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Regional Impacts of Public Spending on Food Security and Poverty Reduction in China

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Proposal

"Regional Impacts of Public Spending on Food Security and Poverty Reduction in China"

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1.   Abstract (100 to 250 words)

Despite China made great achievement in food security and poverty reduction in the past three decades, with the population growth, more grain will be required to satisfy the grain food demand growth. And more and more grain was used for industrial processing and feed. Grain has extended to other sectors, and has multi downstream and upstream linkages with livestock and industry. Another challenge is the large food consumption and income gaps among the different regions and households. The situation of gain production and transportation changed from the north from the south to the south from north during recent years. Regional uncertainties with food security and poverty also are still a factor of national and international concerns. In the recent years, Chinese government has been attentive to the problems of uneven regional development and income inequality. China has made a regional development strategy and increased public investments to promote regional economy with an attempt to narrow the gaps among different regions and households. Various forms of public investments have differential effects on economy growth, food security and poverty reduction. To evaluate the impacts of those public investments on the regional food security and on the welfare of households, we plan to construct a four-region (Eastern, Western, Northeast, and Central region) dynamic computable general equilibrium model (DCGE) for China. We will use the model to assess effects of different kinds of public investments in different regions, and to explore who and which region will benefit more from which types of public spending, and answer which types of public investment will be more effective in ensuring regional food security and poverty reduction.

2.   Main Research Questions and Core Research Objectives

The world has been experiencing food, financial, and energy crises in the recent years. The Food and Agricultural Organization (FAO) projects the number of undernourished people in the developing world to have increased from 848 million in 2003-05 to 1,020 million in 2009 (FAO 2008; FAO 2009).   China has achieved great success in food self-sufficiency since its reforms started in 1978. From the period from 1978 to 2008, grain output was substantially

increased from 305 million ton to 528 million tons in 2008, while per capita grain availability was increased from 319 kg in 1978 to 399 kg in 2008 respectively. Self-sufficiency ratio was more than 99% in the recent years for major grains. China was only modestly impacted by the food, financial, and energy crises. However, there were still about 9% population of undernourished in 2003-05, 6% prevalence of underweight in children under five years in 2002-07 and 2.2% mortality of under five in China in 2007 (IFPRI 2009). Despite the fact that most of people have access to basic food item, there are large disparities among different households and different regions. In particular, per capita food consumption expenditure of urban households was 2.67 times of that of rural households. Per capita food consumption expenditure of the richest deciles group of urban households was 4.2 times of the poorest five percentage group (Appendix Table1). Economic development is at very different stages cross regions in China. Per capita GDP in eastern region was 2.5 times of western region in 2008. Per capita food consumption by households in Eastern region was about 1.5 times of those in western region. With the population growth, more grain will be required to satisfy the grain food demand growth. And at the same time, more and more grain was used for industrial processing and feed. For example, the amount of industrial use of corn was doubled from 10.5 mmt in 2001 to 20 mmt in 2004 and doubled again in 2006 and reached to 40 mmt. About one–fourth of China's corn enters industrial processing, which yields hundreds of food, feed, alcohol and chemical products (Fred Gale et al, 2009). National Grain Bureau (2009) also showed near 20mmt corn was used for feed, and both industrial and feed use of wheat were about 10mmt in 2008. This means grain has extended to other sectors, and has multi downstream and upstream linkages with livestock and industry. China's food security is challenged by several anthropogenic, socio political and policy factors, including: population growth; urbanization and industrialization; land use changes and water scarcity; income growth and nutritional transition; and turbulence in global energy and food markets (Khan et. al. 2009).

In terms of poverty, there were about 260 million poor people at the beginning of reform in 1978 and incidence of poverty was as high as 33%. After about 30 year's development, only about 14 million poor people and the incidence of poverty was only 1.6%

in 2007. At the same time, near 70% of poor people lived in western area and its incidence of poverty was more than double of the national average level at 3.5%, and about one fourth people live in central region. In eastern and northeast areas, only one million are counted as poor in total and their poverty incidences were 0.2% and 1.1%, respectively, in 2007. Table 2 in appendix shows the detail of regional population under poverty and regional distribution and poverty incidence from 2000-07. New poverty line was adjusted upwards to 1,067 yuan per capita in2008 and 1,196 in 2009, and the poverty population were about 43 million people in 2007 and 40 million in 2008. However, by the international poverty line defined at less than $1.25 per day, the number of poverty population was still about 254 million poor people in 2005 and was the second largest country in the world (The World Bank 2009). China still has a long way to eliminate the poverty.

