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Households Food Security in Poverty-Stricken Regions: Evidence from Western Rural China

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Abstract

Food security of poor rural households has always been a policy concern. Based on a field survey on three western provinces, the paper finds that over two thirds of households achieved self-sufficiency in grain consumption, but the consumption of other major food items are all below recommended standard. Most households are unsatisfied with and expect to change this situation. Econometric analysis indicates that income, education, and household stock-raising have significant impact on food consumption. The paper suggests strengthening grain relief, agricultural development, local successful practices and poverty reduction to enhance food security for poor rural households.

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1. INTRODUCTION

There has been three phases in the development of food security in China as summarized by Xu [1]. The first phase, from China's establishment in 1949 to the year of 1984, is marked by quantity-centered food security. The second phase, from the year of 1985 to the year of 2001, is marked by combining quantity with quality food security. The third phase, from the year of 2001 to present, is distinguished for placing great stress on quality food security. According to the FAO statistics, the prevalence of undernourishment in China is 10%, and the absolute number of undernourished persons is 127.4 millions in 2004-2006. However, this is just a general picture of the whole country. Currently, there are a fair proportion of farmers in rural China and less developed remote mountainous regions in particular, which have not solved the matter of food as pointed out by Jiang [2]. The insufficiency of protein intake is quite severe among this population.

The status of food security across regions in China varies substantially. In a cluster analysis on food security condition in China's 31 provinces, Xiao and Nie [3] finds that 9 provinces including Shaanxi, Guizhou, Gansu and 6

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others are classified as absolute food insecurity regions. The distinctive features of these regions are poor food supply capability, poor food availability, poor food utilization, low food consumption level, and low food safety. Farm production and purchase from market are the two major channels for rural household to achieve food security in grain as shown in Chen and Tao [4], natural disasters and damage by disease and insects are the major threats to grain security. Xiao et al. [5] conduct a quantitative analysis on rural households' food security and influencing factors, their study show that food availability is high while food access ability is relatively low. Similarly, Chen and Li [6] finds that only 41.91% of farm household in poor region are self-sufficient in grain and 2.11% couldn't afford to have enough grain. Food insecurity hurts younger generation, Li and Li [7] find that nutrition intake of boarding students in poverty-stricken regions was generally insufficient, and nutrimeal intervention had an evident positive impact on the nutrition status of boarding students.

Ye and An [8] suggest investigating food security in the perspective of household behavior. However, most studies focus on food security at national or regional level. There are several studies analyzing household food security but only restricted to grain. There is relatively few studies examine food security at household level. And even fewer studies investigate household satisfaction with food consumption and quantitatively analyze influence factors of major food consumption in poor regions.

This paper aims to enrich literatures in this direction by investigating food security at household level and exploring its influencing factors. Grounding on rural households' consumption status quo and household self-evaluation of food consumption, this paper constructs econometric model to identify influencing factors of major food consumption. The following of the paper is arranged as below. Section 2 will introduce data and the survey. Descriptive analysis will be given in section 3, econometric analysis will be done in section 4, and conclusions will be drawn and policy advices will be proposed in section 5.

2. DATA AND THE SAMPLE

The data analyzed in this paper comes from a survey named as "Food Security and Food Rights of Rural Households in China's Poverty-Stricken Regions". The survey was conducted in August 2008 by the authors. The survey collects food consumption, income and expenditure, agricultural production, and demographic information at household level.

The survey selected Shaanxi, Guizhou, and Gansu as sample provinces. Seven poor counties designated at national level in the three provinces were chosen as sample counties. These sample counties includes Wushuan county and Zhangjiachuan county of Gansu, Leishan county of Guizhou, Hanyin county, Lueyang county, Ningqiang county, and Yongshou county of Shaanxi. Two townships in each county were chosen as samples, one is economically less developed township and another is relatively developed. Two villages were chosen in each sample township, one with higher income and another with lower income. Five households were chosen in each sample village based on income. Finally, 20 households were surveyed in each of the 7 counties. The survey interviewed 140 households with 138 turning out as valid samples.

3. AN OVERVIEW OF HOUSEHOLD FOOD CONSUMPTION

The survey investigated food consumption information of sample households in the past year. The sample households in poor counties were poorly fed. The food consumption is low in quantity and less diversified in variety.

