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# Agricultural assistance in China: An analysis of farmers' opinions

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**The purpose of this study was to examine farmers' needs for agricultural assistance to help improve production, marketing, and farm finance. Though agricultural assistance has become more available to China's rural farming communities, little if any, research is available to evaluate the impact of the assistance on farming efficiency. Which farming groups have the highest demand for the assistance and what types of assistance are in urgent need? This study uses a Canonical Discriminate Analysis to examine farmers' perceived usefulness of selected agricultural assistance to answer the above questions. Using face-to-face interviews, agricultural economics students collected 332 surveys in 2007 from producers in China's major agricultural production provinces of Shaanxi (128 observations), Shanxi (115 observations), and Shangdong (89 observations). The results show that a severe shortage of agricultural assistance has greatly affected the majority of farm households on their production, marketing and financial aspects of the business practice. Some farmers with larger land and higher total farm expenditures are likely to seek for improved assistance on production. Those who worked off the farm to compensate farm financial needs have reported especially a strong desire for financial and marketing related assistance. This study reveals that surveyed farm operations in China have been challenged by the inefficient agricultural support and that the government policy interventions need to be planned to furnish an adequate support to aid farming efficiency.**

**Key words:** Agricultural assistance, farmers' needs for agricultural assistance, agricultural assistance in China's major production areas.

## INTRODUCTION

With its new role as a leader in the world economy, China is seriously challenged inefficiency by its lack of efficiency in production agriculture. How to effectively improve government support to aid food production has become an urgent issue. Lately, an extensive public debate has been conducted to discuss the availability of agricultural assistance to rural farming communities and how this assistance could improve social and economic welfare of the farming households (Hu et al., 2009; Rozelle et al., 2005; Huang and Hu, 2005; Dai and Xue, 2005). On the

one hand, a group of researchers have noted that agricultural support from the government was sufficient in past decades and that it has still contributed to the present rapid growth of agricultural productivity (Kong, 2008; Kong et al., 2007; Perkins, and Yusuf, 1984). As a result of the support, agricultural production output has been sufficient to feed China's people of 1.2 billion. On the other hand, researchers have observed uneven government support across regions and they are concerned about the lamentable consequences of such a significant assistance shortage for remote production regions (Rozelle, Huang and Otsuka, 2005). The latter group states: "government programs to help develop impoverished villages have not effectively reached much of the poor who reside in

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remote, resource-poor and ethnic-minority areas” (Rozelle et al., 2005).

This on-going debate has helped agricultural researchers and policy planners rethink the usefulness of agricultural support to improve the economic welfare of the farming community (Kong et al., 2007; Kong, 2008). Policy planners started to notice that disconnected farming communities are the biggest challenge for agricultural improvement. The Chinese government recently updated a series of regulations to help improve production technologies and assist farmers in the marketing of their outputs. The 2004 new Agricultural Policy stated that: “government supported agricultural assistance aim to improve farm production efficiency by financing production inputs of seeds, reinforce the use of production technology... provide a better marketing environment to aid commodity trading and improve farm financial efficiency by farm loans and tax reduction.” (China’s Agricultural Policy, number 1, 2004). To fulfill these goals, the Chinese government has largely invested in agriculture with a documented record high of USD \$30.8 billion spent on agricultural assistance programs in 2006 (Kong, 2008).

Anecdotal evidence indicates an increase in the percentage of available agricultural assistance is provided to rural farming communities. However, little if any research conducted to analyze the efficiency of these programs. Which farming groups have the highest demand for assistance? What types of assistance are timely desired? This study uses survey information collected from farmers who received the support to examine perceived efficiency of China’s agricultural assistance to help government planners propose proper policy interventions and to contribute to academic understanding on the issue.

### **China’s agricultural assistance revisited**

Agricultural assistance in China is mainly directed by farm extension services (Stavis, 1978; Dai, 2000; Hu, 2009). According to Stavis, over 100 agricultural research institutions were established by 1965 to aid the diffusion of research outcomes among farming communities. China’s education system trained over one hundred thousand college students in Agricultural Science to run the agricultural extension services. Farm extension assisted in the establishment of a multiple cropping system to make, cold tolerant and higher yield crops widely available to growers in south and central south China. With such a successful spread of the crops, a rapidly growing grain production has rapidly increased. “[F]rom 1952 to 1957, grain production grew at about 3.7%... grain production grew from 1963 to 1967 at about 5.9%” (Stavis, 1978).

In addition to distributing new technologies invented by scientists, agricultural extensions also assisted scientists to learn agricultural innovations developed by farmers.

According to Stavis, agricultural extension researchers are required to collect innovations developed by farmers, assist in the testing of these innovations, and make the innovations available to other farmers.