Food security and poverty reduction are of high priority on the Chinese political agenda. All levels of Governments have taken many measures and increased fiscal expenditure on agriculture to increase grain production. The total expenditure to support agricultural and rural development was about 200 billion *Yuan* in 2003, but increased rapidly and reached 600 billion *Yuan* in 2008, up 37% over 2007. The level could reach 720 billion in 2009.   The average annual nominal growth rate of the total expenditure to support agriculture was about 22% during the period from 2003-09 (in Appendix Figure 1). Many measures were taken to increase personal incomes and boost consumption. The main measures were enhancing public infrastructure investment, agricultural subsidies, and the reforms of education, medical health, and social security. Public investments contributed significantly to agricultural growth, food security and poverty reduction through growth.

Despite the recent economic growth, the disparity of food consumption and poverty distribution among regions are also one of most significant problems in China. To promote balanced development among regions, four new regional [1] development strategies were bought

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1 Eastern region: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdogng and Hainan
Central region: Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan
Western region: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Shannxi, Gansu, Qinghai, Ningxia and Xinjiang
Northeast region: Liaoning, Jilin and Heilongjiang

forward in the Eleventh Five-Year Plan 2006-2010, including overall western development strategy, rejuvenation of northeast China and other old industrial bases, the rise of the central region, and the eastern region to lead the country in western development. Chinese government also improves the mechanism of regional activity linkage. For example, a number of major construction projects of railway were launched. Various ways were taken to assist and stimulate the development of less developed regions. More support to accelerate economic and social development in old revolutionary base areas, ethnic minority regions, border areas, and poor areas and more aid to poor people. Public investment is one of major tools to support regional development. Modern agriculture, in particular commercial grain bases in major grain-producing areas of central and northeast regions are also emphasized.

In the recent years, CGE model were applied to assess the impacts of public investment on economy for its advantages to capture both direct and indirect economy-wide effects, and to reduce the bias ignored by the partial equilibrium model or econometrics method. We plan to develop four-region dynamic computable general equilibrium model (DCGE) to capture the linkages of food sectors and other sectors, and assess the overall impacts of public investments on regional food security and poverty reduction in China.

Three research questions are as follows:

1) To evaluate the medium and long run effects of different types of public investments to food security and poverty reduction in different regions.

2) To assess the medium and long run impacts of different types of public investments on the welfare of different types of household.

3) To compare the effects and efficiency to economy growth and food production of different public investments in different regions and to identify public investment or policy of pro-poor or less developed regions, and narrow the gaps of households and regions.

3.   Scientific contribution of the research

There are extensive literatures on the impact of public policies on poverty and food security. The paper reviewed below by no means are exclusive but serves a purpose of summarizing key findings in the relevant literature.

Literature on the effects of public spending on food security and poverty reduction in China: Many studies concluded that rural infrastructure investment could contribute to significant reductions in rural poverty. Freeing people from hunger will require more and better-targeted investments, innovations, and policy actions, driven by a keen understanding of the dynamic risks and forces that shape the factors affecting people's access to food and the links with nutrition, national governments and the international community must assume a new focus on agricultural growth and rural development, along with increasing their investments in education, social services, and health (von Braun et al., 2005). Fan et. al.（2002，2004）analyzed the impacts channel of public investments and evaluated the effects of public investments and compared the priorities of different types of public investments using econometric method. Their results showed that various kinds of government expenditures played an important role of improving productivity growth and reducing poverty. However, their effects were different among different regions, less developed western region with highest poverty-reducing return, while more developed central and eastern region with highest return from agricultural production growth. Fan and Connie (2008) estimated the impact of road investments on overall and rural and urban economic growth, and rural and urban poverty reduction. Gao and Li (2006) constructed a computable general equilibrium (CGE) model and analyzed the implications of infrastructure on poverty reduction in rural China in both short-term and a long-term. They find that reducing the transfer cost and promoting the employment in urban areas of rural labour are the key approaches through which infrastructure makes contributions to poverty reduction.

Zhu (2003) analyzed grain consumption and food security in less-favoured regions in China, and showed that food consumption level was positively related to their income and purchasing power; and that the expansion of grain area percentage, increase farmers' income to enhance food security for these disadvantageous group of people. Zhu (2004) mentioned that China moved away from many of its past measures and explored alternative policy tools

to strengthen domestic grain production. , She found that increasing public investment in agricultural research would bring about higher output in a cost effective manner, and increasing public investment in agricultural R&D should be considered with high priority in the future to be utilized as a policy tool to enhance long-term food security. Chan-Kang *et. al.* (2003) showed that the total number of rural poor lifted above the poverty line added up to nearly 39 million from 1982 to 1998 as a result of the productivity gains from adopting improved wheat varieties. Huang and Rozelle (2009) concluded that investment in agricultural R&D could best protect its future agricultural and food security in China.