3.1 GENERAL SITUATION

In general, sample households, according to the survey results, apparently consumed adequate amount of grain (or staple food). Their annual average per capita consumption of grain is 189 kg, which is 10 kg lower than national mean of rural residents but passes national recommended target of 178 kg for rural China. But, when we break down the "average" picture, it is found out that 66% of the sample households (91 households) with per capita grain consumption below national recommended target. Among those, 81 households consumed less than 100 kg.

Wheat and rice are the staple food of sample households. 94 households or 68.1% of the sample are self-sufficient in grain during the past year. 30 households or 21.7% of the sample borrowed grain from neighbors or relatives when they were deficient in staple food during the past year. 9 households or 6.5% of the sample resorted to coarse cereals such as corn and beans for substitute when they were deficient in staple food. 5 households or 3.6% of the sample experienced semi starvation from one to three months in a year.

The annual consumption of vegetables, meats, aquatic products, eggs and milk products of sample households are all below national recommended target (Table 1). The percentage (and absolute number) of sample households with their consumption of vegetables, meats, aquatic products, eggs, milk and milk products below national recommended target are 100% (138), 78% (108), 97% (134), 85% (117), and 98% (135), respectively. Besides, the consumption of these food items is all lower than national mean of rural residents except eggs. To be specific, per capita consumption of vegetables of sample households is 60 kg, amounting to 43% of recommended target. Per capita consumption of meats of sample households is 18 kg, amounting to 60% of recommended target. Per capita consumption of aquatic products of sample households is 1.2 kg, amounting to 9% of recommended target. Per capita consumption of eggs of sample households is 6.2 kg, amounting to 48% of recommended target and higher than national mean of rural residents. Per capita consumption of milk products of sample households is 0.4 kg, amounting to 6% of recommended target. The percentage of households that did not consume any meats, eggs, aquatic products, and milk products in the past year is 5.8%, 26.8%, 73.9%, and 91.3%, respectively.

Table 1 Annual Food Consumption of Western Rural Residents (Unit: kg/person)

Province	County	Observations	Grain	Vegetables	Meats	Aquatic products	Eggs	Milk & milk products
Gansu	Wushan	20	201	75	18	0.2	8.7	0.6
	Zhangjiachuan	20	188	42	9	0.0	7.0	0.0
Guizhou	Leishan	18	197	87	25	5.0	4.3	0.2
Shaanxi	Hanyin	20	164	42	24	2.9	4.3	0.4
	Lueyang	20	193	68	18	0.0	12.6	0.0
	Ningqiang	20	162	80	26	1.1	4.4	1.3
	Yongshou	20	205	24	4	0.1	2.5	0.4
Average		138	189	60	18	1.2	6.2	0.4
National Recommended Target*			178	140	30	13	13	7
National Mean of Rural Residents**			199	100	19	5.2	5.4	3.4

Data Source: the authors calculated from survey materials.

*---China Food and Nutrition Development Program (2001-2010)

**---China Statistics Yearbook (2009)

3.2 HOUSEHOLD CHARACTERISTICS AND CONSUMPTION

Across the seven sample counties, per capita consumption level of different food items varies. Grain consumption in Hanyin and Ningqiang are the lowest. Consumption of vegetables, meats, and eggs are lowest in Yongshou. Consumption of aquatic products at large is quite low except in Leishan. Consumption of milk and milk products are in general quite low. Consumption across households also shows large difference. What factors are determining food consumption and its structure? Since we believe that household income, productive activities they engage in, and demographic characteristics will have some connection with consumption. We try to discern these factors firstly by grouping the observations via income, demographic features, and production activities (table 2).

We set a line at 1500 yuan for per capita annual net income. 38% of the household fell below this line. The consumption of grain, vegetables, fruits, meats, aquatic products, eggs, milk and milk products for households below the income line is 180kg, 44kg, 29kg, 13kg, 1kg, 3.3kg, and 0.7kg, respectively. The consumption by households above the line is obviously higher in all these items except milk and milk products. The difference is especially larger in the consumption of eggs, vegetables, meats, and aquatic products, the lower income group consumed 59%, 37%, 35%, and 29% less than the higher income group on average per capita consumption.