Dai and Xue (2000) studied the structure of the contemporary agricultural extension systems in China and noted that extension service stations were established in every rural county to help with crop and livestock production, agricultural machinery adoption, and economic development. Specialized sub-stations were also established to satisfy the needs of farmers who grow specialized crops in isolated regions. Assistance was made available to aid remote farmers improve crop management, plant protection, and the use of soil-and fertilizer-technologies. The goals of the extension stations and sub-stations were said to: 1) diffuse newly available agricultural technologies; 2) help farmers access various government provided production services; and 3) communicate agricultural policies to rural farmers (Dai and Xue, 2000). Agricultural extension officers also provide consultant services to farmers to improve adoption of new technologies. These officers also work with demonstration stations to present outcomes of a new technology.

Though literature has chronicled satisfactory outcomes of China’s farm extension services, a recent study reveals that extension stations contribute very little to the delivery of needed help to farmers due to their high engagement in commercial activities (Hu et al., 2009). The authors note that since 1988 China’s central government has locally funded agricultural extension stations, which result in a shortage of fund to operate the stations. Thus, many officers spend significant hours to seek financial support from other sources. The study shows that on average a government fully funded township station, which should be in closest contact with farmers, spent less than 81 days each year to serve farmers; a partially funded station spends 54 days; and a self funded station spends even less time. The focus on looking for outside financial support has resulted in low quality services (Huang et al., 2001). Hu et al. suggest that the central government providing better financial support to extension stations can be critical to improve efficiency of China’s farming assistances.

## **METHODOLOGY**

### **Data collection**

This section presents the sample selection procedure, the survey process and, summary statistics. A survey was conducted in the summer of 2007 by agricultural economics students and researchers from Renmin University of China who interviewed farming households in three major agricultural production provinces of Shaanxi (128 observations), Shanxi (115 observations), and Shangdong (89 observations). In the three surveyed provinces, the researchers first randomly selected towns and then randomly selected villages before randomly choosing farm households to visit. In total, eight villages in Shaanxi with 128 selected households,

**Table 1.** Demographic information and household profiles (Data 2007).

Definition	Aggregate (n=316)				Shaan'Xi	Shanxi	Shandong
	Mean	S.D.	Max	Min	n = 125	n = 107	n = 84
Age of household head	49.08	11.30	80	19	49.91	49.07	47.85
Household members	4.11	1.49	9	1	4.40	3.96	3.86
Total areas owns	1.25	5%	36	0	0.79	1.52	1.58
Total income in 2007 (until summer) (In USD: 1USD=7.57 CNY)	2739.6	3767.8	30383.1	0.00	2743.3	3074.6	2307.7
Total expenditure in 2007 (until summer)	2589.2	39.4	55348.7	51.5	3405.3	2403.7	1560.1
Education (in %)	Percent (%)	--	--	--		Percent (%)	
Illiterate	5	--	--	--	2	6	10
Elementary	20	--	--	--	17	21	23
Middle school	52	--	--	--	5	51	48
High school	20	--	--	--	22	21	15
Technical school	2	--	--	--	2	1	4
College	0	--	--	--	0	0	0.00
Above college	0	--	--	--	0	0	0
Gender	1=male	83	--	--	85	80	86
	0=female	17	--	--	15	20	14
Marital status	1=married	96	--	--	98	97	91
	0=no	4	--	--	2	3	9
Had off-farm work experience or not	1=yes;	35	--	--	30	46	26
	0=no	65	--	--	70	54	74
Currently hold an off-farm job or not	1=yes;	25			22	21	34
	0=no	75			78	79	66
Household decision maker or not	1=yes;	85	--	--	84	85	88
	0=no	15	--	--	16	15	12

twelve in Shanxi with 115 selected households, and eight in Shandong with 89 selected households were visited. The random selection process was based on a local agricultural administrative database, which resulted in more villages to be surveyed in Shanxi province. Questions regarding agricultural households' perceived efficiency for production, marketing, and financial related assistances were asked during the interview. When selected respondents did not show up, convenience sampling was applied and survey administrators randomly selected farm households to fill the absence of the selected farmers. A 14-page survey was used. We asked demographic information and perceived effectiveness of thirty-seven types of services to assist farm production, marketing, and finance. When the respondent had previously used the listed assistance, he/she was also asked to assess the quality of the assistance. We also collected information about perceived challenges in farming. Specifically, we asked them if a low access to technologies and processing facilities, barriers to access markets, and limited financial assistance affected farm growth. Among the 332 observations obtained, 16 contained missing information, which resulted in a total of 316 useful observations.