Literature on assessing impact of public investment using CGE model: The impacts of public investments go beyond the targeted sector or economy development objectives. In the recent years, CGE model were applied to assess the public investment for its advantages to capture the direct and indirect economy wide effects, and reduce the bias ignored by the partial equilibrium model or econometrics method. de Janvry et al. (2002) analyzed the direct and indirect impacts of agricultural technology to the world poverty through CGE model, and found agricultural technology was helpful to reduce poverty through the direct return from adopting new technology and cheaper food and employment opportunities and other growth linkages. Breisinger (2006) constructed a dynamic CGE model for Vietnam and analyzed the impacts of infrastructure investment large scale hydropower dam on growth and poverty. Fan *et. al.* (2006) evaluated multi-level impacts of public investment on economy growth and poverty reduction in Egypt from household, regional and macro aspects, and using CGE model to simulate the impacts of different portfolio of food subsidy and cash transform and compare the investment efficiency of different scenarios. Thurlow *et. al.* (2007) used regional dynamic CGE model to analyze the effects of rural public investment, including irrigation, road, research and extension to each region in Kenya. Lofgren and Robinson (2008) explored the direct and indirect effects of public spending on long-run growth, economic performance and poverty alleviation in an archetype Sub-Saharan Africa SSA country using a dynamic CGE model, and compare the investment on agriculture, transportation, human capital and defence. Giesecke *et. al.* (2004) uses a dynamic multi-regional CGE model (MMRF) to

evaluate the regional macroeconomic consequences of four alternative methods(developer charges, payroll tax, government debt, and residential rates) of financing an expansion in state government spending on public infrastructure, demonstrates that the total gains from urban infrastructure are quite sensitive to the means chosen by government to finance infrastructure investment and confirms that the services provided by public infrastructure can have significant impacts on the regional macro economy.

Literature on regional CGE model applied in China: CGE model was introduced to Chinese researchers during 1990's and has then been applied to examine the economic wide effects of many national policies in China. However there were limitations on the model and data. Most CGE models for China are national and there are few regional CGE models in China. Hu (2002) carried out an analysis on income gap and rural urban migration by a spatial general equilibrium model. His model consists of three regions, coast region, interior region, and the rest of China. Diao *et. al.* (2003) constructs a regional CGE model of China to analyze the impact of China's WTO accession on rural households' income, they separated the production of agriculture sectors into several regions in the national SAM. Li and He (2005) constructed a three regions CGE including Guangdong, Shanxi and rest of China and was applied to analyze the impacts of trade and environmental policy on human health and preferably other environmental end-points like crop damage and material damage. Wang *et. al.* (2006) analyzed the problem of regional development in China focusing on wage and income disparities between regions by using a regional linked CGE model with 30 regions and seven sectors, and also investigated the impacts of government investment policies favouring western provinces. Wittwer and Horridge (2007, 2008, 2009) constructed a multi-regional computable general equilibrium model of China named Sino TERM model and updated it and disaggregated agriculture sectors, and used the model to analyze the impacts of Chongqing-Lichuan rail link construction project on regional economy and examine the impacts of productivity growth in different agricultural sectors in China. The model was based on Australia TERM and provided input-output data for 131 sectors in 31 provinces and municipalities using a top-down method. Li *et. al.* (2009) constructed a static eight-region CGE model using an interregional input-output table for China and their results showed the

specifications of the regional differences and key linkages have significant influence on policy analysis.

It is clear that there are rich studies on public spending on food security and poverty reduction, and CGE model is one proper approach to assess their economy-wide effects. There are still significant knowledge gaps. Most of studies focus on national level, not regional level food security and poverty reduction. The partial equilibrium analysis of public spending on food security and poverty reduction were built, but the general equilibrium effects analysis are few in China. In particular, though there are few studies on the general equilibrium analysis of specific public policies, there is no systematic assessment and priority setting of various types of public spending using general equilibrium model at national or regional level in China. This is serious shortcoming as government investment in rural areas affects not only the agricultural sector and rural areas, but also other sectors and urban areas. Ignoring these impacts severely underestimates the overall impact of public investment on poverty. This proposed research plans to build regional CGE model and applies it to assess the impacts of public spending from regional perspective. Moreover, there is little understanding on: 1) the medium and long run returns to public spending on food security and poverty reduction; 2) the medium and long run impacts of public spending on regional food security; and 3) The medium and long run impacts of public spending on household welfare of different income levels.

The proposed research would make two specific contributions, including 1) construction of a four-regions dynamical CGE model for China with detailed agricultural subsectors and household types according the new regional development strategies in China and 2) building the linkages of different types of public spending and CGE model such as agricultural subsidies, road, irrigation, rural education and other investment and assess their effects on food production and households' food consumption of different income levels.

