China), Ministry of Education, Ministry of Science and Technology, the National Agriculture Leadership Working Group (consisting of leaders from ministries or similar agencies associated with different aspects of rural areas), and the National Development and Reform Commission, which all have respective counterparts at various local levels too (Fig. 1). These agencies at the central

government (national) level provide resource and program support to the provincial agencies.

At the central government level, the China Academy of Agricultural Sciences is administered by the Ministry of Agriculture, and the China Academy of Forestry Sciences by the State Forestry Administration. The two academies are similar to USDA Agricultural Research Service in Washington, DC, metropolitan area, focusing on research on food and fiber, and forestry-related crops (including woody ornamental crops), respectively, and have both increased integration of extension outreach in their projects and programming in recent years. Institutes of New Rural Development are coestablished and coadministered by the Ministry of Education and the Ministry of Science and Technology, and often housed within universities administered by either the Ministry of Education or the provincial government.

Under the administration of a provincial government, agencies involved with agricultural extension include the Department of Agriculture, the Department of Forestry, the Department of Science and Technology, the Department of Education, the provincial Agriculture Leadership Working Group, and the provincial Development and Reform Commission. All these provincial agencies provide resource and program support to farmers and agriculture enterprises (stakeholders) directly, and to Institutes of New Rural Development housed in provincial universities, which conduct technology transfer to stakeholders directly. In addition, there is a provincial Academy of Agricultural Sciences, and a provincial Academy of Forestry Sciences. Provincial universities alone or with collaboration from agriculture enterprises can apply for integrated research and extension grants from both national and provincial agencies. Normally, the provincial Academies of Agricultural Sciences and Academies of Forestry Sciences apply for grants available from provincial agencies and their national counterparts. However, the Ministry of Agriculture does not fund proposals from provincial Academies of Forestry Sciences, and the State Forestry Administration does not fund proposals from provincial Academies of Agricultural Sciences,

as agriculture and forestry are two separate systems.

Within county and municipal governments, agencies involved with agricultural extension include the Bureau of Agriculture, the Bureau of Forestry, the Bureau of Science and Technology, the county and municipal Agriculture Leadership Working Group, and the county and municipal Development and Reform Commission. The county Institute of Agricultural Sciences is administered by the county Bureau of Agriculture, and the county Institute of Forestry Sciences (if there is one) by the county Bureau of Forestry. In some counties, there is a county Institute of Agricultural and Forestry Sciences administered by the county Bureau of Agriculture. There is no municipal- or township-level institute of agriculture or forestry sciences. Faculty in the county Institute of Agricultural Sciences and Institute of Forestry Sciences have more responsibilities for extension outreach to stakeholders and less research requirements, compared with their peers in provincial academies.

At the township level, agencies involved with agricultural extension include local Agricultural Extension offices and Forestry Extension offices, which are under administration of the municipal Bureau of Agriculture and municipal Bureau of Forestry, respectively. The local Agricultural Extension offices and Forestry Extension offices conduct outreach directly to stakeholders. However, local Agricultural Extension offices and Forestry Extension offices do not interact with each other in extension outreach. Generally, funding for most agriculture-related programs is provided by the provincial agencies. Stakeholders can apply for projects and grants from the local government agencies, which are then reviewed by corresponding agencies of each upper level, and eventually reviewed by the provincial agencies.