### Preliminary statistics

Summary statistics about farm profiles are presented in Table 1. The aggregate sample combining the three surveyed regions shows that

the respondents' mean age is about 49 years. The mean age of the Shandong respondents is slightly younger, but the difference is not statistically significant. On average, the surveyed households have about four family members (mean 4.11) with Shanxi and Shandong having slightly smaller household size. The households own 1.25 acres on average, with Shanxi and Shandong having statistically significant higher mean acres than Shaan'Xi ( $t > 6.51$ ). Average income of the wealthiest region of Shanxi (mean income = USD3074.6) is significantly higher than the less wealthy Shandong province ( $t = -1.659$ ). Constrained by this lower income, the expenditures of Shandong households seem lower than households in the other two regions ( $t = 2.89$ ). A majority of our respondents (75%) have a middle school or above education. Many of the surveyed household heads have off farm work experience, for example 46% of respondents from Shanxi had worked off the farm before and about 25% of all surveyed farmers have an off farm job to augment farm income. More respondents from the coastal province of Shandong report the involvement in off farm work (34%).

The surveyed households specialize in different crops. Though a majority of surveyed farm operations grow corn, rice, sorghum, and wheat (67%), respondents (81%) from Shandong are likely to focus on grain production and from Shaan'Xi focus on fruits (84%). The specialty crops of pecan, peanuts, and other oil plants are widely grown by Shandong growers (78%) but rarely in Shaan'Xi. Only about 20% of our respondents are involved in livestock production and even fewer in vegetable production (18%). However, a high

percentage of respondents from the inland Shanxi province do grow vegetables of tomatoes, potatoes, and cucumbers among other vegetables. In the coastal province of Shandong, a small percentage of respondents (15%) engage in horticulture to grow flowers.

Looking at farm diversification across the three regions, we found that 82% of Shandong respondents have diversified to grow more than one category of crops including grain, fruits, specialty crops, livestock, vegetables, and horticultural crops. Respondents from Shanxi (70%) and Shaan'Xi (50%) also have diversified to grow more than one crop.

## Econometric analysis

### Canonical discriminate analysis

Canonical discriminate analysis is popularly used by applied economists to analyze variance of linearly combined variables between two or more groups compared to the single within-group variance (Bibb and Roncek, 1976). We separated our responses into two groups. The goal of our analysis was to compare differences between those farmers who have a high desire and those who have a low demand based on all multiple predictor variables simultaneously. Canonical discriminate analysis is a proper statistic procedure to analyze group difference in choices. In our analysis, the multiple predictor variables selected include demographic information of age (AGE), education (EDUCATION), gender (GENDER), and decision-maker of the household (DECISION). We include economic variables of household size (HHSIZE), total acres owned (LAND), total income (TINCOME) and total household expenditure (TEXPENSE). Other variables selected include off-farm work experience (EXPERIENCE), currently hold an off farm job or not (OFFFARM), whether the firm is diversified or not (DIVERSIFY), and whether a member of an agricultural cooperative (AGCORP). A detailed summary statistics of these variables appear in Table 4. We included a list of predictor variables to explain a single dichotomous criterion variable, which represents Chinese farmers' perceived demand for agricultural assistance on farm production, marketing and finance efficiency. This single dichotomous criterion variable used is the dummy variable of 0 = low need for assistance; 1 = high need for assistance. This study separated the assistance into three categories of "production assistance", "marketing assistance" and "financial assistance". Previously published research has used similar categories. For example, Ransom and Bain (2011) differentiated the types of agricultural assistance and categorize them into "commodity production", "finance to get loans and credits", "infrastructure" to help with marketing and transportation (Ransom and Bain, 2011). The dependent variable of assistance has theoretical relationship with the independent variables. Demographic variables and farmers' economic information have been used to explain farm perceived importance of government support programs (Rejesus et al., 2009). We added additional explanatory variables to understand the influence of these variables on Chinese farmers' opinions (Rozell et al., 2000, 2005; Dai and Xue, 2000; Findlay et al., 2003; Kong, 2008; Hu, 2009). For example, we added a variable to explain how the perceived importance will change if a respondent holds a membership position in an agricultural cooperative, compared to a non-member.