When we group the households according to education level of household head, the consumption by households with their head had 9 years and above education is higher in all these items except milk and milk products than households with their head had less than 9 years education. The gap is relatively obvious in the consumption of aquatic products, fruits, and meats, the lower education group consumed 42%, 26%, and 23%, respectively less than

the higher education group. When we group the households according to the age of household head and set a line at the age of 40. We find that the consumption of fruits, vegetables, and eggs by household with younger head is higher than elder head group, but the consumption of the rest items is lower than elder head group. We also find that if there is family member in the period of attending non-compulsory education, the consumption of grain, meats, eggs, milk and milk products is higher, while the consumption of other items is less than the counterpart group. The group analysis also show that households with more labors consumed more grain, meats, aquatic products than household with fewer labors, while they consumed less fruits and eggs. Households with members employed in nonfarm business consumed more grain, fruits, meats, and eggs than households without nonfarm employment.

Simple comparison shows that households that raised meat livestock consumed 7 kg per capita more than households they didn't (20 kg versus 13 kg). Households with more land consumed more grains, fruits, milk and milk products than households with less land. Households with access to convenient food market consumed more vegetables, meats, aquatic products, milk and milk products than households farther away from market.

Table 2 Households Characteristics and Consumption in Poor Regions

Group		No. of Obs.	Grain	Vegetables	Fruits	Meats	Aquatic products	Eggs	Milk & milk products
Income(yuan)	<=1500	53	180	44	29	13	1.0	3.3	0.7
	>1500	85	194	70	31	20	1.4	8.1	0.2
Education(year)	<=9	119	188	59	29	17	1.1	6.0	0.5
	> 9	19	189	64	39	22	1.9	7.1	0.3
Household head age	<= 40	49	184	64	36	17	0.8	6.5	0.3
	> 40	89	191	58	27	18	1.5	6.0	0.5
Non-compulsory Student?	Yes	26	190	55	25	18	0.8	6.8	0.8
	No	112	188	61	32	17	1.4	6.1	0.4
Labor share (%)	0-50	66	183	60	33	15	1.0	6.4	0.4
	51-100	72	195	60	28	20	1.6	5.9	0.4
Raise livestock?	Yes	78	186	63	32	20	1.8	5.4	0.6
	No	60	192	56	28	13	0.4	7.3	0.1
Land (mu)	<=1.5	66	181	72	25	20	1.5	6.5	0.1
	>=1.5	72	194	52	34	15	1.0	6.0	0.7
Nonfarm employment?	Yes	95	194	59	31	18	1.2	6.2	0.4
	No	43	176	63	28	16	1.3	6.1	0.6
Market Convenience*	Yes	37	184	66	30.7	24.5	2.6	5.6	0.5
	No	101	193	59	30.3	15.2	1.2	6.9	0.4

Data source: collected by the survey.

3.3 SELF-EVALUATION OF FOOD CONSUMPTION

The survey asked the farmers to evaluate their food consumption. As it turned out, only 38 households or 27.5% of the sample are satisfied with their current food consumption and its structure. 72.5% of the sample households are unsatisfied with their food consumption structure (table 3).

Table 3 Household Desired Improvement in Food Security

Item	Number of households	Share (%)	
Satisfied	38	27.5	
Unsatisfied	100	72.5	
Of unsatisfied, which item they expect to increase?	1. Animal protein food	59	43
	<i>Meats</i>	42	30
	<i>Aquatic products</i>	10	7
	<i>Milk& milk products</i>	11	8
	2. Edible oil	33	24
	3. Vegetables	14	10
	4. Fruits	9	7

5. Staple food/grain

6

4

What improvement do the households expect to increase their food security? Of those that are unsatisfied with their food consumption, 59 households, account for 42.8% of the total sample, expressed the desire to consume more animal protein food. 42 households or 30.4% of the sample expressed exactly that they need to increase the consumption of meats. 24% of the sample wishes to increase the consumption of edible oil. 10% of the sample wishes to increase the consumption of vegetables. 8% of the sample expects to increase the consumption of milk and milk products, 7% of the sample hope to increase the consumption of aquatic products and fruits. Only 4% of the sample expects to increase their consumption of staple food. As we can see from table 3, the priority demand from the households to improve food security in these poverty-stricken regions is to increase the consumption of animal protein food and meats consumption in particular.

Then who are those unsatisfied with their food consumption composition. As shown in table 4, households' satisfaction status show significant difference between groups when classified by characters including education, with non-compulsory student, whether raising livestock, and age of household head, whereas the difference in satisfaction at food consumption is indistinctively connected with characteristics including per capita income, land, and nonfarm employment.

