

Study on Influencing Factors of Planting Technique Selection of Corn Farmers in Gongzhuling

Han Zhang*

Yanbian University, Longjing 133400, Jilin Province, China

*Corresponding author: Han Zhang, 1738331332@qq.com

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Abstract: In this study, a questionnaire survey was used to obtain the characteristics of corn farmers' technology selection, and the Logit model was used to analyze the factors influencing the planting technology selection of Gongzhuling corn farmers. It was found that the choice of corn farmers in Gongzhuling was influenced by capital cost input, production organization, policy system, and ecological environment.

Keywords: Maize planting technology; Farmer; Technology selection; Influencing factor

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1. Introduction

Gongzhuling is a county-level city located in the world's golden corn belt, with the reputation of being the "hometown of corn." Under the guidance of the 14th Five-Year Plan, Gongzhuling is committed to building high-standard farmland and improving the level of agricultural industrialization. Achieving the goal of agricultural construction depends on the application of excellent field planting technology^[1]. The planting technology of pin-shaped corn has been widely implemented in Jilin Province and other corn-planting provinces, but the selection of new planting technology in Gongzhuling corn planting is very limited, and the promotion degree is insufficient. To improve corn yield, achieve green and sustainable agricultural economic construction, and promote the overall development of the corn industry, it is necessary to explore the characteristics of farmers' planting technology selection from the perspective of their behaviors^[2].

2. Overview of corn planting techniques

2.1. Key points of corn planting techniques

Corn planting is the pillar industry of agriculture in Gongzhuling City, both the agricultural management department and the farmers themselves attach importance to the selection and application of planting technology. The "Pin-shaped" planting technology invented by Zhao Zhonghui's team adopts mechanical land preparation and patent matching sowing. It involves planting with large ridge wide and narrow rows, two ratios

of space, film planting, and high light efficiency technology. The fertilization and irrigation methods were shallow buried drip irrigation, drip irrigation under film, gradient fertilization, and section fertilization. The harvest adopts the patented matching harvest and straw returning technology.

2.2. Advantages of corn planting

In 2021, the agricultural technology research expert team of Jilin University, the Provincial Agricultural Technology Extension Station, and other six units, more than dozens of experts carried out field tests on the plots of corn planting technology application, confirming that this corn field planting technology can solve the problems existing in the implementation of traditional corn planting technology. This can avoid the situation of poor growth of corn seedlings, insufficient fertility supply, and uneven ears caused by over-dense plants, reduce the total amount of water and fertilizer and pesticide use, and avoid the risk of lodging, over-flooding, and over-drought that are common in corn field planting.

2.3. Application of corn-shaped planting technology in farmers

Pin-shaped planting technology was recognized by the Agricultural Promotion Station in 2021, and its planting area will gradually expand. However, after reviewing the land input of farmers planting (including cooperative planting) and enterprises leasing planting in recent years, it is found that by 2023, enterprises will invest 252,300 mu of land, of which 249,900 mu will adopt pin-shaped planting technology^[3]. The technical coverage rate reached almost 100%, but in the same year, farmers invested 4,097,700 mu of land, and only 274,100 mu of land were planted with the pin-shaped planting technology, which indicates that the yield increase advantage of pin-shaped planting technology for corn planting could not be widely reflected in farmers' planting behavior^[4].

3. Factors influencing the technical selection of corn farmers' product shapes

3.1. Differences in the technical selection of corn crop shapes

Referring to previous research methods and questionnaire compilation methods, this study developed a questionnaire on the selection behavior and influencing factors of shaped planting technology for corn plantings in Gongzhuling City^[5-6]. The study distributed questionnaires to 364 corn growers in 18 towns and 2 townships in Gongzhuling City and conducted field planting surveys and random interviews. The percentage Chi-square test was used to analyze the differences in planting techniques from four aspects: demographic variable, market factor, policy factor, and natural condition factor^[7-10]. It was found that there were differences in production cost, production organization form, participation in publicity, enjoying guaranteed loans, ecological environment awareness, and field continuity in the selection of pin-shaped planting technology by corn growers in Gongzhuling.

