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Study on China's Food Security Status

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Abstract

China has realized food security at the national level, but there are still some areas and populations vulnerable to food insecurity due to disparities between urban and rural areas, and among regions. The concept of food security in this paper covers grains, and also foods rarely covered in a general research on food security in China. It reviews and evaluates the food security status in poverty counties between 2002 and 2007 from perspectives of food availability, access, consumption and nutrition, utilization and vulnerability to food insecurity. With Cluster Analysis, it indicates that the 271 poor counties in 9 provinces are confronted with serious food insecurity problems. Farmer's income, education, family scale, work type, land area and nationality are the main factors influence food consumption of the rural poor.

Keywords: Food security, indicator system, poverty counties, Cluster Analysis, regression model

1. Introduction

1.1 Background

Since the 1996 World Food Summit, China has made remarkable progress in increasing agricultural production, incomes and the nutritional status of its population. In the face of tight supply in the global food market and food crises in many countries, China has maintained a grain self-sufficiency rate above 95% in recent years, contributing greatly to global food security. Food availability improved in general; farmer's income, food expenditure increased, and Engel's Coefficient declined; consumption of grain, sugar decreased, while other food increased. China has also made brilliant achievements in poverty reduction and meeting the basic food needs of the poor population. Furthermore, China transitioned from a recipient of the World Food Programme's (WFP) assistance at the end of 2005 into a donor to WFP, reported by WFP [1]. Despite its achievements, there are still some areas and populations vulnerable to food insecurity in China due to disparities between urban and rural areas, and among regions. It is important to identify these areas and populations for improving the overall food security with better-targeted measures. To that end, WFP, the Food and Agriculture Organization of the United Nations (FAO) and the International Fund for Agricultural Development (IFAD) jointly set up a research project on *the food security status in China*, whose major findings are presented in this paper.

1.2 Contents and features

The concept of food security in its broad sense is applied in this paper. It studies not only grains, but also foods that are rarely covered in a general research on food security in China, i.e. edible vegetable oils, meat, eggs, milk, aquatic products, vegetables and fruits. Instead of focusing only on food supply and demand, it reviews and evaluates the food security situation in China National-defined Key Poverty Counties (referred to hereafter as "poor counties") since 2002 from the perspectives of food availability, food accessibility, consumption and nutrition, food

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utilization conditions and vulnerability to food insecurity with reference from poverty monitoring and the second agricultural census of China finally identifies the areas and populations vulnerable to food insecurity. With households survey it analyzed the in-depth factors that affect the food consumption of rural poor.

1.3 Methodology and data

A food security indicator system is established from the perspectives of food availability, food accessibility, consumption and nutrition, food utilization conditions and vulnerability to food insecurity and specific indicators are utilized to identify the food security situation at the national, provincial and poor county levels. Due to limited data, the indicators vary slightly at different levels. Poor counties' provincial average and the poor counties are the main point. For food availability, the indicators are total food supply and per capita food output, including grain, meats, eggs, milk, aquatic products, vegetables and fruits. For food access, the indicators used are the per capita net income of rural households, proportion of villages with highway access and distance to the market. For consumption and nutrition, we use per capita consumption of grain and other food per capita, and nutritional intake. To appraise their food utilization, we use the proportion of villages with medical treatment rooms, qualified village doctors/medical staff, availability of rural tap water, proportion of rural households with difficult access to drinking water, proportion of rural household with toilets, proportion of rural households with difficulty in obtaining fuel, and the illiteracy rate of rural labour force. For vulnerability, we use the indictor of a disaster-hit area.

All of these indicators are quantified with the data from various official statistical yearbooks. The data from the poverty monitoring reports of the Rural Survey Department of the National Bureau of Statistics of China and the second agricultural census of China are used for the research on poor counties. The methods of comparison, ranking, clustering, mapping and regressing are applied. Indicators among different periods and different areas are compared to indicate the improvement in the food security situation and the gap among regions and between rural and urban areas.