Table 4 Household Self-Evaluation of food consumption in Rural Poor Regions

Group		No. of Obs.	% of households satisfied	Difference between groups (%)
Per capita income(yuan)	>=1500	85	28.24	1.82
	< 1500	53	26.42	
Household head age	>=40	89	47.13	8.01*
	< 40	49	39.12	
Education(year)	>=9	32	46.88	25.18*
	< 9	106	21.70	
Non-compulsory Student?	Yes	26	11.54	-19.71*
	No	112	31.25	
Labor share(%)	0-50	66	25.76	-3.41
	51-100	72	29.17	
Raise livestock	Yes	78	34.62	16.29*
	No	60	18.33	
Land (mu)	<=1.5	62	44.11	-1.54
	>=1.5	76	45.65	
Nonfarm employment	Yes	95	28.42	2.84
	No	43	25.58	
Market convenience	Yes	37	24.32	-4.39
	No	101	28.71	

*--- Difference greater than 5% is marked as significant difference.

4. MODELS AND ESTIMATION

4.1 SELF-EVALUATION AND INFLUENCING FACTORS: A PROBIT MODEL

Household's self-evaluation of food consumption status is a good indicator reflecting food security here. According to the statistics analysis in last section, we find that household's satisfaction with food consumption and structure is connected with household head's age, education, whether there is non-compulsory student, and whether they raise livestock. We construct an econometric model in attempt to identify factors influencing household's satisfaction at food consumption and to estimate the impact. We choose household's evaluation of satisfaction with food consumption as dependent variable. On basis of theoretical analysis, a Probit model is used to capture the various factors that might have an effect.

The equation to be estimated is as below:

$$\text{Probit (P)} \\ = \beta_0 + \beta_1 \text{income} + \beta_2 \text{age} + \beta_3 \text{edu} + \beta_4 \text{student} + \beta_5 \text{family} + \beta_6 \text{off_farm} + \beta_7 \text{livestock} + \beta_8 \text{land} + \beta_9 \text{market} + \sum_{s=1}^6 \gamma_s D_s + \varepsilon \quad (1)$$

where P is the probability of interviewee report satisfied with food consumption and its structure; "income" is the per capita net income; "age" is the real age of the household head; "edu" is the education level of the household head; "student" is a dummy that indicates whether the household had student attending non-compulsory education; "family" is a variable of family structure and is denoted by labor share; "off-farm" is a dummy that indicates whether the household had family member employed in nonfarm business; "livestock" is a dummy that indicates whether the household raised middle and large livestock; "land" is the per capita land area owned by the household; "market" is a dummy that indicates whether the household had access to food markets within one-hour walking distance; "Ds" is a county dummy. "ε" is the error term. β and γ are parameters to be estimated.

Table 5 Influence factors of Household Satisfaction: a Probit model analysis

Variable	dF/dx	z
income	0.0000745	2.44**
age	0.0088314	1.64
edu	0.0355495	2.47**
student	-0.2063437	-1.63
family	-0.2461603	-1.05
off_farm	-0.1165225	-0.9
livestock	0.0793179	0.71
land	-0.1022955	-2.02**
market	-0.5107519	-3.49***
Yongshou	0.0336098	0.16
Ningqian	-0.1641358	-1.1
Zhangjiachuan	-0.3367796	-2.44**
Hanyin	0.5114787	2.09**
Wushan	-0.0692284	-0.4
		LR chi2(14)=34.32
No. of Obs.=118		Prob > chi2=0.0019
Log likelihood = -56.99		Pseudo R2=0.2314

Note : ***---statistically significant at 1% ; **--- statistically significant at 5%.

The estimation results are summarized in table 5. The results show that income, education of household head, land owned, and market convenience all have statistically significant impact on households' self-evaluation of food consumption. Specifically, holding other factors constant, the higher the per capita income is, the more likely the household is satisfied with its food consumption. 100 yuan increase in per capita net income will increase the probability of being satisfied by 0.7 percentage point. Better educated household head is more likely to be satisfied

with food consumption. With one more year education, the probability of being satisfied will increase by 3.6 percentage points. This suggests that better educated people might be more capable in making their food consumption satisfied. If the household owns more land per capita, its possibility of being satisfied will be smaller. It might be that households own more land but the quality is poorer considering the adverse natural condition in poor counties. This suggests that low land productivity in poor region matters more than land quantity itself in affecting food consumption. The result also shows that closer to market facility will less possible to feel satisfied. It is possible that people will become less satisfied when they are exposed to better market convenience but they lack the ability to access it. It is intuitive that improvement of food availability will be discounted if households' access ability fails to be enhanced correspondingly.