Are there any theoretical relationships between need for "production assist" and the other dependent variables and the independent variables? Could they be briefly stated, if they exist?

$$\begin{aligned} \text{PRODUCTION ASSIST} = & \beta_1(\text{AGE}) + \beta_2(\text{EDUCATION}) + \beta_3(\text{EXPERIENCE}) \\ & + \beta_4(\text{GENDER}) + \beta_5(\text{HHSIZE}) + \beta_6(\text{LAND}) \\ & + \beta_7(\text{DECISION}) + \beta_8(\text{DIVERSIFY}) + \beta_9(\text{OFFFARM}) \\ & + \beta_{10}(\text{TINCOME}) + \beta_{11}(\text{TEXPENSE}) + \beta_{12}(\text{AGCORP}) \end{aligned}$$

$$\begin{aligned} \text{MARKETING ASSIST} = & \beta_1(\text{AGE}) + \beta_2(\text{EDUCATION}) + \beta_3(\text{EXPERIENCE}) \\ & + \beta_4(\text{GENDER}) + \beta_5(\text{HHSIZE}) + \beta_6(\text{LAND}) \\ & + \beta_7(\text{DECISION}) + \beta_8(\text{DIVERSIFY}) + \beta_9(\text{OFFFARM}) \\ & + \beta_{10}(\text{TINCOME}) + \beta_{11}(\text{TEXPENSE}) + \beta_{12}(\text{AGCORP}) \end{aligned}$$

$$\begin{aligned} \text{FINANCE ASSIST} = & \beta_1(\text{AGE}) + \beta_2(\text{EDUCATION}) + \beta_3(\text{EXPERIENCE}) \\ & + \beta_4(\text{GENDER}) + \beta_5(\text{HHSIZE}) + \beta_6(\text{LAND}) \\ & + \beta_7(\text{DECISION}) + \beta_8(\text{DIVERSIFY}) + \beta_9(\text{OFFFARM}) \\ & + \beta_{10}(\text{TINCOME}) + \beta_{11}(\text{TEXPENSE}) + \beta_{12}(\text{AGCORP}) \\ & \beta_{13}(\text{FUND}) \end{aligned}$$

The selected predictor variables can be further categorized as a farm managers' profile variables and farm characteristics variables. A description of all dependent and independent variables is shown in Tables 4 to 6.

According to Fisher (1936), canonical correlation analyzes the correlation between the linear combination of variables in one set and in another set. The correlation between the dependent variables of the two groups is called canonical correlation. The aim of the canonical correlation analysis is to estimate canonical coefficients when the canonical correlation is maximized. In discriminant analysis, the maximization procedure aims to "spread apart" the group means while simultaneously compressing the differences between the individual variable values and their respective group means (Tiedeman, 1951 as cited by Bibb and Roncek, 1976). Maximizing the correlation coefficient, we obtained the total canonical structure coefficient, or loading. This coefficient represents the simple linear correlation between each independent variable and their respective dependent variable. To unfold the contribution of each explanatory variable to the separation of the two groups, we computed the standardized discriminant function coefficient.

## RESULTS

The computed coefficients for production related assistances are presented in Table 4; marketing related assistance in Table 5, and finance related assistance in Table 6.

### Production related assistances

We organized the selected fifteen production related assistances into four categories: 1) providing production technology supports; 2) assisting the procurement of seeds and fertilizers; 3) building irrigation systems, and 4) helping with custom harvests. An efficient assistance on these activities could contribute largely to rapid productivity growth (Rozelle et al., 2005) and thus can improve farm level efficiency. In our analysis, the dichotomous criterion variable was separated into two groups. The first group, coded as 1, represents household heads that have reported a need of six or more production related assistances (high need group). The second group, coded as a zero, represents household heads that reported a need of less than six production related assistances (low need group).

**Table 2.** Reported Information on Farm Level Diversification (Data 2007).

Definition	Aggregate (n=316)	Shaan'Xi	Shanxi	Shandong
	n=310	n=123	n=107	n=80
<b>Respondents growing each listed categories (%)</b>				
(Percentages do not total 100% because responses are not mutually exclusive.)				
Grains	67	50	76	81
Fruits	56	84	60	9
Specialty crops*	29	4	22	78
Livestock	21	14	23	28
Vegetables	18	9	29	16
Horticulture	8	2	8	15
<b>Farm level diversification</b>				
Grow one category listed above	35	50	30	18
Grow Two categories	37	37	33	44
Grow three categories	22	11	28	30
Grow four categories and above	6	2	9	8

\*Specialty crops include pecan, peanuts and oil plants.

**Table 3.** Percentage of respondents reported some difficulties or great difficulties in obtaining relevant assistance.

	Aggregate (n=316)	Shaan'Xi	Shanxi	Shandong
	n=316	n=125	n=107	n=84
Assistance to market harvested products	61	67	72	39
Needed land	64	80	61	43
Production material supplies, that is, seeds, tractors, fertilizer fund	47	62	54	17
Production technology support	48	61	48	29
Assistance in product processing	36	49	37	16
	7	7	11	5

Tests of the discriminant function suggest a statistically significant difference between the high need group and the low need group when using the aggregated data from all three provinces. The canonical correlation of 0.318 indicates that 31.8% of the variance between the two groups can be explained by the selected discriminant function variables. A high Wilke's Lambda of 0.899 suggests that one can reject the null hypothesis that the selected two groups have the same mean discriminant function scores. The group centroids are well apart indicating that the selected discriminant function is appropriate in differentiating the two groups. The low F statistics and high calculated probability (Prob > F) for the Shaan'Xi and the Shanxi samples indicate that the selected explanatory variables can explain the differences between the high need and low need groups for these two provinces (Table 4).