2. Food Security in the Poor Counties

While at the national level food security has improved enormously, in some rural regions, especially in the poor counties, the food security situation is still not assured. Many scholars have studied the relationship between poverty and food security. There is no doubt that they are closely related. Poverty affects the human ability to acquire food. Moreover, it also affects the absorption and utilization of food when associated with inadequate medical and sanitary conditions, such as those prevalent in poor areas. Food insecurity can also affect human health and intelligence, limiting a poor person's chances of seizing opportunities – like education and employment – that would help them to step out of poverty, FAO [2]. In 2002, WFP and IFAD China's Vulnerability Assessment and Mapping (VAM) Unit [3] analysed vulnerability in food security at the county level and discovered that over 70% of the counties with vulnerable grain supplies were also classified as nationally-defined key poverty counties. This section will analyze the food security status of the poorest regions with a focus on China's 592 nationally-defined key poverty counties from 2002 to 2007.

2.1 Identifying the Poor Counties

To make the best use of funds available for poverty alleviation and provide the poor with effective support, the Chinese Government identified a group key poverty counties nationwide as the focus for its assistance. More than half of China's poverty-stricken population is concentrated in these poor counties and their food security is likely to reflect the food security level of China's poverty-stricken population.

Close to two-thirds of the poor counties are concentrated in the western region. Slightly more than one quarter is located in central China and just 11% are found in the eastern region. Most of the poor counties are in four provinces: Yunnan (73 poor counties), Guizhou (50), Shaanxi (50) and Gansu (43). Moreover, two thirds of the poor counties are in mountainous regions, 18% in hill areas and only 16.7% on the plains.

2.2 Food Availability in the Poor Counties

2.2.1 Total Food Production in the Poor Counties

The output of the main food products in poor counties witnessed significant growth from 2002 to 2007. Milk output saw the most rapid growth with a 2.6-fold increase. Fruit production increased 67.78%; the output of aquatic

products grew by 48.34%; meat output rose by 29.03%. By comparison**,** grain output grew by a relatively modest 19.53%.

2.2.2 Per Capita Food Output in the Poor Counties

Food production increased faster than the average population growth rate in most poor counties, improving the availability of food those counties.

In 2007, the per capita output of grain was 432kg in the poor counties and meat output was 64.8kg both slightly higher than the national average. The per capita output of fruit, vegetables, aquatic products, egg and milk grew rapidly, but were still much lower than the national average.

As for the per capita output of animal products, the case for poor counties in provinces and regions such as Inner Mongolia, Heilongjiang, Jilin and Hainan was generally good. However, poor counties in 14 provinces saw the per capita output of animal food lower than the national average, of which, Guizhou, Ningxia and Gansu saw lower per capita output of animal products with Gansu having the lowest at below 50kg.

In 2007, the per capita vegetable output in the poor counties in most provinces fell below 300kg. The vegetable supplies, however, improved in the poor counties of the western region. Per capita fruit output was lower than the national average in 18 provinces, with poor counties in Hubei, Yunnan, Shaanxi, Ningxia, Jilin, Guizhou, Heilongjiang, Anhui and Qinghai producing less than 50kg per person per year. Most provinces saw a growth of per capita fruit output in their poor counties.

2.3 Access to Food in the Poor Counties

2.3.1 Food Purchasing Power in the Poor Counties

Per Capita Net Income of Rural Households **(**PCNIRH) in the poor counties saw significant growth over the past five years, rising from RMB 1305.2 (about US $191) in 2002 to RMB 1957.0 (about US $286) in 2007, an annual growth rate of 8.44%, adjusted for inflation. With the growth of farmers' income, their expenditure on food rose significantly. Using 2002 prices, adjusted for inflation, the average expenditure on food consumption in the poor counties rose from RMB 649.5 (about US $95) in 2002 to RMB 842 (about US $123) in 2007 with a growth rate of 29.6% compared to the annual average growth rate of 5.33%. While households' absolute food expenditure in poor counties grew, the percentage of total income spent on food decreased from 50% in 2002 to 43% in 2007.

The Report on Poverty Monitoring in China's Rural Areas of the National Bureau of Statistics indicated that the main reasons for the growth of PCNIRH were: 1) Wage income grew rapidly, especially for those employed by others; 2) Increased prices for farm products generated a higher net income from agriculture; and 3) Transfers and net financial income grew as the Chinese Government introduced subsidies, e.g. for converting cultivated land into forests and grasslands, for grain production and input costs also had an effect on the net income of the farmers.