4.2 ANIMAL PROTEIN FOOD CONSUMPTION AND INFLUENCE FACTORS

As we already shown in above analysis, sample household per capita consumption of meats, aquatic products, eggs, milk and milk products only reach to 60%, 9%, 48% and 6% of the target for rural areas as recommended in "China Food and Nutrition Development Program (2001-2010)". The consumption of these animal protein foods is far from recommended standard. 59% of those who want to improve food consumption put increase in the consumption of animal protein food on top of the agenda. And 42% wish to increase in the consumption of meats.

Based on these facts, we intend to analysis the factors affecting households' consumption of animal protein food. Considering the high substitutability between meats, eggs, aquatic products, milk and milk products, we use annual per capita consumption of meats, per capita consumption of animal protein food (simple total of meats, aquatic products, eggs, milk and milk products) , and per capita consumption of animal protein (calculate the animal protein content of animal protein food) respectively as dependent variable. We estimate the regression listed as below:

$$Y = \beta_0 + \beta_1 \text{income} + \beta_2 \text{age} + \beta_3 \text{edu} + \beta_4 \text{student} + \beta_5 \text{family} + \beta_6 \text{off_farm} + \beta_7 \text{livestock} + \beta_8 \text{land} + \beta_9 \text{market} + \sum_{s=1}^6 \gamma_s D_s + \varepsilon \quad (2)$$

The independent variables are defined as same as those in equation (1). The estimation results are summarized in table 6. Model (1)-(3) don't control for region fixed effects, while model (4)-(6) control for region dummy. The results show that household per capita net income, education of household head, labor share, raising livestock, and market convenience have statistically significant impact on the consumption of meats. However, the latter two lost significance when region dummies are included. The results suggest that household per capita net income, education of household head, labor share, and market convenience all have statistically significant impact on household consumption of animal protein food and calculated animal protein consumption, but the latter one lost significance when region dummies are included.

Higher income, better educated and more labor in the household all mean better capability of feed the family. To be specific, an increase of 100 yuan in per capita net income will increase per capita consumption of meats, animal protein food, and calculated animal protein intake by 0.095 kg, 0.16 kg, and 25 g, respectively. Additional one year to household head's education will increase the consumption of per capita consumption of meats, animal protein food, and calculated animal protein intake by 0.84 kg, 0.91kg, and 156 g, respectively. 10% increase in household labor share will increase per capita consumption of meats, animal protein food, and calculated animal protein intake by 1.3 kg, 1.8kg, and 304.5 g, respectively.

In model (1), the result indicates that household raising large and middle livestock will consume 6.55 kg more meats than otherwise household. It is possible that raising livestock will improve self-sufficiency in meats. In model (1) -(3), holding other factors constant, a household moves to a place with markets within one-hour walking distance will enhance meats consumption by 7.21 kg, animal protein food consumption by 7.49 kg, and animal protein intake by 1247 g. This suggests that better market access can increase food security. Results from the six regressions suggest that the impact of stock-raising and market facility might be regional specific.

Table 6 Influence Factors Analysis of Animal protein Food

Dependent	Meats (1)		Animal protein food (2)		Animal protein (3)	
	Coef.	t	Coef.	t	Coef.	t
income	0.001	3.74***	0.002	4***	0.33	3.72***
age	0.10	0.74	0.18	0.93	31.11	0.97
edu	0.87	2.46**	0.90	1.7*	156.51	1.77*
student	1.62	0.53	1.30	0.28	164.14	0.21