Zhongfang Township, City of Luoyuan, Fuzhou County, Fujian Province, is a good example of the Ministry of Agriculture extension system. A population of  $\approx 25,000$  resides in a land area of 141 km<sup>2</sup> (54.4 mile<sup>2</sup>) in Zhongfang and major agriculture crops include rice (*Oryza sativa*), sweetpotato (*Ipomoea batatas*), and tea (*Camellia sinensis*)

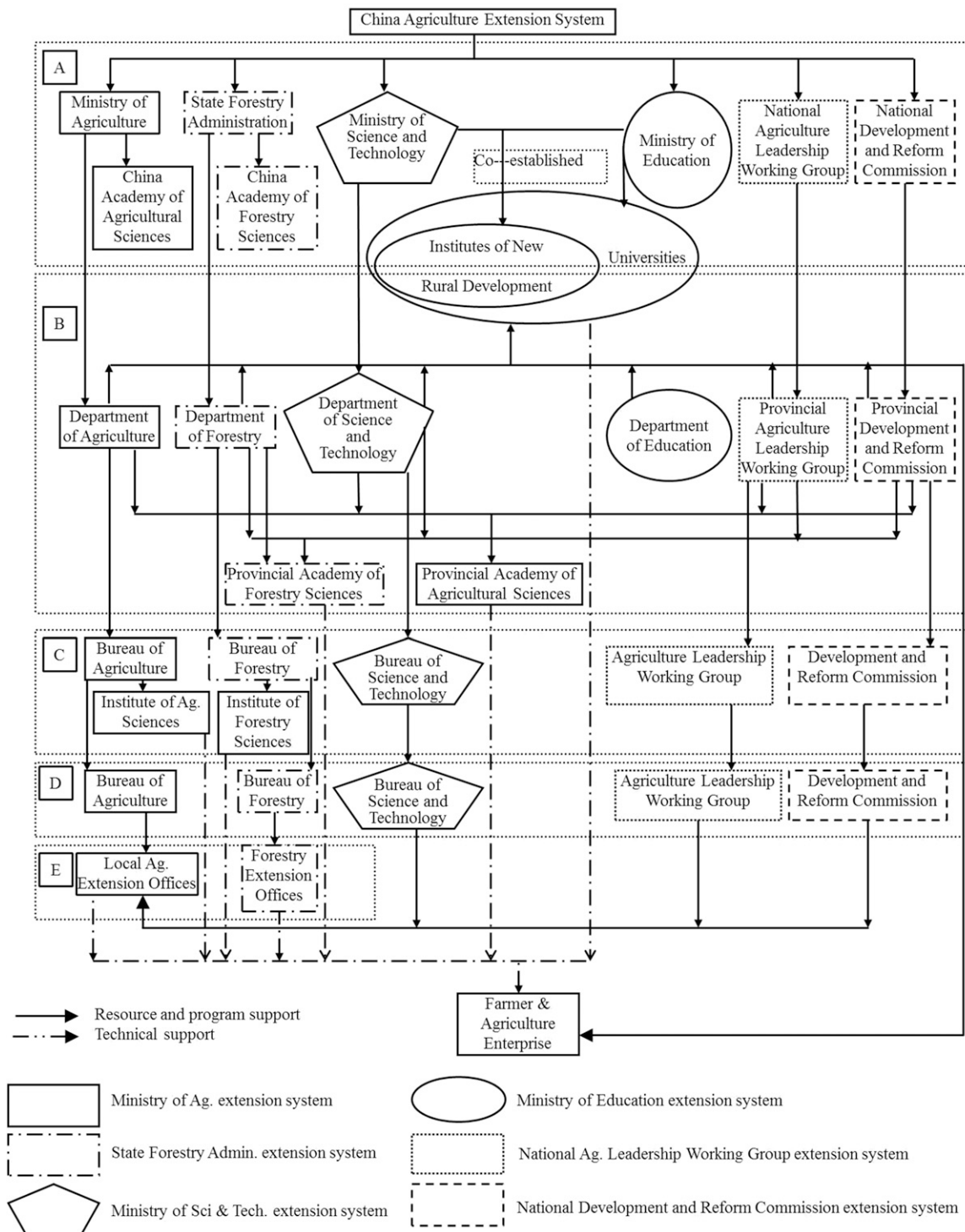


Fig. 1. Five levels [(A) Central Government, (B) Provincial Government, (C) County Government, (D) Municipal Government, and (E) Township Government] and six sectors of agricultural extension systems led by the China Ministry of Agriculture, the State Forestry Administration, Ministry of Education, Ministry of Science and Technology, the National Agriculture Leadership Working Group, and the National Development and Reform Commission.