2.3.2 Physical Access to Food in the Poor Counties

The transport conditions in the poor counties improved from 2002 to 2007, and the proportion of villages accessible by road rose from 72.2% to 82.8%. The improvement of transportation conditions in the poor counties was mainly attributed to support from the National Poverty Alleviation Fund. Road building was a major item in the national poverty alleviation plan. Since 2002, the annual capital input for road building, rebuilding and expansion absorbed over 10% of the poverty alleviation funds.

The growth of markets shall be measured by the distance from the investigated village to the market. The average distance from the surveyed village to the nearest market saw an increase from 2002 to 2007. One reason was mainly due to sample rotation. Since the sample is now more biased towards poorer villages which are more likely to be in mountainous areas, the distance from the markets rose from 2002 to 2007.

2.4 Food Utilization in the Poor Counties

2.4.1 Health

The proportion of villages with clinics in the poor counties rose from 69.0% in 2002 to 75.6% in 2007.The gap between provinces, regions and municipalities was very large. In 2007, the poor counties in 12 provinces had lower-than-average access to health clinics with Shanxi, Qinghai, Sichuan, Xinjiang and Hainan, the worst affected.The proportion of the villages with trained village doctors/nurses in the poor counties rose from 71% in 2002 to 76.5% in 2007. Poor counties in Xinjiang, Guizhou, Sichuan, Shanxi and Hainan had the lowest proportion of competent medical staff per village. The medical and sanitary conditions have been gradually improving in the poor counties,

but many problems still exist. For example, farmers cannot afford to get treatment or it is too far to go to hospital. These problems are still restraining the overall improvement of rural medical treatment and the health status of the farmers.

2.4.2 Drinking Water

The availability of tap water in the poor counties rose from 30.2% on average in 2002 to 35.9% in 2007, an increase of only 5.7%. In 2007 less than 20% of households in poor counties in Anhui, Sichuan, Hubei and Jiangxi had access to tap water. In 2002, 19.8% of rural households in the poor counties had difficulties acquiring drinking water with Chongqing and Guizhou ranking as the top with 35.8% and 31.5%, respectively. By 2007 10.7% of households still had trouble getting water, with more than 20% of poor rural families in Ningxia, Hubei, Hunan and Chongqing struggling to get water.

2.4.3 Sanitation

The proportion of rural households with sanitary toilets was 82.3% in 2002, of which, the proportion of households with flushing toilets was 1.8%, and the proportion of households with dry toilets was 80.5%. There are few flushing toilets in the rural areas and most of the toilets used by the farmers are still dry toilets. In 2007 the proportion rural households with sanitary toilets in the poor counties grew to 86.5% in 2007. Of this, the proportion of rural households with flushing toilets was 3.8%. At present, the sanitary toilet has not been fully used in the poor counties, which is mainly because these regions have an underdeveloped economy, fund shortages and inconvenient transportation. Moreover, the high price of building materials increases the difficulties in improving the rural environment and sanitary conditions. In addition, recognition and practice of good sanitation by farmers will also play a vital role in the improvement of the rural sanitary situation and food security.

2.4.4 Cooking Fuel

In 2002, the proportion of rural households with difficulties in acquiring fuel for domestic use was as high as 45% in the poor counties; and in 2007, it fell to 34.2%. In 2007, some provinces, regions and municipalities still saw a high proportion, of which, seven saw a proportion higher than the average of the poor counties. These were Yunnan, Guizhou, Hainan, Guangxi, Xinjiang, Shanxi and Hunan of which four (Yunnan, Guizhou, Hainan and Guangxi) was over 50%. Relatively speaking, Inner Mongolia, Anhui, Henan and Hebei saw a proportion below 10%. Only Ningxia Province saw a rise of 5.6% compared to 2002.

2.4.5 Education: Rural Labour Force Illiteracy Rate

The illiteracy rate of the rural labour force in the poor counties was 15.3% in 2002 and it dropped to 11.6% in 2007, but progress was uneven across provinces. There were 15 provinces below the average for poor counties in 2007 where illiteracy rate had not changed since 2002. The poor counties with the highest rural illiteracy rates are located in the central and western regions of the country. The eastern regions have a relatively low rate. Since 2004, China has implemented several policies designed to eliminate illiteracy such as the abolition of school tuition fees and compulsory nine-year education. At the same time, the Chinese Government has supported training programmes for workers in the poor counties. The portion of the National Poverty Alleviation Fund dedicated to professional training has increased and the proportion of the labor force receiving training also rose year-on-year. This has helped improve the literacy of the rural labor force, in turn improving earning capacity and hence their ability to afford more and better-quality food.