The standardized canonical coefficients measure the relative importance of each predictor variable in explaining the differences between the two groups. These coefficients determine the unique contribution of each of the predictor variables to the group differences. We also calculated the total canonical structure coefficients to

measure how closely a variable and a function are interrelated and are not affected by relationships between groups; that is, it denotes the simple correlations between the selected predictor variables and its function (Klecka, 1982). In the aggregated model, from the significance of the standardized canonical coefficients, we found that total farm expenditure (TEXP), total acres owned (LAND), and household heads' previous experiences working off the farm (EXPERIENCE) are positively related to the high need group. Whether the respondent is a household head (DECISION), if he/she currently has an off-farm job (OFFFARM), and the reported size of the household (HHSIZE) are all negatively related to the high need group. This result shows that a household head who holds an off farm job and who has a smaller family of fewer than four members tends not to report a high desire for production related assistance. Among these important predictor variables, total expenditure contributes the largest to the group differences. The resulting structure coefficients confirm that total farm expenditures and total acres owned are the two dominant variables that are most correlated with the high need group and thus account for most of the differences among the two groups. This tells the story that

**Table 4.** Perceived demand for production related assistance (Data 2007).

		<b>Aggregated (305)</b>		<b>Shaan'xi (n=124)</b>		<b>Shanxi (n=107)</b>		<b>Shandong (n=75)</b>	
		<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>
<b>Independent variables</b>		<b>Perceived needs in production activities: 1 if reported needs is greater than 6; 0 if 6 or less</b>							
AGE	1 if 49 or above	0.183	0.086	0.146	0.194	-0.875	-0.523	1.019	0.457
EDU	1 if > elementary	0.281	0.093	0.239	0.066	-0.206	0.071	0.093	-0.037
EXPERIENCE	1 if had off-farm job	0.703	0.194	0.659	0.18	0.266	0.499	0.381	0.020
GENDER	1 if male	0.342	0.161	-0.138	-0.046	0.131	0.08	1.857	0.403
HHSIZE	1 if has >=4 members	-0.360	0.08	-0.128	0.04	-0.512	-0.020	-0.096	0.090
LAND	1 if <=1.15 acres	0.834	0.472	1.019	0.54	0.783	0.355	0.330	0.243
DECISION	1 if decision maker	-0.890	-0.052	0.212	-0.169	0.159	0.185	-0.510	-0.146
DIVERSIFY	Diversification levels	0.206	0.182	0.416	0.344	0.113	0.191	0.353	0.177
OFF-FARM	1 if holds off-farm job	-0.606	-0.225	-1.82	-0.531	0.471	0.204	1.000	0.220
TINC	1 if >= \$2695/year	-0.284	0.176	-0.553	0.147	-0.184	0.05	0.430	0.185
TEXP	2 if >= \$2695/year	1.764	0.747	1.262	0.408	1.552	0.601	1.243	0.396
AGCORP	1 if member of ag. Cooperative	0.583	0.162	-0.476	-0.038	1.454	0.235	0.495	0.126
Canonical correlation		0.318		0.427		0.424		0.400	
F Statistics		2.74		2.049		1.714		0.982	
Wilke's Lambda		0.899		0.817		0.82		0.840	
Philla's Trace		0.101		0.183		0.18		0.160	
Prob F		0.002		0.03		0.076		0.476	
Group "Centroids" (means)									
High need group		0.221		0.188		0.178		0.267	
Low need group		-0.272		-0.284		-0.383		-0.115	

**Table 5.** Perceived demand for marketing related assistance (Data 2007).

		<b>Aggregate (n=305)</b>		<b>Shaan'xi (n=124)</b>		<b>Shanxi (n=107)</b>		<b>Shandong (n=75)</b>	
		<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>	<b>Standardized</b>	<b>Structure</b>
<b>Independent variables</b>		<b>Perceived needs for marketing assistances: 1 if reported needs is greater than 3 activities; 0 if 3 or less</b>							
Independent variables									
AGE	1 if 49 or above	-0.507	-0.245	0.833	0.354	-0.471	-0.437	0.729	0.426
EDU	1 if > elementary	0.654	0.394	-0.484	-0.389	0.091	0.154	0.044	-0.000
EXPERIENCE	1 if had off-farm job	0.775	0.476	-0.812	-0.299	-0.207	0.127	0.626	0.206
GENDER	1 if male	0.094	-0.033	-0.000	0.152	-0.707	-0.232	2.005	0.553
HHSIZE	1 if has >=4 members	0.49	0.252	-0.708	-0.052	-0.762	-0.144	0.851	0.491