4. Policy relevance

A round table policy discussion was held in March with key policy makers from different ministries, including the Institute of Macroeconomic Research of National

Development and Reform Commission (NDRC), the Office of Western Development from the NDRC, Department of Market and Trade from the Ministry of Agriculture (MoA), Department of Policy and Regulation from the MoA, and Department of Rural Economy from the Development Research Center under the State Council. Two meetings were also held with International Center for Poverty Alleviation of the National Office of Poverty Alleviation and Rural Economic Research Center from the MOA. The discussion made it clear that there is lack of quantitative economic wide assessment of various public policies and therefore lack of understanding on the priorities of government investment from both national and regional perspectives. This has inhabited science-based design of public policies aimed to improve the welfares of targeted regions and groups in the society.

Central Government has published several documents and plan to implement policies to promote regional development. Northeast region were added on three regions (eastern, central, and western). National policy "Opinions of promote rising central region" was released in May, 2006. National policy "the Eleventh Five Year Plan for western development" was released in March, 2007. National policy "Plan of Revitalizing Northeast China" was released in August, 2007. The Chinese government has clearly puts forward to continue to increase the investment in poverty reduction of less developed regions in China, and also strengthen the programs related to agriculture, rural areas and farmers. Many policies have been introduced to improve the equality of public services for rural and urban households in different regions. With the recent increasing various investments on rural areas, a policy challenge is having sound guideline to guide these regional public investments. A priority setting of these regional investments is essential. A regional CGE model will be served to address this challenge.

Chinese government implements pro agriculture, rural area and farmers policies and increase public spending in recent years and aims to increase farmers' income and improve food production capacity, including agricultural input subsidies and public investments. To enhance land productivity, resources utilization efficiency and labour productivity, northeast region set priorities of agricultural development, like increasing investment in irrigation and drainage facilities construction, transformation of low and middle yielding farmlands,

construction of large-scale agricultural and animal husbandry bases with high-quality products, public facilities of education, culture, healthcare, medical, etc, will also be strengthened. Central region is an important grain base, and always put agriculture on strategy. Central government also take many measures to inspire farmers to plant grain, and emphasize agricultural research and extension, and promote food processing industry. Central region is trying to realize the change from "Chinese granary" to "Chinese kitchen". Western region also improve the comprehensive grain productivity and adjust the agricultural structure, develop water-saving crop and increase land area of water-saving irrigation, and also promote characteristic agriculture. Some of preliminary types of public spending that we plan to look in this research, like irrigation, agricultural R&D, education and agricultural input subsidies and et al. The distributions of irrigation, agricultural R&D, education among areas are presented in appendix Figure 3. The structures of different type of public spending are obviously different in different regions.

5. Methodology

As an economy-wide, general equilibrium model, the dynamical CGE model is a proper tool for the purpose of this study because the model captures the economic inter-linkages across sectors. A static standard CGE model was developed by the International Food Policy Research Institute (IFPRI) and has been documented in Lofgren（2002). The recursive dynamic version of the CGE model is an extension of the static standard CGE model, which incorporate of a series of dynamic factors. The application of similar dynamic CGE models for other country case studies can be found in Thurlow (2004), Diao *et. al.* (2007) and Breisinger *et. al.* (2009). Similar to other CGE models, the DCGE model is a multi-sectoral general equilibrium model that captures economic activities on both the supply and demand sides. On the supply side, the model has defined specific production functions for each economic activity, which is often called production sector in the model. As in any other quantitative economic analysis, certain assumptions have to be applied before calibrating the model to the data. In a typical CGE model, a constant return to scale technology with constant elasticity of substitution CES between primary inputs is fundamentally a necessary

assumption in order for the model to have a general equilibrium solution. However, as both primary and intermediate inputs are considered in the production functions of a CGE model, a Leontief technology with fixed input-output coefficients is often assumed for intermediate inputs as well as for the relationship between intermediates and primary inputs in aggregation. The demand side of the CGE model is dominated by a series of consumer demand functions. In the current model, the system of consumer demand functions is solved from maximizing a Stone-Geary utility function in which the income elasticity is not necessarily one which differs from a Cobb-Douglas utility function, and hence, the marginal budget share for each consumer good departs from the average budget share of this good in consumers' total budget. As in any other general equilibrium model, consumers' income that enters the demand system is an endogenous variable. Income generated from the primary factors employed in the production process is the dominant income source for consumers, while incomes coming from abroad as remittance received or the government as direct transfers are also considered. The relationship between supply and demand has to be explicitly modeled in a CGE model, which determines the equilibrium prices in the domestic markets. Given that a CGE model also captures the trade flows --both import and export the relationship between domestic and international markets is also modeled explicitly. In general, the commodities produced or consumed in the domestic market are not perfectly substitutable for those going to or coming from international markets and price-sensitive substitution imperfect substitution between foreign goods and domestic products is assumed. The dynamics occur between two periods. Neither consumption smoothing, nor the inter-temporal investment and saving decisions are taken into account. Instead, private investment hence capital accumulation is determined by a Solow type of saving decision in which savings are proportional to income and not endogenously solved from a Ramsey type of inter-temporal utility function. The government is generally included in a CGE model as an institutional account. In the current model, the Chinese government collects taxes including tax revenue from domestic households and producers, export taxes, and import tariffs, transfers to households, and uses the rest either as investments or recurrent spending.