2.5 Consumption & Nutrition in the Poor Counties

Since the mid-1990s, the dietary structure of the China's rural population has improved. Nutrition has improved with the rise of living standards. Per capita grain intake has fallen while consumption of fruit, meat, eggs, dairy and aquatic products has risen. The consumption trend of the rural population in the poor counties is similar to the national average, but some gaps still exist.

2.5.1 Food Consumption

The per capita grain consumption directly reflects the grain consumption of the rural population. It fell from 233.6kg in 2002 to 196.2kg in 2007 in the poor counties. In 2007, the per capita grain consumption in poor counties was slightly lower than the national rural average of 199.48kg. Per capita meat consumption in poor counties rose from 16.4kg to 19.6kg, a 19.13% increase; per capita egg consumption rose from 2.0kg to 2.2kg, a 13.24% increase;

per capita milk consumption fell from 2.0kg to 1.8kg, an 8.07% decrease; and per capita consumption of aquatic products saw the fastest growth of 60% from 1.0kg to 1.6kg. Per capita vegetable consumption decreased from 92.1kg to 87.3kg; per capita fruit consumption saw a decline of 23.84%; and per capita consumption of edible oil declined by 33.73%.

2.5.2 Nutrition

Energy, protein and fat are the necessary nutrients for human activity. According to official data from the National Statistics Bureau, the daily per capita intake of calories in the poor counties was 2,251.0 kilocalories (Kcal), 78.9 Kcal higher than that in 2002 (2,171.2Kcal); that of protein was 58.4 grams or 3.7 grams higher than that in 2002 (54.8g); and that of fat was 35.6g or 4.2g higher than that in 2002 (31.5g). The target set in *Essentials of China Food and Nutrition Development 2001-2010* [4] was for China's rural population to have a per capita daily intake of 2,320Kcal, 75g of protein and 65g of fat by 2010. The current nutritional situation of the rural population in the poor counties is considerably lower than this target, especially regarding the intake of protein and fats.

If we compare the food intake in the poor counties with the national standard for the nutritional intake - presented in *Chinese Resident Meals Guide [5]*, it is clear that the dietary structure of the poor counties' population is still characterized by high cereal consumption and low consumption of other food varieties. It is worth noting that the dietary standard is an ideal pattern and the food consumption of rural residents still has some gaps regarding vegetables, milk and legumes.

Table 1 Comparing the Recommended Standards and Poor County Average Intake in 2007

Commodity	Recommended standard	NDKPC average intake 2007
Cereal	300-500g	514g
Eggs	25-50g	6g
Milk	11g	5g
Aquatic products	50g	4.4g
Vegetables	400-500g	239g
Fruit	100-200g	22g
Legumes	50g	10g

2.6 Vulnerability- Natural Disasters

Some 70% of China's 592 poor counties are located in ecologically vulnerable areas where frequent natural disasters extensively harm the development of the agricultural economy. This is one of the key reasons for rural poverty in these regions. In 2002, 62.3% of villages in the poor counties were hit by severe natural disasters and, in 2007, the proportion was 48.2%, down 14.1%. In 2007, 80.5% of villages in poor counties reported a decrease of output between 30 and 50% due to natural disasters.

This paper used the coefficient of fluctuation of the grain yield in the poor counties to reflect the vulnerability of the food supply. As for the provinces, Inner Mongolia has the highest coefficient of fluctuation of the grain yield, reaching 13.3% and following it is Jilin with 10.5%; Shanxi, Shaanxi, Heilongjiang, Hebei and Qinghai with a coefficient of 5%-10%; and the other 13 provinces all had a coefficient below 5% while Yunnan had a minimum coefficient of fluctuation of only 1%. As for the regions, the eastern region witnessed the highest coefficient of fluctuation, reaching 6.5%, followed by China's middle region with 5% and the western region with the lowest coefficient of fluctuation of 3.7%.

3. Food Security Cluster Analysis

The section above analyzed the food status at the province level and county level from five aspects of food security. This part will outline the vulnerable areas using ranking and clustering methods.

