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A Poverty Alleviation-oriented Study on the Factors Influencing Peanut Cultivation

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Abstract: In the context of continued poverty alleviation and high demand in China, the plantation industry is an indispensable way to help farmers get rich. China is the world's top producer of peanuts and the world's top consumer of peanuts, and the demand for peanuts is very high. Therefore, promoting peanut production by farmers can not only increase chemical production, but also bring farmers income and get rid of poverty. So it is of great significance to explore how to promote peanut cultivation. On the basis of previous research, this paper lists four factors affecting the peanut planting area, and finds the data of 16 provinces in China from 2012 to 2021, and carries out regression analysis. From the results, it can be seen that the government gives subsidies and strengthens the degree of mechanization can significantly increase the peanut planting area. When the number of employees reaches a certain level, further increase will fail to improve the output and have a negative impact. This concludes that government subsidies and increased mechanization can promote peanut cultivation, which in turn promotes poverty alleviation in an efficient manner.

Keywords: poverty alleviation, peanut cultivation, factors affecting peanut planted area, binary logit model

1. Introduction

In the past decades, each country has been seeking effective anti-poverty measures according to its own national conditions. China is the country with the largest number of poor people in the world. In order to change the country's poverty and backwardness, China has mentioned in the 13th Five-Year Plan that it will strive to basically reach the goal of poverty eradication by 2020 [1]. At present, China has made great achievements in this field. In the five years since the implementation of the policy of precise poverty alleviation, the number of rural poor nationwide has been reduced from 98.99 million to 30.46 million, an average annual reduction of 13.7 million. The incidence of poverty has fallen from 10.2 per cent to 3.1 per cent, a cumulative decline of 7.1 percentage points [2]. However, China's rural areas are vast, and the poor are mainly concentrated in rural areas. For natural, historical and other subjective and objective reasons, poverty in these areas is widespread and deep, affecting the overall development of China's economy and society. Then, the country is committed to fully developing land in areas with high peanut production and alleviating poverty by focusing on agricultural development. For instance, China has long been engaged in land exploring and scientific and technological poverty alleviation in the peanut agricultural plantation fields. In 1990, Shandong

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Peanut Research Institute carried out scientific and technological poverty alleviation work in Yinan County. Ten thousand mu (a Chinese unit) of land were developed, and peanut optimized cultivation techniques were vigorously implemented in the development zone, and yield targets were fully achieved [3]. In addition, Zhengyang County in Henan Province, in conjunction with the fight against poverty, has taken the lead in opening up areas in all poor villages in the county to plant new varieties of peanuts through the support of the peanut industry. Through a series of measures such as optimizing formula fertilization and upgrading planting technology, it ensures that peanuts planted by poor households are sold at high prices online [4]. Therefore, how to expand peanut planting area and increase production has become a major research objective in the fight against poverty. This paper focuses on exploring what factors have a positive or negative impact on peanut planting area. The relationship between the independent variables and dependent variable (peanut planting area) is explored by establishing a binary logit model. By processing the data and regress them in the model, the results will be presented. Based on the results, poverty alleviation related suggestions are given. Through this study, it is possible to know more clearly how to alleviate poverty precisely through peanut cultivation, which will be helpful for more in-depth research.

2. Method

As an important cash crop and a major oil seed crop in China, peanut research is currently focused on two major areas, which are peanut production and export trade. Research on peanut mainly focuses on the import and export of products, changes in the comparative advantage of the main producing areas and spatial evolution characteristics [5-7]. The natural conditions, socio-economic conditions, and technical level of the main producing areas of peanut are different, resulting in large changes in the peanut planting area of the main producing areas, but there is a lack of in-depth research on the factors affecting the changes in the planting area of the main producing areas of peanut. This paper analyzes the factors affecting the planting area of each peanut planting main producing area through the binary Logit regression model, and puts forward policy suggestions to promote the development of peanut main producing areas, which is of great significance for promoting the sustainable growth of peanut industry and alleviating the poverty of peanut planting farmers.