We had built one national DCGE model for China using the standard CGE model

developed by IFPRI (Diao *et. al.,* 2009). We constructed social accounting matrix SAM in the CGE model is 2005 and update it to 2007, which include 61 sectors. The DCGE model was applied to assess the impact of global recession and China's Stimulus Package. The main data was from 2005 extend Input and output table of 42 sectors from National Bureau of Statistics, but only include one sector of agriculture. To emphasize agricultural sub-sectors, we split agriculture into 20 agricultural sub sectors using the data of detail crop and livestock production, cost, consumption and trade.

To captures different agricultural production patterns and technologies at sub-national level, we plan to construct a multi regional dynamic CGE model based on our national dynamic CGE model, and also disaggregate rural and urban households by different levels of incomes. Workers in the model can migrate between sectors and regions, although agricultural family labour remains within regions. Capital is free to move across sectors and regions, and accumulation of capital is through investment financed by domestic savings and foreign inflows. Increased capital is allocated across sectors and regions according to their relative profitability. Incomes from factor employment accrue to different households, according to employment and wage data. Households are defined at the regional level. To capture the impacts of policies on poverty and the welfare of households, we will use various types of households for substituting due to lack of household survey data. As such we cannot use the usual approach to examine the poverty issues with a microsimulation module. We have to rely on the income and consumption data to infer poverty effect. According to China's statistical yearbooks, all urban households are grouped by per capita disposable income of the household and divide into groups of lowest income, low income, lower middle income, middle income, upper middle income, high income and highest income, each group consisting of 10%, 10%, 20%, 20%, 20%, 10% and 10% of all households respectively, and the lowest 5% of households are also referred to as poor households. Rural households are divided into five groups with average share of 20%, named low income, lower middle income, middle income, upper middle income and high income rural household group.

We will apply this model and design scenarios to simulate the impacts of different types of public spending on the regional economy development, food security and household

welfare. One of the challenges is to identify and classify various public spending into policy types and analyze the effects accordingly. Different linkages of public spending and CGE model will be built to evaluate their impacts on food security and poverty reduction. We will distinguish the impact channels of different types of public spending and choose the linkage of each type of public spending and CGE model. For example, the channels of agricultural subsidy are equal to negative activity tax, while road investment will reduce transport cost. Irrigation will enhance land productivity and agricultural R&D will improve the TFP. The channel on how specific types of public investments affect linkages will be based on the results in the literatures.

6. Data requirements and sources

The main data for the construction regional CGE model was social accounting matrix SAM and different kinds of elasticity and data for simulations. The essential data for SAM is input and output table. The latest available input and output table is 2005. As such we need data to update SAM into 2007/2008 and split agricultural subsectors and household types. Most data will be available from published statistical books which are detailed as follows:

1). Input-output tables at national level come from China input output table of 2005.

2). Data use for factor, household and enterprise, government account will be from China Statistical Yearbook, Statistical Yearbook for each provinces, fiscal statistical yearbook, and labour statistical yearbook.

3). Data for dividing agriculture sectors will be from rural statistical yearbook, agricultural statistical yearbook, and agricultural cost and revenue survey statistical yearbook.

4). Data for household types will be from the China and provincial statistical yearbook and rural and urban household survey.

5). Data for updating SAM will include the growth data of production growth and population and other main indicators.

6). Data for elasticity such as elasticity of substitution between domestic and imported goods in the Armington aggregation, elasticity of substitution between primary factors,

elasticity of substitution among imports from different destinations, elasticity of substitution between composite intermediate inputs and value-added, elasticity of transformation between domestic sales and exports will be from literature and experiences.

7). Data for simulations will be from statistical yearbooks published by ministries, like communication statistical yearbook, education statistical yearbook, R&D statistical yearbook and some key documents of governments and some assumptions.

7. Consultation and Dissemination Strategy

The team will carry out its research agenda by interacting with policymakers and collaborating closely with Chinese institutes and individuals at the national and provincial levels. During the course of the project, the team will seek a number of consultations with key policy makers from NDRC, MOA, DRC, and National Office of Poverty Reduction. The main purposes of these consultations are to ensure proper construction of the CGE model, to design appropriate policy scenarios to be examined using the CGE model, and to engage the potential policy makers in early stage of the project. The team will communicate its policy research findings through several channels as defined below:

1) A final report will be submitted to MPIA of PEP;

2) A policy brief will be written and submitted to relevant government agencies;

3) Seminar will be held with participants from governments, research institutes, universities, and media to disseminate the research findings of the project; and

4) One working paper and one journal article will be submitted to Scientific Journals for a consideration of publication.