3.1 Poor County Provincial Average Cluster Analysis

In order to classify the poor counties of the 21 provinces, we used the average for all poor counties in each province or region as the basis for analysis. First, the 21 provinces are divided into three levels according to food availability, access, utilization, consumption and vulnerability. The result is that the vulnerability index shows little

difference in the three levels and does not pass the means test. Therefore, the vulnerability index was excluded from the analysis. As a result, the cluster analysis only utilizes four indexes.

The statistical clustering results also indicated that the first cluster consisted of seven provinces, the second level four provinces and the third level nine provinces. Cluster 1, included poor counties in Anhui, Chongqing, Jiangxi, Henan, Hebei, Heilongjiang and Jilin provinces. They featured above average food availability and access, a good level of food utilization, and sufficient levels of food consumption. This cluster was classified as food secure. The population (86.0 million) accounted for 36.51% of the total of the poor counties.

Cluster 2, consisting of Sichuan, Hunan, Hubei and Xinjiang, and Inner Mongolia, featured average food availability and consumption level. But the access and utilization indices are very poor. These areas can be classified as vulnerable to food insecurity. The food access and utilization are main elements constraining food security and nutrition in these areas and the main concerns for improving the situation in the future. By increasing construction of infrastructure, improving agricultural production and quality of living conditions, these areas could be included in Cluster 1 and be considered areas of relative food security. The population (53.6 million) accounts for 22.76% of the poor counties.

Cluster 3 consists of poor counties in Shaanxi, Hainan, Guangxi, Ningxia, Yunnan, Guizhou, Gansu, Qinghai and Shanxi. It featured low levels of food availability, accessibility, utilization and consumption and is considered food insecure. These areas are poor in numerous aspects. This report recommends giving priority to improving food availability and agricultural infrastructure, such as farmland and irrigation. At the same time, because these areas have the lowest level of food security, they should be a primary concern. They account for the greatest number of people – some 95.9 million, or 40.73% of the total of the poor counties' population.

3.2 Cluster Analysis of 592 Poor Counties

Constrained by data, we clustered 592 poor counties using the following indicators: per capita grain output, per capita animal products output, per capita net income of rural households, proportion of villages accessible by vehicle, proportion of villages with markets, proportion of villages with medical clinics, proportion of qualified medical staff to population, availability of tap water, proportion of rural households with difficulty accessing drinking water, proportion of rural household with toilets, proportion of rural households using firewood, and the proportion of the labour force with at least primary-school education. Unfortunately, food consumption data are not available at county level.

With these indicators, the 592 poor counties were divided into five groups using the cluster analysis method of two-step cluster. The five groups were divided into three levels – good, average, and bad. Among the five groups, Group 1 features relatively good food security; Group 2 and Group 3 have average food security status, and Group 4 and Group 5 have the worst food security indicators.

Group 1, is a comparatively food secure area consisting of 52 counties, including 6 counties in Hebei, 13 counties in Heilongjiang, 25 counties in Inner Mongolia, 5 counties in Xinjiang and 3 counties in Jilin . 39 counties are involved in pasturing cattle, with production distributed in the plains and foothill. The total population of these counties is 13 million, accounting for 5.5% of the total for the poor counties' population. These areas feature sufficient food supply. The conditions for food accessibility are good, and the average net incomes per farmer are 3,175 RMB (about USD$460), topped all groups. The market and transport conditions are also good. Although a relatively small percentage of villages have tap water, only one tenth of the households face difficulties accessing drinking water – the lowest among these five groups. The conditions of medical treatment are also better than the other groups. Only 4.23% of them do not have a primary school education. However, this group faces a higher level of natural disasters, so the agricultural yield fluctuated. In addition, the sanitation conditions are also very poor and the rate for the number of households with toilets is the lowest of all groups.

Group 2 consists of 157 poor counties. Of those, 113 counties are located in mountainous areas, mainly in the central and eastern provinces. This group features high per capital grain output and relatively lower amounts of animal-derived food. But the per capita output of aquatic products is 11kg, the highest of these five groups. This can be attributed to the rich water resources in the area. Vegetable consumption is relatively high. Average per capita net

incomes are 2,568 RMB (about USD$375). These areas have good transport conditions with 80.3% villages accessible by road and 31.5% of the villages have at least one small supermarket. About 40% of villages have adequate tap water, but 17.8% of households face problems accessing drinking water. The rate of households using firewood as the primary fuel is lower and the cooking energy is diversified. The labours of these areas have good education and only 3.7% of them are illiterate, the lowest among the five groups.