Since technology has a significant impact on peanut production. Increased levels of mechanization can reduce the need for labor and increase productivity, and increased rates of technological progress can increase yields [8]. This paper choose the factors of the total power of agricultural machinery and the original value of agricultural machinery of rural households in those provinces. In addition, subsidies can reduce farmers' peanut planting costs and increase their returns, thus increasing the farmers' incentive to plant [9]. Therefore, this paper choose the original value of productive fixed assets from social security and welfare in rural households as a variable. Based on the theory of farmer behavior, Johnston et al. argue that human capital and markets influence the behavior of farmers, which affects the change in acreage in production areas [10]. So the number of rural practitioners is considered in this case. In general, this paper choose 4 main aspects. They are the total power of agricultural machinery, the original value of agricultural machinery of rural households, the original value of productive fixed assets from social security and welfare in rural households, and the number of rural practitioners in those provinces.

In this model,16 major peanut production provinces are selected. Those are Jilin, Liaoning, Hebei, Shanxi, Shandong, Henan, Jiangsu, Anhui, Hubei, Hunan, Sichuan, Jiangxi, Fujian, Guangdong, Guangxi, and Guizhou respectively, in order to study the factors affecting peanuts cultivate. Then, from National Bureau of Statistics, the author finds the data of these four factors in those 16 provinces and select the time period from 2012 to 2021[11].

In order to quantitatively analyze the effects of several variables on the increase or decrease of farmers' peanut sown area, on one hand, the dependent variable is represented by the changes in

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farmers' peanut sown area, with "1" indicates an increase in peanut sown area in every two years from 2012 to 2021 and "0" indicates a decrease in peanut sown area in every two years from 2012 to 2021.On the other hand, the explanatory variables include binary selection variables such as total power of agricultural machinery, the original value of productive fixed assets from social security and others listed as before. Similarly, this paper represents the variables with "1" indicates an increase in those variables in every two years from 2012 to 2021, and "0" indicates a decrease in those variables in every two years from 2012 to 2021. There are total four variables and denote them by X1, X2, X3, and X4. Therefore, all the variables are either 0 or 1. The following table shows the details of the data.

From the Table 1, the maximum value, minimum value, mean value and standard deviation are listed. Compare the mean with 0.5 and use the standard derivation to determine the accuracy. The author initially finds that X1, X3, and X4 are the main increasing variables.

Table 1: Data of four variables.

Variable	Title	Meaning of the variables	Maximum value	Minimum value	Average value	Standard deviation
X1	Increase or decrease in the number of rural practitioners	increase=1 decrease=0	1	0	0.7625	0.1830
X2	Increase or decrease in the original value of productive fixed assets from social security and welfare in rural households	increase=1 decrease=0	1	0	0.4750	0.2525
X3	Increase or decrease in total power of agricultural machinery	increase=1 decrease=0	1	0	0.8500	0.1290
X4	Increase or decrease in the original value of agricultural machinery of rural households	increase=1 decrease=0	1	0	0.9250	0.0700
Y	Increase or decrease in acreage over the past three years	increase=1 decrease=0	1	0	0.4875	0.2530

Since the dependent variables are binary selection variables, utilize a binary response model, which is the Logit model as follows:

$$P = G(x) = \frac{e^{(\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4)}}{1+e^{(\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4)}} \tag{1}$$

Taking the logarithm of equation (1) and simplifying it:

$$\ln\frac{p}{1-p} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 \tag{2}$$

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If Xi is assumed to be a roughly continuous variable, its bias effect on the response function can be obtained by finding the following partial derivatives:

$$\frac{\partial G(X)}{\partial X_i} = g(X_i)\beta_i \quad (3)$$

where G(X) is the joint probability distribution, and $g(X_i)$ is the probability density function.