8. List of team members

Kevin Zhigang Chen, Ph.D in agricultural economics from Canada, Director, International Centre for Agricultural & Rural Development, Institute of Agricultural Economics and Development (IAED), the CAAS. 47 year olds, worked with the IFPRI

researchers on building a national dynamic CGE model to examine the economic- wide impact of stimulus dealing with the financial crisis on agricultural and rural development.

Yumei Zhang, female, 31 year olds, Associate Research Fellow, Agricultural Information Institute, Chinese Academy of Agricultural Science. Hold Ph.D in agricultural economics. She constructed a national dynamical CGE model of 2005 for assessment the economy effects of R&D for different agricultural sub sectors in 2009 for Ph.D dissertation and one national China dynamical CGE model of 2007 and applied to analysis the effects of stimulus packages. She learned the CGE model and GAMS code from IFPRI in 2007, and mastered the general equilibrium theory and the skills of GAMS software.

Jintian Wang, male, 31 years old, Ph. D candidate, ICARD, IAED, Chinese Academy of Agricultural Science (CAAS), and also lecturer, Shandong University of Technology. His main research interest is application of quantitative methods in policy research.

Xinxin Wang, female, 24 years old, jointed Ph.D candidate, ICARD, CAAS and Zhejiang University. Her main interest is to learn how to construct CGE model for Chinese agriculture. She will be mainly involved with building up regional SAM.

9. Expected capacity building

Chinese Academy of Agricultural Sciences (CAAS) is China's national agricultural research organization directly affiliated to the Ministry of Agriculture. We expect to develop one regional dynamical CGE mode for China based on the IFPRI standard CGE model and apply it to analyze the medium and long run impacts of Chinese government policies, especially agricultural and rural policies, and provide scientific evidences for the government decision makers. As one of our flagship models, the model not only could be of great use in public investment decisions, but also could examine economic impacts of the global financial/food crisis, climate change/adaptation, and relevant global issues.

Most of our team members are young researchers who will improve their research abilities through the project, including general equilibrium theory and the method of mathematical programme, especially the techniques of building the regional activity linkage, regional trade matrix estimate, and SAM construction and balance, and the dynamical CGE

model. It is important to follow up the latest government policies and apply the CGE model to do relevant policy analysis. These activities will have great influence on their future research careers. It is anticipated that young researchers also can spread the model to their own institutes or universities, and help increase the use of CGE model and their applications.

The specific works for each team member are as follows:

1) Kevin Zhigang Chen, leader of the project, and specialize on the overall work of SAM construction and CGE model development, public spending policies, scenarios design, and report writing.

2) Yumei Zhang, specialize on SAM and DCGE Model and scenarios simulation, and report writing.

3) Jintian Wang, specialize on Input-Output table and national and regional policies of public spending.

4) Xinxin Wang, collect data and help to build regional SAM for the DCGE model.

10. Any ethical, social, gender or environmental issues or risks that should be noted.
No such risk in this project.

11. List of past, current or pending projects in related areas involving team members

In the past a year, lead researcher (Dr. Kevin Zhigang Chen) and member (Dr. Yumei Zhang) of this proposed project worked with researchers from the IFPRI (Dr. Xingshen Diao) to build a dynamic CGE model for China and to look at the economic wide impact of stimulus package on agricultural and rural development in China. The work was supported by the IFPRI. Dr. Chen and Dr. Zhang worked on the grass root level impact of public policies in rural Guizhou and Gansu as well. The work was supported by the National Science Foundation of China. Dr. Zhang also worked on examining the national wide impact of agricultural R&D using the national dynamic CGE model. The work was supported by the CAAS.