Group 3 consists of 112 poor counties, of those, 76 are located in the plains and the remainder in the foothills. The food supply level of this group is higher than Group 2 and the per capita fruit output, in particular, is the highest. The per capita income is lower than that of Group 2. Areas such as water supply, sanitation conditions, medical care, and traffic conditions are worse than that of Group 2. Though the conditions of the tap water supply are similar to that of Group 2, the proportion of households facing problems with the supply of drinking water is higher.

The worst levels were in Groups 4 and 5. These groups have poor food availability and access. Group 4 presents the worst food security conditions among non-pasturing counties. This group consists of 227 counties, all mountainous areas, belonging to 11 western provinces except for two counties from southern Hainan Province. These counties have a population of 6.09 million in total, accounting for 2.6% of the total poverty-stricken population. This group features a relatively low food supply and the per capita annual food output is only 320.5kg. Of that the total animal-derived food supply is 80.2kg, most of which is meat. This group also has the lowest per capita output of dairy products. The fruit output is only 37kg. The farmers' purchasing power is low and markets are underdeveloped. Though 46% of the villages have access to tap water, about one third of the households face difficulties in the supply of drinking water. More than 11% of the labourers have not completed primary school. This group features moderate sanitary conditions and access to health care.

Group 5 features the worst food security among the five groups, consisting of 44 pasturing counties of the western provinces of Gansu, Ningxia, Sichuan and Xinjiang, of that 42 counties locate in the mountainous area. Except for the animal-derived food, the per capita output of grain, vegetable and fruit is much lower than the average of the poor counties. This group also faces the worst food access, the lowest incomes for farmers and the worst transport and market conditions. The medical conditions are also very poor. Nearly two thirds of the villages do not have a local clinic or a qualified health worker. With regard to food utilization, 44.5% of households face difficulties accessing drinking water. The rate of households with a lavatory is only higher than that of Group 3. The education level of labours is also lower, with illiteracy as high as 39.2%.

Figure 1 Clusters of 592 Poor Counties According to Their Food Security Status

4. Regression analysis on food consumption of rural poor- case from Ningxia

With the above analysis, we have a vivid picture about the distribution of the most vulnerable food insecure counties. But food security situation at households level and food consumption status are still not included. Considering this, a households survey is conducted in Ningxia Hui Municipality.

4.1 Basic Information
4.1.1 Why choose Ningxia
First, Ningxia lies in the worst group in the Clustering and has smaller area and population compared with other vulnerable provinces; there are 9 poor counties while there are just15counties in total, it's much easier for the logistic and operation.

4.1.2 Sampling methodology
A 3-stage sampling method is applied. First, 5 poor counties are chosen from 9 poor counties with clustering, considering their economic development, farmers' income, and population scale. Second, 24 villages are fixed through local officers' recommendation comprehensively considering food availability, access, utilization, food consumption and vulnerability. Third, 282 HHs are chosen near randomly. Local leaders randomly ask interviewees to cooperate the survey. And the sample size in each village are fixed according to the scale of village.

4.1.3 Main purpose and method
The main purpose of the survey is to analyze factors influence the food consumption in poor counties. Regression analysis is applied to reach the purpose.

4.2 Regression analysis
4.2.1 Variables
As to food consumption, both total food expenditure, food expenditure at home and out home are included. The consumption quantity of staple, vegetable, oil, meat (include pork, beaf, mutton, chicken), eggs, milk, aquatic products and other food (include condiment, salt, wine, etc.) are explained variables and analyzed separately. All the data used are per capita data.

The main explaining variables include per capita income of the household in the last year, family scale, work type(agricultural activity or non-agricultural activity), land area owned per capita, the nationality of the HH, age, education and sex of the interviewee.

4.2.2 Regression analysis
With regression model, we estimate each explained variables separately. And the results show that: When income increases, food expenditure both at home and outside increase, but only vegetable, fruits and meat increase significantly. For the rest food, staple and vegetable maybe because they are basically self-sufficient and the rest animal food are rare not only for the low income level but also the low availability and bad transportation. Family scale weaken the per capita food expenditure which shows the negative effect of family scale to food consumption. But vegetable, fruits, pork, mutton, milk and aquatic products will increase if the family scale grow. Land area is a positive factor to food expenditure and most food. There are significant difference between different nationality, Hui ethnic nationality spend more on food and eat more food except vegetables and pork, that's definitely what it is, as Hui ethnic nationality do not eat pork because of religious. Food expenditure of non-agricultural activity engaged people is much higher than agricultural activity engaged ones and they eat more food. This also indicate that work type affects food consumption more than income does. The age of the interviewee is a positive factor to food expenditure but to some food it's a negative one. Education level can significantly increase the food expenditure and some food. While sex of the interviewee is not a significant factor.

