Analysis of Factors Influencing Supply Effect of Farmland Water Conservancy Facility Based on Ordered Probit Model

Li Peng

Xichang University, Xichang Sichuan, China.

371553711@qq.com

Keyword: Supply effect of farmland water conservancy facility; Ordered Probit model; Type of water supply; Degree of emphasis of government; Maintenance of facility

Abstract: Through questionnaire investigation of 320 rural households at 8 towns of Xichang City Liangshan Autonomous prefecture Sichuan, an ordered Probit model is constructed to analyze the influence of various factors on supply effect of farmland water conservancy facility based on populations with different educational background, and the result shows that populations with different educational background have different level of understanding of supply effect of farmland water conservancy facility. With rise of educational, their satisfaction shows up-downtrend. Meanwhile, sex, educational degree, type of water supply, degree of governmental emphasis and the situation of facility maintenance have significantly positive influence on supply effect of farmland water conservancy facility, whether to construct new facility has negative influence. Type of water supply, degree of governmental emphasis and maintenance of facility have the most significant influence, the government shall strengthen guarantee in these three aspects.

Introduction

In 2016 our country consumed water more than 580 billion m^3, among which cultural water accounts for about 61.9%, but the average per capita water availability in our country only accounts for 25% world's average [1]. Though Sichuan has rich water resource, uneven regional distribution, much slope farmland, weak water conservancy capability of soil, concentration of large amount of water resource on economically undeveloped region results in unavailability of water. Culture is an important approach to consume water[2]. Farmland water conservancy facility construction is the foundation to increase availability of cultural water, cultural output value and rural income, in different region the difference in landform, economy results in different supply effect of farmland water conservancy facility, so using a suitable method to reasonably assess supply effect of farmland water conservancy facility is an outstanding problem to be resolve urgently in agricultural production.

Many domestic researches show that supply effect of farmland water conservancy facility mainly includes type of water supply, degree of emphasis of government, expected water price, facility maintenance, etc.[3] Considering that different rural households assess supply effect of farmland water conservancy facility differently, and there is no scholar researching supply of farmland water conservancy facility based on different rural households, this paper made further deep research on Supply effect of farmland water conservancy using ordered Probit model, questionnaire investigation, aiming at rural households at different income level.

Data source and model construction

Data source

The data in the research comes from the questionnaire investigation at 8 towns including Madao, Lizhou, Anning, Chuanxing, Huanglianguan, Youjun, Taihe and Anha of Liangshan

Prefecture Sichuan province from October to November, 2016, selecting one adult farmer from each rural household for questionnaire investigation, with subject investigated covering rural households at different cultural level, income level. Total 320 questionnaires were sent out and 313 effective questionnaires were recovered, with effective recovery of questionnaire up to 97.8%. Basic information on subject of the questionnaire investigation is shown in Table 1.

Table 1 Basic information of subject of questionnaire investigation

Attribute of subject investigated	Proportion	Attribute of subject investigated		Proportion
Gender			40~50	45.0%
Male	80%		Above 50	25.0%
Female	20%	Educational level		
Age group			Primary school and below	15.6%
Below 20	3.0%		Junior middle school	46.9%
20~30	5.0%		Senior middle school	29.1%
30~40	22.0%		College and above	8.4%

The investigation mainly involved 5 aspects relating to supply effect of farmland water conservancy including type of water supply, degree of emphasis of government, expected water price, facility maintenance and whether to construct new water conservancy facility, in the questionnaire we introduced every rural household the content relating to supply effect of farmland water conservancy in detail, making subjects investigated have basic knowledge of supply effect of farmland water conservancy, then we asked subjects investigated to rate local supply effect of farmland water conservancy (1 represents very good, 2 represents good, 3 represents general, 4 represents bad, 5 represents very bad), fully understanding the satisfaction of different age group with different educational level with local supply effect of farmland water conservancy.

Model construction

Based on combining related literature, from aspects of individual characteristics of rural households such as "governmental guarantee", construction and maintenance, 8 factors possibly influencing supply effect of farmland water conservancy were selected, every variable is defined as shown in Table 2.

Table 2 Definition table of variables investigated

Type of variable	Name of variable	Code of variable	Definition of variable
Dependent variable	Satisfaction of rural household with supply effect of farmland water conservancy	Y	1= very good; 2= good; 3=general; 4= bad; 5= very bad
Independent variable	Gender	X_1	1= Female; 2= Male
	Age	X_2	1= below 20; 2=20~30; 3=30~40; 4=40~50; 5= above 50
	Educational level	X_3	1=Primary school and below; 2=Junior middle school; 3= Senior middle school; 4= College and above
	Type of water supply	X_4	1= collective water supply; 2= non-collective water supply
	Degree of emphasis of government	X_5	1= Emphasize; 2= Relatively emphasize; 3= generally; 4= Not emphasize
	Expected water price	X_6	1= Increase; 2= Constant; 3= decrease
	Facility maintenance	X_7	1=Facility is perfect; 2= Facility is general, locally damaged; 3= Facility is maintained poorly, damaged severely
	Whether to construct new water conservancy facility	X_8	1= Yes; 2= No

Due to complex discrete data, the law cannot be recognized easily. It needs model algorithm to find the relation between data, and ordered Probit model can obtain potential variation law of data by analyzing the relation between discrete data, recently it is widely used in processing multi-type discrete data [4]. By construction ordered Probit model, defining attributes of subject investigated as independent variable, with satisfaction of rural households with local supply effect of farmland water conservancy as dependent variable, the paper established the relation between both to obtain most concerned key factors influencing supply effect.