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Appendix

Table1 Regional economy development, unit: yuan

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Per Capita GDP									
National	7858	8622	9398	10542	12336	14053	16165	19524	22698
Eastern	14883	16269	17531	20108	23864	27379	31323	36333	41467
Central	5521	5949	6551	7497	9131	10636	12256	14722	17773
Western	4814	5273	6158	7063	8463	9827	11504	13827	16782
Northeast	8878	9677	10418	11587	13274	15588	17901	21197	25500
Per Capita Disposable income of Urban Household									
Eastern	8099	8891	9639	10678	11874	13262	14894	16908	19228
Central	5272	5745	6432	7101	7887	8830	9911	11624	13197
Western	5648	6172	6675	7235	7996	8700	9545	11150	12742
Northeast	5027	5521	6295	6975	7773	8690	9776	11277	12935
Per Capita Net income of Rural Household									
Eastern	3588	3800	4033	4283	4691	5267	5813	6558	7405
Central	2071	2160	2272	2370	2693	2958	3280	3837	4437
Western	1632	1693	1792	1921	2136	2356	2576	3004	3481
Northeast	2175	2340	2486	2658	3104	3392	3761	4366	5122
Per Capita Consumption of Urban Household									
Eastern	6293	6695	7444	8046	8875	9824	10829	12101	13395
Central	4249	4499	4948	5345	5880	6517	7227	8327	9218
Western	4620	4940	5471	5860	6434	6941	7233	8228	9295
Northeast	4067	4395	4926	5528	6060	6781	7332	8503	9861
Per Capita Consumption of Rural Household									
Eastern	2480	2611	2800	3015	3347	3850	4261	4759	5271
Central	1488	1562	1647	1731	1962	2273	2554	2929	3365
Western	1306	1347	1400	1494	1716	1999	2175	2496	2836
Northeast	1616	1684	1712	1787	1961	2552	2795	3184	3701
Per Capita Food Consumption of Urban Household									
Eastern	2529	2607	2862	2983	3310	3555	3801	4300	4977
Central	1663	1695	1835	2009	2262	2453	2653	3097	3593
Western	2049	2114	2321	2537	2851	3040	3153	3722	4366
Northeast	1608	1686	1823	2046	2265	2430	2592	3012	3604
Per Capita Food Consumption of Rural Household									
Eastern	1101	1121	1141	1208	1366	1564	1687	1894	2176
Central	780	791	808	852	993	1089	1146	1315	1520
Western	709	699	703	731	868	991	993	1141	1320
Northeast	735	753	746	763	871	1018	1056	1217	1393

Source: China Statistical Year book, various years.

Table 2 Regional Grain Output and Structure of China in 2008

	Grain	Cereal	Rice	Wheat	Maize
Production 10,000 ton					
National	52870.9	47847.4	19189.6	11246.4	16591.4
Eastern	13587	12681	4354	4381	3802
Central	16407	15560	7751	4806	2945
Western	13952	11639	4482	1963	4750
Northeast	8925	7967	2603	96	5094
Structure %					
Eastern	25.7	26.5	22.7	39.0	22.9
Central	31.0	32.5	40.4	42.7	17.8
Western	26.4	24.3	23.4	17.5	28.6
Northeast	16.9	16.6	13.6	0.9	30.7

Source: National Bureau of Statistics, China Statistical Yearbook of 2009.

Table 3 Regional Poverty

Indicator	Region	2000	2001	2002	2003	2004	2005	2006	2007
Poverty line (Per Capita Income, yuan)		625	630	627	637	668	683	693	785
Poverty Population 10,000 person	Nation	3209	2927	2820	2900	2610	2365	2148	1479
	Eastern	207	183	261	217	173	142	112	54
	Central	814	683	642	752	730	668	560	372
	Western	1944	1856	1742	1698	1552	1421	1370	989
	Northeast	244	204	175	233	156	134	107	64
Poverty Regional Distribution %	Eastern	6.5	6.3	9.3	7.5	6.6	6.0	5.2	3.7
	Central	25.4	23.3	22.8	25.9	28.0	28.2	26.1	25.2
	Western	60.6	63.4	61.8	58.6	59.5	60.1	63.8	66.9
	Northeast	7.6	7.0	6.2	8.0	6.0	5.7	5.0	4.3
Poverty Incidence %	Nation	3.5	3.2	3.2	3.1	2.8	2.5	2.3	1.6
	Eastern	0.7	0.6	0.8	0.7	0.5	0.4	0.3	0.2
	Central	2.9	2.5	2.3	2.7	2.6	2.4	2	1.3
	Western	6.9	6.6	6.2	6	5.5	5	4.8	3.5
	Northeast	4.4	3.6	3.1	4.1	2.7	2.4	1.9	1.1

Source: NBS: China Poverty Monitoring, various years.

Table 4 Sector list in China's SAM

Agriculture			
1	Rice	31	Chemistry
2	Wheat	32	Non-metallic mineral products
3	Maize	33	Pressing of metals
4	Other grain	34	Metal products
5	Bean	35	Machinery
6	Oil crop	36	Transport equipment
7	Cotton	37	Electrical machinery
8	Sugar	38	Communication equipment
9	Vegetable	39	Measuring instruments and machinery
10	Fruit	40	Other manufactures
11	Other crops	41	Recycling waste
12	Pork	42	Electric and heat power
13	Beef	43	Gas supply
14	Mutton	44	Water supply
15	Poultry	45	Construction
		Services	