**Table 5.** Contd.

LAND	1 if <=1.15 acres	-0.533	-0.287	0.975	0.272	0.018	-0.032	0.313	0.319
DECISION	1 if decision maker	0.159	0.245	0.451	0.158	0.596	0.498	-0.340	0.096
DIVERSIFY	Diversification levels	-0.298	-0.243	0.141	0.158	0.057	0.112	0.155	-0.014
OFF-FARM	1 if holds off-farm job	0.296	0.183	1.399	0.259	0.726	0.404	0.978	0.319
TINC	1 if >= \$2695/year	0.709	0.461	-0.677	-0.444	0.698	0.383	-0.304	-0.138
TEXP	2 if >= \$2695/year	0.747	0.474	-0.182	-0.115	1.174	0.543	0.368	0.026
AGCORP	1 if member of ag. Cooperative	-0.697	-0.354	0.984	0.448	0.586	-0.129	0.466	0.149
Canonical correlation		0.252		0.366		0.482		0.508	
F Statistics		1.654		1.42		2.378		1.800	
Wilke's Lambda		0.936		0.866		0.767		0.742	
Philla's Trace		0.063		0.134		0.232		0.258	
Prob F		0.076		0.167		0.01		0.067	
Group "Centroids" (means)									
High need group		0.258		0.156		0.723		0.717	
Low need group		-0.057		-0.057		-0.100		0.102	

**Table 6.** Perceived demand for financial related assistance (Data 2007).

		Aggregate (305)		Shaan'xi (n=124)		Shanxi (n=107)		Shandong (n=75)	
		Standardized	Structure	Standardized	Structure	Standardized	Structure	Standardized	Structure
Independent variable		Perceived needs for marketing assistances: 1 if reported needs is greater than 3 activities; 0 if 3 or less							
AGE	1 if 49 or above	-0.278	-0.125	-0.717	-0.163	-0.120	-0.189	0.040	-0.183
EDU	1 if > elementary	0.444	0.280	0.237	0.241	0.090	0.360	-0.474	-0.141
EXPERIENCE	1 if had off-farm job	0.087	0.036	0.196	0.035	0.012	-0.078	-0.409	-0.264
GENDER	1 if male	-0.327	-0.062	-1.686	-0.426	0.304	0.156	-0.003	0.080
HHSIZE	1 if has > =4 members	0.335	0.301	0.404	0.163	-0.389	0.110	0.678	0.361
LAND	1 if <=1.15 acres	0.137	0.008	0.441	0.206	0.276	0.069	0.536	0.525
DECISION	1 if decision maker	0.117	0.094	0.014	-0.184	0.220	0.297	0.016	0.013
DIVERSIFY	Diversification levels	0.001	0.010	-0.051	0.105	0.133	0.143	0.615	0.550
OFF-FARM	1 if holds off-farm job	0.250	0.200	-0.865	-0.219	0.876	0.431	1.252	0.449
TINC	1 if >= \$2695/year	-0.088	0.008	0.366	0.276	-0.013	-0.152	-0.475	-0.118
TEXP	2 if >= \$2695/year	0.333	0.232	-0.137	-0.087	0.657	0.255	0.271	0.077
AGCORP	1 if ag. Cooperative	-0.410	-0.138	-0.235	-0.136	0.954	0.153	-0.970	-0.481
Fund	1 if funding is a challenge	1.019	0.900	0.781	0.652	0.911	0.815	-0.284	0.096
Canonical Correlation		0.386		0.394		0.583		0.439	

**Table 6.** Contd.

F Statistics	3.903	1.591	2.942	1.105
Wilke's Lambda	0.851	0.840	0.709	0.806
Philla's Trace	0.149	0.159	0.291	0.193
Prob F	0.000	0.098	0.001	0.372
Group "Centroids" (means)				
High need group	0.348	0.110	0.080	0.372
Low need group	-0.399	-0.266	-0.08	-0.189

a respondent who grows the largest acres and spend a large expenditure on farming would be more likely to demand production related assistance.