When Xi varies sufficiently small, the above equation can be converted to:

$$\Delta \mathrm{G(X)} \approx [g(X_i)\widehat{\beta}_i]\Delta X_i \quad (4)$$

In the binary response model, $e^{(\beta_i)}$ represents the odds ratio (OR value), which refers to the multiple of change in the ratio of increases divided by decreases of peanut sown area when the independent variable changes by one unit. On one side, if the variable X_i has no effect on the dependent variable Y, then the value of $e^{(\beta_i)}$ is always 1 regardless of the change in X_i. On the other side, if X_i has influence on Y, positive influence is reflected when Xi increases, $e^{(\beta_i)}$ is greater than 1, and vice versa.

3. Results

From the Table 2, the p-value of X1, X2 and X4 are smaller than 0.05, thus X1, X2and X4 are significant to have effect on Y. And since the p-value of X3 are larger than 0.05, thus X3 do not affect Y.

Table 2: Binary logit regression analysis results.

Variables	Logit coefficients	Standard deviation	Z value	Wald x^2	P value	OR value	OR value 95% CI
X1	-3.193	1.103	-2.895	8.378	0.004	0.041	0.005 ~ 0.357
X2	0.349	0.599	0.582	0.339	0.031	1.417	0.438 ~ 4.588
X3	-0.264	0.753	-0.351	0.123	0.726	0.768	0.176 ~ 3.356
X4	3.696	1.530	2.415	5.833	0.016	40.293	2.007 ~ 808.998
Intercept	-0.869	1.375	-0.632	0.400	0.527	0.419	0.028 ~ 6.208
Dependent variable: Y							
McFadden R square:0.177							

Moreover, from the logit coefficients, X1 have a negative effect on planting peanuts, X2, X4 have a positive effect on planting peanuts. The results also can be obtained from the OR-value, where the value of X1 is smaller than 1, and the value of X2, X4 is greater than 1.

Finally the equation can be shown, according to the information obtained above:

$$ln\frac{p}{1-p} = -0.869 - 3.193X_1 + 0.349X_2 + 3.696X_4 \quad (5)$$

where p represents the probability when Y is equal to 1, and (1-p) represents the probability when Y is equal to 0.

Taking peanut farming in Guangxi as an example. The author select data from Guangxi and put the data into the Binary logit model for regression. And the regression analysis was done on the original value of agricultural machinery of rural households and the planting area of peanut from 2000 to 2021. Then obtain a series of regression data shown in Table 3 and the line graph (Figure 1).

Table 3: Regression analysis on the model.

	Coefficients	Standard error	t Stat	P-value	Lower bound 95.0%	Upper limit 95.0%
Intercept	41.40995	2.12792	19.46032	1.81941E-14	36.97119	45.84871
X Variable	0.00318	0.00053	5.94865	8.10914E-06	0.00206	0.00429