16	Other livestock	46	Transport
17	Forestry	47	Post
18	Logging and transport of wood	48	Information and computer services
19	Fishing	49	Trade
20	Agricultural services	50	Hotel and restaurant
Industry		51	Finance
21	Mining	52	Real estate
22	Petroleum and natural gas	53	Leasing
23	Metal mining	54	Research
24	Nonmetal mining	55	Technical services
25	Foods and Tobacco	56	Environment and public facilities
26	Textile	57	Other private services
27	Leather and products	58	Education
28	Wood manufacture	59	Health
29	Paper and printing	60	Entertainment
30	Petroleum	61	Other public services
31	Chemistry		

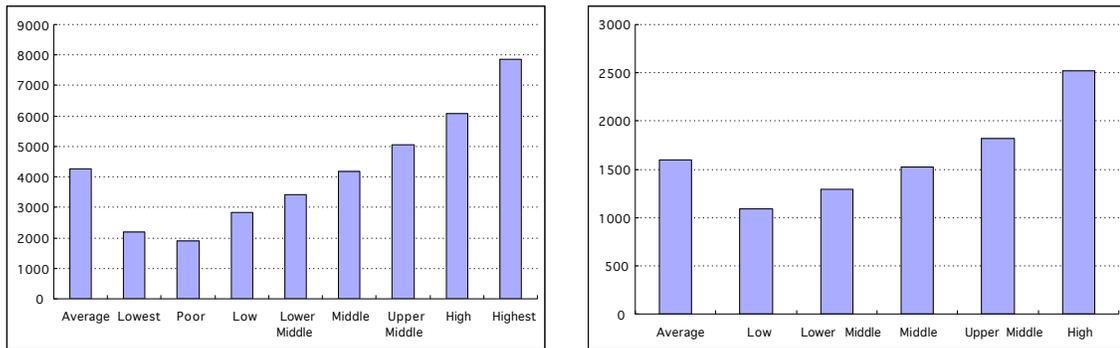Figure 1 The Central Government's Investment on Agriculture, Rural Areas and Farmers
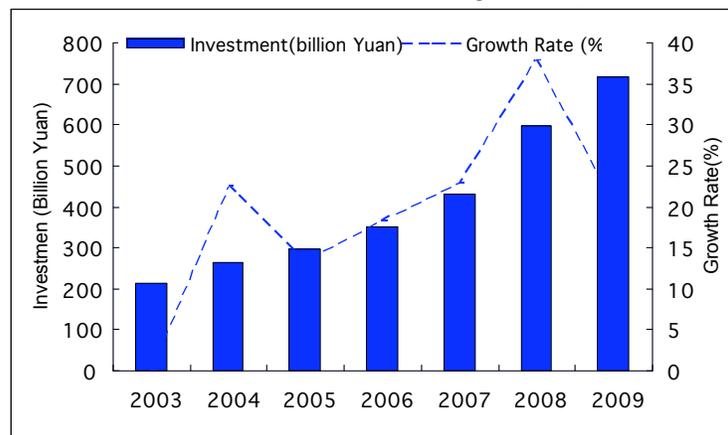
Note: the investment data of 2009 is budget data; the growth rate is nominal.
Source: Ministry of Finance People' of Republic China
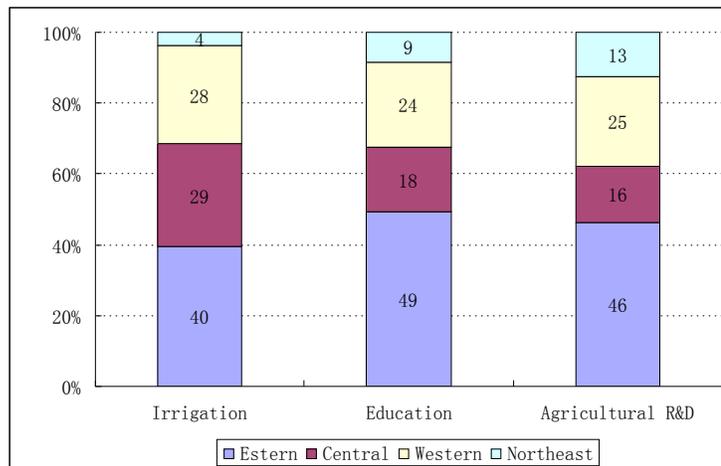
Figure 2 Regional Map of China

Figure 3 Per Capita Food Consumption Expenditure of Urban and Rural Households by Income level of 2008

Source: National Bureau of Statistics, China Statistical Yearbook of 2009.

Figure4 Regional Irrigation and Education and Agricultural Investment Structure of China of 2007

Source: irrigation and education investment data are from China Water Conservancy Yearbook of 2008, and China Education Expenditure Yearbook of 2008, and Ministry of Agriculture, National Statistics of Agricultural Science and Technology of 2007, unpublished, 2007 (In Chinese).respectively, 2008.