Table 2 Factors and their effect to the food consumption

	Income	Family Scale	Land area	Nationality	Work type	Age	Education level	Sex
Food Expenditure	0.0242	-136.00	38.24	-245.01	342.09	9.89	157.56	
at home	0.0119	-117.01	34.46	-242.55	300.35	9.64	86.89	
outside	0.0242	-136.00	38.24	-245.01	342.09	9.89	157.56	
Staple		-16.08		-47.86		-16.08		
Vegetable	0.0023	18.80		30.57	18.80			-67.25
Oil		-3.63	1.20	-13.74	4.47	-3.63		
Fruits	0.0029	22.30	12.56	-50.06	22.30	1.79		
Meat	0.0008	-4.06	1.05		12.01	0.53	8.01	
Pork		2.63		30.00	2.63		2.00	
Beaf	0.0003	-2.19	0.94	-14.45	3.89	0.21		-5.12
Mutton	0.0004	4.74	0.39	-3.87	4.74			
Chicken		-1.22		-3.93	1.78	-1.22	1.02	
Eggs		-2.57				-2.57		10.72
Milk		3.26			3.26		3.17	7.20
Aquatic products		0.64			0.64		1.17	
Others		-1.30		-3.97	3.48	0.28		

5. Conclusions and Recommendations

5.1 Major Conclusions

China's basic food requirements are guaranteed for the most part and production has improved. But China's food security situation varies from region to region and between urban and rural areas, with some regions still facing food security problems. The eastern region has a small quantity of food output, but boasts favorable income conditions for acquiring food, as well as good market and transportation conditions; the central region enjoys adequate food supplies, but has low incomes. The western region, however, is poor in each of these aspects. The grain consumption of rural residents is much higher than that of urban residents who, by contrast, consume much more meat, fish and poultry products.

Food insecurity is still common in poor rural areas. The most vulnerable region of food security is in the rural areas of the western poor counties. The 271 counties which mostly located in the western mountainous areas are the most vulnerable areas. They have poor natural conditions and fragile ecologies. And the population is 90.5 million, accounting for 38.4% of the total population of poor counties or 7.3% of China's total. The main factors affecting the food security of poor counties are natural conditions. First of all, the geography and climatic conditions restrict agricultural production, especially in those provinces with low incomes. Poor natural conditions plus natural disasters have worsened the local grain production and as a result these regions are generally short of necessary food, fuel and animal feed. The difficult environment and poor living conditions also result in a high incidence of disease. Poor people in these regions have little knowledge of nutrition and health and the medical and sanitary facilities are insufficient, thus, even basic food security is difficult to ensure. In addition, topographical conditions make the development of transportation and markets difficult.

Farmer's income, education level, land area and age of the interviewee play positive effect to food consumption while family scale plays a negative one. Non-agricultural activity engaged people have a better food consumption status than agricultural activity engaged people. Hui ethnic people's food consumption status is better than Han nationality. The influence of interviewee's sex id not significant.

5.2 Recommendations

China is basically food secure at national level and has put in place plans to continue that until 2050. Efforts need to be made to focus on solving the food security issues in those counties where people still face difficulties to access sufficient, culturally acceptable food to live an active, healthy life. 1) Focusing on food security issues of the poverty-stricken regions from a strategic point of view, and offering preferential policies. 2) Strengthening the monitoring and early warning system for the food security situation of the vulnerable groups. 3) Focusing more on the source of poverty and hunger, not just on results measured as income; more focus on the potential for recurrence of poverty, rather than just its eradication; efforts should be coupled with comprehensive measures in other aspects such as medical care, sanitation, and education to enable the poor counties to develop in a balanced way. 4) Integrating agricultural support projects and funds to improve the food security in poverty-stricken regions. 5) Encourage more farmers transferred to non-agricultural fields, carry on the arable land protect policy and population control policy to guarantee the food availability.

Acknowledgements

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