family	13.41	2.37**	16.68	1.97*	2933.99	2.08**
off_farm	-0.23	-0.09	0.43	0.11	35.65	0.05
livestock	6.55	2.69***	5.15	1.41	901.85	1.48
land	-0.84	-0.88	-0.52	-0.36	-116.11	-0.49
market	7.21	2.44**	7.49	1.69*	1247.39	1.69*
_cons	-6.88	-0.94	-6.94	-0.63	-1374.62	-0.75
	No. of obs.=138		No. of obs.=138		No. of obs.=138	
	F(9, 128)= 5.96		F(9, 128)= 4.05		F(9, 128)= 3.97	
	Prob > F=0.000		Prob > F=0.0001		Prob > F=0.0002	
	Adj R2=0.2458		Adj R2=0.1667		Adj R2=0.1634	
Dependent	Meats (4)		Animal protein food (5)		Animal protein (6)	
	Coef.	t	Coef.	t	Coef.	t
income	0.00095	2.68***	0.0016	2.8***	0.25	2.67***
age	-0.02	-0.15	0.05	0.25	8.21	0.27
edu	0.84	2.63**	0.91	1.8*	156.21	1.85*
student	1.28	0.46	-0.01	0	-13.38	-0.02
family	13.30	2.45**	17.61	2.05**	3045.59	2.13**
off_farm	0.73	0.28	1.09	0.27	131.90	0.2
livestock	-0.75	-0.3	-3.36	-0.85	-548.96	-0.83
land	-0.05	-0.05	0.97	0.63	115.99	0.46
market	3.29	0.79	-2.93	-0.44	-522.18	-0.48
Yongshou	-23.32	-4.71***	-33.12	-4.23***	-5511.59	-4.24***
Ningqian	-0.70	-0.16	-6.58	-0.95	-1188.09	-1.03
Zhangjiachuan	-18.85	-3.98***	-23.72	-3.17***	-4130.04	-3.32***
Lueyang	-13.75	-2.99***	-16.32	-2.24**	-3114.08	-2.58**
Hanyin	-7.75	-1.61	-2.74	-0.36	-579.03	-0.46
Wushan	-11.25	-2.57**	-10.71	-1.55	-1995.13	-1.73*
_cons	13.56	1.73	18.15	1.46	3031.01	1.47
	No. of obs.=138		No. of obs.=138		No. of obs.=138	
	F(15, 122)=7.3		F(15, 122)= 4.43		F(15, 122)= 4.41	
	Prob > F=0.000		Prob > F=0.000		Prob > F=0.000	
	Adj R2=0.4084		Adj R2=0.2732		Adj R2=0.2719	

Note : *---statistically significant at 10% ; **--- statistically significant at 5%,***--- statistically significant at 1% .

In model (4)-(6), households in certain counties tend to consume more animal protein food than households in base group. This suggests that regional factors, such as consumption habit, local resources or other customs, might play an important role in food consumption improvement. Further analysis in this direction might be instructive to improve food security by utilizing local positive factors or practices.

5. CONCLUSIONS AND SUGGESTIONS

According to our survey on seven national poor counties, the paper has several important findings in terms of food security at household level in poverty-stricken regions. In general, food security for most households in poverty-stricken regions is still a thorny challenge and they are unsatisfied with current food consumption status.

Firstly, most households achieved self-sufficiency at a lower level of grain consumption. 66% of the households consumed less grain than national recommended target. 68.1% of the household is self-sufficient in grain, 21.7%

borrowed grain from neighbors or relatives and 6.5% resorted to coarse cereals for substitute when they were deficient in staple food. 3.6% of the household experienced semi starvation for one to three months in the past year.

Secondly, non-grain food consumption is very low and less diversified for most households. The annual consumption of major food items are all below national recommended target for rural China. The percentage of households with consumption of vegetables, meats, aquatic products, eggs, milk and milk products below national recommended target is 100%, 78%, 97%, 85%, and 98%, respectively. The percentage of households that did not consume any meats, eggs, aquatic products, and milk products in the past year is 5.8%, 26.8%, 73.9%, and 91.3%, respectively.

Thirdly, 72.5% of the sample households are unsatisfied with their food consumption structure. 59% of those unsatisfied wish to increase the consumption of animal protein food and meats in particular. Econometric analysis shows that increase in income, household head education level, and labor share will significantly enhance the consumption of animal protein food.

Fourthly, there is visible regional difference in food consumption and especially in animal protein food consumption. Local specific practices in stock-raising, market facility have evident impact on animal protein food consumption. The impact of local practices on animal protein intake should be further investigated.

Based on the above mentioned findings, the paper proposes several advices to improve household food security in poverty-stricken regions. In the first place, for the small portion of households that lack the resources to obtain enough staple food, it's the local government's responsibility to identify this population and transfer relief grain in time. Secondly, development of agriculture is essential to attack food insecurity and poverty, investment in agriculture must be boosted in poverty-stricken regions. Households should be encouraged in particular to use new agricultural technology and raise livestock to increase grain consumption and animal protein intake. Thirdly, more regional specific practices, such as market access improvement should be explored. Useful knowledge on utilization of local food resources should be widely available to help people make full use of local food resources under limited food budget. Finally, it goes without saying that poverty is one major reason of food insecurity in surveyed regions. It is vital for local government to guarantee employment and income growth through various measures, such as development of education cause, training, and broadening nonfarm opportunities.

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