Suppose that Y is the satisfaction of subjects investigated with local supply effect of farmland water conservancy which is a continuous variable. Independent variable vector is defined as （X_1 , X_2…X_8）, the ordered Probit model relating to Y can be expressed by the following equation:,

$$Y = \beta X + \varepsilon$$

Where, β represents the recession coefficient of ordered Probit model; ε represents intercept term.

When testing the calculated result of ordered Probit model, constructed model needs chi-square test, result shows that when model significance test of likelihood ratio $P<0.05$, it indicates the model has statistical significance. Construction of ordered Probit model in the paper adopted STATA14.0 software.

Result and analysis

Knowledge of supply effect of farmland water conservancy of population with different educational level

Table 3 is the knowledge of supply effect of farmland water conservancy of the population with different educational level at different towns of Xichang City Liangshan Prefecture Sichuan. Table 3 shows that subjects investigated with different educational level have different knowledge of supply effect of water conservancy facility. Evaluation on supply effect of farmland water conservancy of different rural households shows a U shaped trend, namely, as educational level rises, satisfaction with supply effect of farmland water conservancy shows first decreasing, then increasing trend, indicating that population with low educational level has low degree of knowledge of farmland water conservancy facility, among rural households with college and above educational level, those evaluating "very good" are 0, those evaluating "general" account for 48.5%, indicating that the higher with educational level, the higher the degree of knowledge of farmland water conservancy facility, they can comprehensively analyze existing problems. As educational level rises, the proportion of rural households evaluating "very good" show decreasing trend, and the proportion of evaluation "general" shows rising trend, which also fully demonstrates the conclusion above mentioned. Meanwhile, currently local supply effect of farmland water conservancy basically keeps nearly "general", with maximum mean value of evaluation only 2.98, indicating that current farmland water conservancy facility is far from meeting the standard and requirement of rural households, and its supply effect needs further improvement.

Table 3 Knowledge of supply effect of farmland water conservancy of population with different educational level at different towns

Different population	Very good	Good	General	Bad	Very bad	Mean value
Primary school and below	11.8%	27.4%	23.7%	19.8%	17.3%	3.03
Junior middle school	8.2%	25.5%	24.3%	23.0%	18.7%	3.18
Senior middle school	7.8%	15.8%	27.4%	28.3%	20.7%	3.38
College and above	0	28.5%	48.5%	19.3%	3.7%	2.98

（2）Gender, educational level, type of water supply, degree of emphasis of government and facility maintenance have significant positive influence, whether to construct new facility has negative influence, indicating that the government shall increase related degree of emphasis, adopt the mode of collective water supply, strengthen maintenance of water conservancy facility and equipment, so as to maximize local supply effect of farmland water conservancy .

Supply effect of farmland water conservancy is guarantee of water for farmland irrigation, deciding agricultural output value to large extent. It is an important link during agricultural production. While strengthening guarantee od supply effect of farmland water conservancy, the government shall not only enhance support to increase financial support and management guarantee, but also based on practice, understand demand of local rural households for irrigation water to reasonably use resource, cut irrigation cost, save human and material resource, establish effective communication platform. Meanwhile, local rural households shall improve their own educational level, beginning with themselves to establish master consciousness, strengthening maintenance of local water conservancy facility. The government shall use currently advanced technology to strengthen construction of farmland automatic irrigation management system, so as to minimize manpower needed, play the role of farmland water conservancy facility.

Acknowledgements

Reference

[1] Wang Yuan, Lian Shengxi, Li Ke et. Research on Current Situation of China's Water Resource and Countermeasure of Sustainable Development[J]. Water Resource and Water Engineering Journal, 2008, 19（3） ： 10—14.

[2] Situation analysis project group of Development Research Center of Ministry of Water Resource. Preliminary Judgment on Supply and Demand of Water resource in Our Country in 2020[J]．Water Conservancy Research, 2008, 5：5—7．

[3] Wang Lei, Zhu Yuchun. Supply Effect of Farmland Water Conservancy Analysis Based on Perspective of Heterogenicity of Rural Income [J]．Soft Science, 2013, 27（9）：122—126．

[4] Hou Peng, Zhong Hailing, Wang Yuanyuan. Research on Factors Influencing Willingness of Network Consumer to Buy Multi-Brand Bundling Goods – Based on ordered Probit model [J]. Brand Marketing, 2015, 2:69—71.