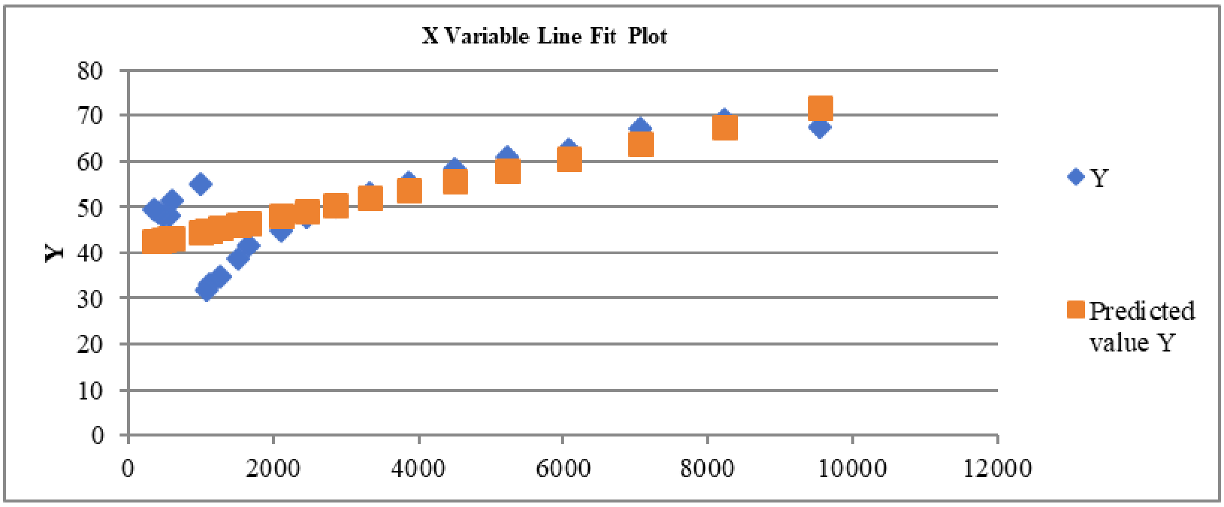

Figure 1: The relationship between the original value of agricultural machinery of rural households and the planting area of peanut

Figure 1 shows a positive relationship between the original value of agricultural machinery of rural households and the planting area of peanut from 2000 to 2021 in Guangxi. The predicted values and true values have roughly the same trend and the standard deviation is not significant. In this case, the binary Logit regression model yields a relatively good model fit.

4. Discussion

From all the analysis above, the value of agricultural machinery in rural households and the value of productive fixed assets from social security and welfare in rural households play a positive role in the fight against poverty. Subsidizing farmers and promoting mechanization can effectively increase peanut planting area. Besides, increase or decrease in total power of agricultural machinery has no significant impact on peanut acreage. It shows that increasing the total mechanized power cannot accurately promote the efficiency of peanut cultivation by farmers. As Joachim et al. mentioned, improving the technology of mechanical appliances can greatly reduce the supply of total mechanical power, and also improve efficiency [12]. Thirdly, the number of rural practitioners play a negative role on peanut planting. Because reducing the number of people working in agriculture decrease labor costs. Unlike the ever-increasing factors of material inputs, labor is one of the factors of production in the ever-decreasing peanut production inputs. With the increase of employment opportunities in non-agricultural industries, agricultural labor force is gradually transferred to non-agricultural industries. The number and structure of agricultural labor force are undergoing a transformation. According to the data on 21 peanut-producing provinces in 2012, the phenomenon of young and middle-aged laborers going out to work in farming families is very common, and most of those who stay at home to work in agriculture are the old, weak and women [13]. Since the reform and opening up, the amount of labor input in peanut production has been decreasing, from 28.1 workdays/mu (a Chinese unit) in 1981 to 9.91 workdays/mu in 2011, a decrease of 64.73% [13]. However, the price of labor is rapidly increase. The labor cost of peanut planting has not declined due to the decrease in the amount of labor used.

5. Conclusion

In the context of China's continued focus on poverty alleviation and the high demand for it, farming is an indispensable way to help farmers get rich. China is the world's number one producer of peanuts and the world's number one consumer of peanuts, and the demand for peanuts is very high. Therefore, promoting farmers to produce peanuts can not only increase the amount of production, but also bring profit to farmers and get out of poverty. It is of great significance to explore how to promote peanut cultivation. This paper lists four factors affecting peanut planting area based on previous research, and finds the data from 2012-2021 for 16 provinces in China and conducts regression analysis. From the results, it can be seen that the government gives subsidies and strengthens mechanization can significantly increase the peanut planting area. When the number of practitioners reaches a certain level, further increase does not improve the yield.

There are some existing shortcomings. Restricted by the acquisition of data and information, this paper adopts the data on macroeconomic operation without regional subdivision based on regional differences, and the data used of each province is the average value in the majority . Although the fit of the model is high, the improvement of the accuracy of the data measurement needs to be further improved in future research.