This significant contribution of total farm expenditure and total acres owned was also found in the Shaan'Xi sample. Given fruits and grains are Shaan'Xi's main crops, land is used as a major production factor and respondents who have larger land holdings are more likely to report a high desire for production related assistance. We detected that the respondents would require fewer assistances if he/she currently has an off farm job (OFF-FARM). We also found that, on average, household heads who currently work off the farm own fewer acres compared to those who work full time on the farm ( $t = 1.68$ ). The land constraint and the involvement in off farm activities can result in reduced production activities, and thus a reduced demand for production related assistance. This high impact of total farm expenditures on production related assistance held true for the Shanxi sample. In addition to this, household heads' age appears to be negatively related to his/her demand for production related assistances (AGE).

Given these results, we conclude that the need for production related assistances is mainly a response to the total household expenditure and total acres owned. Specifically, a higher household

expenditure with more acres grown results in a higher demand for production related assistance. If the household head holds an off farm job, his/her demand for assistance is lower, as appeared in the Shaan'Xi sample. If the household head is young (less than 49 years old), the likelihood of him/her reporting a higher demand for assistances could increase, as was suggested by the Shanxi sample.

#### Marketing related assistances

Marketing assistance includes providing: 1) assistance to forecast future market price; 2) information about where to find packing materials; 3) training on how to store harvested goods; 4) information about transportation services; 5) information about local wholesalers; 6) information about local processing facilities; and 7) information about new agricultural marketing policies. The canonical correlation regression for the aggregated marketing needs data suggests that 25.2% of the differences between the two groups are explained by the selected variables. The high Wilke's Lambda (0.936), the significant F statistics (1.654), low probability  $> F$  (0.076) and the well apart group centroids all demonstrate the goodness of fit of the selected model. When the same model was applied to the Shanxi sample and the Shandong sample, the results were

statistically significant. However, the model performance for the Shaan'Xi regression was insignificant, which indicates the reported coefficients were not stable enough to fully explain the relationship between the dependent and independent variables (Table 5).

In the aggregated model, five predictor variables clearly explain the differences between the two groups: 1) previous experience working off farm (EXPERIENCE, 0.775); 2) total farm expenditures (TEXP, 0.747); 3) total farm income (TINC, 0.709); 4) participation in local agricultural cooperatives (AGCORP, -0.697); and 5) household heads' education (EDU, 0.654). These five variables were all loaded to the regression indicating that they are appropriate variables to explain the need for marketing related assistances. The resulting coefficients suggest that a household head who previously worked off the farm, with relatively high total farm expenditures (\$2695 or above) and total farm income (\$2695 or above), who has an above middle school degree are more likely to request higher assistance to market farm products. This study defines off farm jobs as: 1) short term working for other farms in the same agricultural community; 2) short term working in a town/city; 3) working for an agribusiness marketing firm; 4) working for other agribusiness cooperatives; and 5) managing other farmers' agribusinesses. Working off the farm can expose the farmer to the



macroeconomics marketing environments, and thus improve his/her knowledge about the market. With this improved marketing knowledge, farmers are able to develop their own marketing plans, and require additional marketing related assistances to carry out the plans.

Interestingly being a member of a local agricultural cooperative reduces the need for marketing related assistances. This may be explained by the fact that a single farm seller has lower bargaining power than a large buying cooperative and thus needs additional help to marketing their products. According to Kong et al. (2008), combining single farms into an agricultural cooperative to negotiate sales can largely improve farmers' bargaining power (page 86). The combined agricultural cooperatives, rather than an individual farming household, could sell more effectively and thus members of agricultural cooperatives who rely more on the group bargaining activities are less likely to demand marketing related assistance. In our sample, 15% of the respondents are members of agricultural cooperatives and the needs from these respondents to market their products are relatively low compared to non-cooperative members.

Results from the Shanxi sample indicate that farm total expenditures (TEXP, 1.174), currently holding an off farm job (OFF-FARM, 0.726), total farm income (TINC, 0.698) and whether a decision maker in the family (DECISION, 0.596) all positively contribute to the respondents' high desire for marketing related assistances. The Shandong sample tells a different story. Respondents' gender (GEN, 2.005), size of the household (HHSIZE, 0.851), currently holding an off farm job (OFF-FARM, 0.978), and age of the household head (AGE, 0.729) are main factors explaining the high needs for marketing related assistances. This result suggests that respondents from a larger household, who are a young male currently holding an off farm job tend to require more marketing related help.