(Committee of Chronicle of Fuzhou, 2016). The humid subtropical climate in Zhongfang features hot humid summers and mild winters, and the annual precipitation is over 2000 mm (78.7 inches). The National Agricultural Extension Service

Center in the Ministry of Agriculture provides resource and program support to the Office of Science and Technology in the Department of Agriculture in all provinces, including Fujian Province. Such resource and program support will then be

provided directly to stakeholders, or flow through Fuzhou Agricultural Extension Center (part of Fuzhou Bureau of Agriculture), Luoyuan Municipal Agricultural Extension Station (part of Luoyuan Municipal Bureau of Agriculture), and Zhongfang

Agricultural Extension Office (ZAEO), reaching stakeholders eventually. Luoyuan Municipal Bureau of Agriculture (providing extension agents) and Zhongfang Township Government (providing office space) cosponsor ZAEO, and such operation is very similar to the county extension office relationship between a county and a land-grant institution in the United States. A bachelor's degree is often a requirement for being an extension agent in ZAEO. With resource and program support from Fujian Provincial Department of Agriculture and Fuzhou Bureau of Agriculture, respectively, Fujian Academy of Agricultural Sciences and Fuzhou Institute of Agricultural Sciences provide technical support to the stakeholders. Advanced degrees are often required for extension personnel in Fuzhou Institute of Agricultural Sciences and Fujian Academy of Agricultural Sciences, where faculty (similar to an "Extension Specialist" or a "Program Specialist" in the United States) may work with agents in ZAEO, and provide more in-depth training and technical support to stakeholders. For example, Qingsen Wang, a tea specialist in Fujian Academy of Agricultural Sciences, worked at ZAEO between 1997 and 1998, providing consultation to local farmers on sustainable tea production (China Science and Technology Innovation Net, 2016). Another example is that Yueping Jiang, Director of Luoyuan Municipal Agricultural Extension Station, selected 'Rongchunzao', an early tea cultivar, with assistance from Fuzhou Institute of Agricultural Sciences, Fujian Academy of Agricultural Sciences, and Fujian Agriculture and Forestry University (Fujian General Union, 2016). 'Rongchunzao' has been adopted by many tea farmers in many areas including Zhongfang. However, economic value of such extension efforts often is hard to quantify.

The State Forestry Administration agricultural extension system is very similar to that of the Ministry of Agriculture, but with a focus on forestry-related (including woody ornamental crops) agricultural sectors. The forestry sector is much smaller compared with the other agriculture sectors. Depending on the size of the forestry sector, the forestry agencies may not exist at the provincial,

county, municipal or township level, or be combined with the agriculture agencies.

The Ministry of Science and Technology agricultural extension system is carried out mainly through the Spark Plan, and supplemented with the Special Sci-tech Commissioners (SSCs) System and the Enriching Farmers/Strengthen Municipalities Special Projects. The Spark Plan aims to improve rural economic development through science and technology (e.g., information technology and commercialization of agricultural technology). China Rural Technology Development Center (part of the Ministry of Science and Technology) implements the Spark Plan through the Office of Spark and Information. It is administered at the national, provincial, county and municipal levels, which provide resource and program support to the stakeholders. The Office of Poverty Alleviation via Science and Technology Outreach sends SSCs to work in local Sci-Tech Offices, and to bring funds and projects, in addition to technical support, to directly serve stakeholders in rural areas. The SSCs System was adopted by the Ministry of Science and Technology in 1999 when Nanping County in Fujian Province had success in exploring an innovative way to promote agricultural extension. The SSCs are evaluated on their specific tasks and allowed to financially benefit from technology transfer (Zhang and Zhang, 2013). The local Sci-Tech Office has administered the Enriching Farmers/Strengthening Municipalities Special Projects since 2005. Priorities are given to mid and west China and underdeveloped areas in east China. Backed by science and technology, the Special Projects aim to promote municipal and regional economic development by cultivating and strengthening pillar industries with local advantages, which could be scaled up to benefit more areas in the region. In Zhejiang, a province with almost 55 million people in east China, the SSCs System was initiated in 2003 (Ministry of Science and Technology, 2016). The SSCs were working in 1279 townships, having significant impact on the local economy and being called favorably "Forever SSCs" by local farmers. The SSCs implemented 8381 programs and projects, and trained farmers