In addition, this paper has explored the influencing factors of peanut cultivation, but there are still many directions for further research. For example, researchers can further study the impact of farmers' knowledge level and technical capacity on peanut cultivation. Farmers' knowledge level and technical ability play a crucial role in the application and effectiveness of planting techniques. Therefore, it is a good way of providing them with appropriate training and support to enhance the effectiveness and sustainability of peanut cultivation. Besides, researchers can also delve into the impact of policy and institutional environment on peanut cultivation. It plays an important role in guiding and supporting the development of peanut cultivation and poverty alleviation. Thus, scholars can provide targeted policy recommendations to the government and relevant organizations by studying the impact of policy, so as to promote the development of peanut cultivation and poverty alleviation.

In conclusion, the influencing factors of peanut cultivation is a complex and diverse subject that requires continuous research and exploration. Through further research, scholars can continue to improve the effectiveness and sustainability of peanut cultivation and make greater contributions to poverty alleviation. It is hoped that future research will explore more aspects in depth, and provide more support and guidance for the development of peanut farming and the success of poverty alleviation efforts.

References

[1] *Xiang Qinyan. (2018). Evaluation of the Effectiveness of Precision Poverty Reduction in Ethnic Areas (Master's thesis, Hubei Institute for Nationalities).*

[2] *Xinhua News Agency.(2015).Xi Jinping: Report on the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China. Retrieved from http://www.beijingreview.com.cn/wenjian/201510/t20151030_800041567.html*

[3] *Wang Zai-Xu, Li Ji-En, Xu Y-Po, Xu Hong-Hai, Liang Xiu-De, Zhang Zhi-Gao. (1991). Application and effect of peanut optimized cultivation technology in scientific and technological poverty alleviation. Chinese Oilseeds (02).*

[4] *Guo Wansheng. (2018). Utilizing "Internet+" to expand and strengthen the peanut industry in Zhengyang and boost industrial poverty alleviation. Henan Agriculture (01), 63.*

[5] *Zhang Xidan. (2021). China's peanut products export market forces and influencing factors (Master's thesis, Nanjing Agricultural University).*
[6] *Zhang Yi. (2014). Analysis of changes in peanut production layout in China. China Rural Economy(11),73-82+95.*
[7] *Dong Wenzhao,Zhang Xinyou,Han Suoyi,Tang Fengshou. (2012). Characterization of peanut development and the evolution of main production areas in China. China Agricultural Science and Technology Bulletin (02), 47-55.*
[8] *Wang Yan. (2014). A study on the comparative advantage of major peanut producing areas in China (Doctoral dissertation, Nanjing Agricultural University).*
[9] *Zhou Shudong,Meng Huankuan. (2017). Factors influencing the change of planting area in China's peanut main producing areas. Jiangsu Agricultural Science (13), 250-253.*
[10] *Johnston, Warren E,McCalla, Alex F.(2004). Whither California agriculture:up,down or out?Some thoughts about the future. Giannini Foundation of Agriculture Economics,University of California Agriculture and Natural Resources.*
[11] *Urban Socio-Economic Surveys Division, National Statistical Office.(2022).National Bureau of Statistics.China Urban Statistical Yearbook [2020-2021 Prefecture-Level Cities Panel Data].Retrieved from http://www.stats.gov.cn/zs/tjwh/tjkw/tjzl/202302/t20230220_1913734.html*
[12] *Joachim Nyemeck Binam et al.(2004).Factors affecting the technical efficiency among smallholder farmers in the slash and burn agriculture zone of Cameroon. Food Policy.*
[13] *PRC National Development and Reform Commission.(2012).National Bureau of Statistics.National Compendium of Cost-Benefit Information on Agricultural Products. Retrieved from http://www.stats.gov.cn/tjzs/tjsj/tjcb/tjzl/201205/t20120525_44765.html.*