### Finance related assistances

Finance related assistance in this study includes providing information about: 1) where to obtain letters of credit; 2) how to verify farmers' ability to repay the loans; 3) sources of loans; 4) how to apply loans for a group of farmers; and 5) new agricultural financial policies (Table 6). A new variable denoting farm households' perceived availability of agricultural fund is added to the discriminant function. It was coded as 1 if the respondent perceives a lack of funds as a significant challenge to the farm success, and 0 if it is not a challenge. Though this FUND variable was previously added to the discriminant functions to explain production and marketing related assistance, it did not change the result and thus we removed it. Adding the FUND variable greatly improved the performance of this financial assistance regression. The model goodness of fit for the aggregated model, the Shaan'Xi and the Shanxi

model is significant (Prob F <0.1). Both the structure coefficients and the standardized coefficients in the aggregated regression show that respondents who reported great difficulties in getting funds tend to have a high demand for financial related assistances (FUND, 1.019). The Shaan'Xi sample provides additional evidence that women respondents (GEN, -1.686) who have difficulty getting funds (FUND, 0.781) are likely to seek financial related assistance. This funding constraint (FUND, 0.911) drives respondents to pursue off farm working opportunities (OFF-FARM, 0.876) to help with farm finance situations, and thus respondents from Shaan'Xi tend to demand less financial assistance. Interestingly, those from Shanxi and Shangdong who hold off farm jobs request additional financial assistance to reduce the financial pressure from farming.

### DISCUSSION

Previous studies have noted that China's agricultural households strongly desire new production technologies enhanced marketing channels, and a more efficient financial system (Rozell et al., 2000, 2005; Findlay et al., 2003; Dai and Xue, 2000; Hu, 2009). To meet these demands the Chinese government has restructured the agricultural extension system to provide related assistance (Dai and Xue, 2000; Kong et al., 2008). Besides its direct investment on agriculture, the government has also financed the farm-initiated agricultural cooperatives and included it as a new service available to agricultural communities (Kong, 2008). These direct and indirect investments in agriculture seem to help farmers achieve rapid production growth and improved farm level profitability (Kong, 2008). However, farm level opinions about the efficiency of these government assistance programs have not been researched. This study discovered that a shortage of production, marketing and finance related assistance has largely affected a great majority of surveyed respondents. Our sample gathered from Shaan'Xi, Shanxi and Shandong agricultural communities, suggest that there is an urgent for assistance to: 1) market their farm outputs; 2) access to larger acres; 3) fund; and 4) production materials.

This urgent need is especially critical to aid the two inland provinces of Shaan'Xi and Shanxi to obtain economic efficiency (Table 7). One purpose of this study was to identify farm groups that require the greatest assistance. A discriminant analysis based on the aggregated three-province sample revealed that farms who grow more acres and who have a higher total expenditure tend to demand more assistance to improve production efficiency. These farms differ from other farms in regard to their engagement in off farm jobs. The disaggregated Shaan'Xi regression shows that household heads who currently hold an off farm job are less likely to seek production related assistance. Given our findings,

**Table 7.** Percentage of respondents reported urgent need for various assistance.

	Aggregate (n=316) (%)	Shaan'Xi (%)	Shanxi (%)	Shandong (%)
	n=316	n=125	n=107	n=84
Assistance to market harvested products	61	67	72	39
Needed land	64	80	6	43
Production material supplies, that is, seeds, tractors, fertilizer	48	61	48	29
Fund	47	62	54	17
Production technology support	36	49	37	16
Assistance in product processing	7	7	11	5

agricultural supports may consider giving priorities to operations which have larger acres to aid the adoption of production technologies. In addition, tailored production assistance related to fruit production should be especially provided to large fruit operations in the Shaan'Xi and Shanxi agricultural communities to address farm needs for fruit production related technologies.

This study reveals that participation in an agricultural cooperative mitigates the need for marketing related assistances. This can be explained by the fact that agricultural cooperatives are an important agent to help market farm products (Kong et al. 2007, page 80-81). Given that the majority of our respondents in Shaan'Xi and Shanxi grow fruits (60%), a perishable food that requires timely shipping after harvest, the assistance to access market was significant.

A lack of financial assistance is another obstacle that has hindered farm development. Farm households that reported difficulty in obtaining funds tend to have an urgent need for financial related assistance. According to Kong et al. (2008), it is unlikely that current agricultural assistance provides a sufficient financial help to all farming communities (Kong et al., 2008). Findley et al. (2003) believe this situation in China's rural financial markets is a consequence of China's changing economic environment, which "continue(s) to pull capital out of the countryside towards urban and non-agricultural uses where the returns were highest" (page 64). Farmers in our sample reported a strong demand for financial related assistance. Those who have been working off the farm to compensate farm financial needs have especially reported an urgent need for financial related assistances, as shown by the Shanxi and the Shandong sample. Limited access to funds is specially a problem for the inland Shanxi respondents who reported critical needs for funding support. The coastal Shandong province focuses on the production of higher return specialty crops such as pecan, peanuts, and other oil crops, which helps reduce financial pressure but improve its demand for more efficient marketing assistance.

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