with over 6.7 million contact hours. With technical assistance from SSCs, 186 agriculture enterprises established their own research and development department, and 934 new enterprises were started, which created over 2 million employment opportunities. The main reason that these SSCs are "forever" (i.e., their willingness to stay in rural areas) was believed to be financial incentives.

The National Agriculture Leadership Working Group and the National Development and Reform Commission within the central government provide leadership to their counterparts in provincial governments. They provide resource and program support to provincial Academy of Agricultural Sciences and Academy of Forestry Sciences, and leadership to the Agriculture Leadership Working Group and the Development and Reform Commission in each county. The municipal Agriculture Leadership Working Group and Development and Reform Commission are the local agencies providing funding and projects to Agricultural Extension office in townships, with approval from their higher level counterparts, respectively.

Different aspects of extension (outreach, education, and science and technology) are carried out by agriculture and forestry agencies, education agencies, and science and technology agencies from the national level to the township level. Upper level agencies carry out their extension function by providing projects and funding to lower level agencies, universities and institutions. Agriculture enterprises alone or with collaboration from universities or institutions can apply for grants available at different levels for research and extension projects. Although agricultural extension involves many agencies, the Ministry of Agriculture system (from the national to the township level) carries out the main agricultural extension outreach.

### **Challenges within the current agricultural extension**

Currently, there are  $\approx$ 6000 to 7000 innovations in agriculture technology and application in China every year (not including introduction of technology from abroad), but only 30% to 40% of which were used through extension, compared with

70% to 80% in developed countries (Qin, 2009). Innovation is needed to improve efficiency of agricultural extension in China. There are three main problems with the current system of agricultural extension in China: 1) too many agencies and an inefficient extension outcome, 2) a disconnection between service and demand (Nie and Hao, 2007), and 3) a “two-boss” dilemma for most extension agencies.

In contrast to the Cooperative Extension Service system in the United States, agricultural extension in China involves as many as six agency systems at as many as five levels. Each system has its own program evaluation, which has resulted in competition over funding and resources, instead of collaboration, and a loss of overall efficiency in agricultural extension (Mei et al., 2013). Four of the six agency systems (Ministry of Education, Ministry of Science and Technology, the National Agriculture Leadership Working Group, and the National Development and Reform Commission) do not have administration structure at the township level, and rely on the local Agricultural Extension offices to carry out their extension tasks or plans. Stakeholders could potentially receive multiple financial assistances (e.g., grants and cost share reimbursements) from different agencies; however, navigating the funding sources could be confusing, and resource and funding from the central government may be better used if they had been funneled only through the two agencies directly related to agriculture (Ministry of Agriculture and State Forestry Administration), as it is being done in the United States.

The disconnection between service and demand in agricultural extension has both historical and contemporary roots. As illustrated in Fig. 1, the whole agricultural extension system in China reflects a historical planned economy structure, where extension programs are “planned” by upper administrations and directed to the lower levels and eventually reach the stakeholders, instead of a market economy structure, where extension programs are driven by stakeholders’ needs (“market”). Initiation, research and extension, and evaluation of agriculture projects

lack stakeholders’ participation. The more recent cause of such disconnection lies in the demand of “scholarly activities” on faculty in universities and aforementioned agricultural institutions. The “scholarly activities” is very similar to what is required for a faculty’s (with a 100% research component) promotion and tenure package in the United States, such as peer-viewed publications and grant funding. The demand of “scholarly activities” culminates with a pursuit of publications in journals with the highest impact factor possible without consideration of the research field of each faculty. Outreach and service are not essential and only “good-to-haves” in faculty evaluations. Faculty have little incentive to reach out to stakeholders for inputs. Even as some recent funding programs may mandate an extension component (similar to “integrated projects” in USDA grant programs), faculty have little experience in how to interact with stakeholders. As a result, extension is not providing technology needed by stakeholders, and stakeholders do not always use the technology and information provided by extension (Wang et al., 2013). Faculty often complain that many farmers came to the extension events solely for the door prizes or would only attend such events if getting paid. The disconnection between service and demand in agricultural extension may be alleviated through training or selecting faculty for outreach capability, having different expectation for scholarly activities from extension faculty and getting stakeholders involved from project initiation. In Huzhou, Zhejiang Province, where a selected number of faculty from Zhejiang University and other institutions are appointed as extension faculty based on their interest and outreach capability, and stakeholders are involved in their reappointment, a significant number of agricultural agents (>200) have been trained, and 179 new cultivars (mainly vegetables) have been trialed or adopted since 2009 (Ministry of Agriculture, 2016). In 2014, the value was \$2.4 billion (RMB 16.1 billion) for the top five agriculture sectors (aquaculture, vegetable, tea, fruits, and livestock) in Huzhou.

All the agencies involved in agricultural extension, except the ones at the national level, have

“two bosses”—one is the local level (provincial, county, municipal or township) government controlling personnel budgets and resources at the local level, and the other one is the upper level agency within one of the six agency systems providing resource and program support. Such “two bosses” dilemma faced by faculty in agricultural institutions is mainly caused by requirements of two different funding sources, one requiring “scholarly activities” and the other one outreach. Extension faculty would likely put more effort in outreach if that is more highly valued. Extension personnel at the municipal and township level, although with significantly more extension and less (or no) research appointment than faculty in agricultural institutions, have to answer to local government administration and therefore have less time and effort to focus on their extension duties (Chen, 2011). While interacting with the local government administration is important, extension personnel spending more time on professional development could potentially better serve their stakeholders. When one of the two bosses, preferably the one providing resource and program support, provides a major role in performance evaluation, extension personnel put more effort into serving stakeholders. The recent successful implementation of SSCs System (Ministry of Science and Technology, 2016) in Zhejiang Province and close collaboration between university faculty and local stakeholders (Ministry of Agriculture, 2016) may have provided answer to such “two bosses” dilemma and could be adopted by other areas.

## Conclusion

The Agricultural Technology Extension Act passed in 1953, 39 years after the Smith–Lever Act of 1914 that established the Cooperative Extension System in cooperation with state and county governments and land-grant universities. However, the passage of the act was preceded by the Second Sino–Japanese War (1937–45) and the Chinese Civil War (1945–49) and followed by the Great Leap Forward Famine (1958–61) and the Culture Revolution (1966–76). Little development occurred in agricultural extension in

China in the four decades following the passage of the act.

The Chinese central government has increasingly realized the importance of agricultural extension, as evidenced by the Law of the People's Republic of China on the Popularization of Agricultural Technology passed in 1993, when development of agricultural extension started in China. The Chinese 23-year-old extension system is much younger than the 102-year-old American system. The government at different levels is constantly trying to improve the system. For example, the law passed in 1993 was amended recently in 2012 and the Ministry of Science and Technology adopted the Special Sci-Tech Commissioners System after its success in Nanping County in Fujian Province. Governments at various levels in China are also exploring the pros and cons of the agricultural extension system in the other countries to better serve their stakeholders (W. Zhou and K. Yuan, personal communication). The examples of success stories at local levels in Chinese agricultural extension may be applicable or provide useful tips to other countries including the United States.

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