3.2. Hypothesis of influencing factors for the technical selection of corn crop shape

Corn growers in Gongzhuling showed a diversified and differentiated trend in the choice of planting technology, and these differences were reflected in different variables. However, these differences alone are not enough to establish the specific reasons for planting technology choice. Empirical analysis is often adopted in farmer behavior research to establish and verify hypotheses to reveal the root causes of technology choice behavior. Based on the results of the questionnaire survey, this study proposes 6 research hypotheses from 4 aspects: production factors, market factors, policy factors, and natural environment factors.

Research hypothesis 1: There is a significant positive correlation between farmers' choice of corn planting technology and the cost capital variable of corn planting.

Research hypothesis 2: There is a significant positive correlation between farmers' choice of corn planting

technology and the variable of production organization degree.

Research hypothesis 3: There is a significant positive correlation between farmers' choice of corn planting technology and agricultural technology policy promotion variables.

Research hypothesis 4: There is a significant positive correlation between farmers' choice of corn planting technology and the economic policy variables provided by the government.

Research hypothesis 5: There is a significant positive correlation between farmers' choice of corn planting technology and natural environment variables.

Hypothesis 6: There is a positive correlation between the choice of corn planting technology and planting convenience.

3.3. Logic model construction

The logic model is an empirical research model commonly used by scholars to study the factors affecting farmers' behavior ^[11]. The model itself has strict and clear mathematical logic, strong compatibility with statistical software, convenient operation, and can present data to observe the verification of research hypotheses ^[12]. This study refers to the logic model built in previous studies ^[13]. The study sets the independent variable as the factor content in the 6 research hypotheses, and the dependent variable is "the selection of the cultivated planting technology of Gongzhuling corn farmers", and the variable values are "yes" and "no." The model is established as follows:

$$Y (Y=1) = \ln = \beta_0 + \beta_i X_i + u (i=1,2,3,...)$$

Where Y is the selection of pin-shaped planting technology of corn farmers in Gongzhuling, Y = 0 means "no", and Y = 1 means "yes." X represents the content of the influencing factors in the 6 research hypotheses, β_0 represents the constant term, and u is the random disturbance term. The variables were interpreted to meet the statistical requirements, and the SPSS 20.0 test model was used to calculate the regression results.

3.4. Model test results

The test result of the logic model is shown in **Table 1**. Under the condition of controlling other variables, B represents the amount of change corresponding to the dependent variable when the independent variable changes by one unit. According to **Table 1**, in the binary Logistic model constructed by the hypothesis of this study, each independent variable has unitized changes, the variable direction of the dependent variable is positive, and the change amount is more than 1, which fully indicates that there is a significant positive correlation between the independent variable and the relevant variable within the framework of this model. The 6 hypotheses of influencing factors of planting technique selection of corn farmers in Gongzhuling were verified.

Table 1. Model test results of influencing factors of technology selection of corn growers in Gongzhuling

Variable	B	S.E.	Wals	df	Sig	Exp(B)
Cost fund	2.109***	0.435	14.298	2	0.000	8.123
Production organization	1.027**	0.518	27.336	1	0.004	2.675
Agricultural technology policy publicity	1.210**	0.379	10.891	1	0.017	3.402
Economic policy	1.905***	1.341	22.510	1	0.000	6.189
Natural environment	1.535**	0.770	36.457	1	0.001	4.527
Planting convenience	1.502***	1.228	16.756	1	0.000	5.735

4. Result discussion and countermeasure suggestions

4.1. The capital cost input of corn growers affects the choice of planting technology

There is a high positive correlation between the capital cost invested by corn growers in Gongzhuling and their choice of planting technology. To popularize the crop pattern planting technology, how to increase the amount of capital cost that farmers can use for production should first be considered. It is suggested to investigate the capital demand of corn farmers, analyze the specific direction and content of their production cost input, judge the input benefit, and explore the capital source channels that meet their benefits ^[14].

4.2. The production organization of corn growers affects the choice of planting technology

There was a high positive correlation between the organized production of corn growers in Gongzhuling and their choice of planting technique. In the development of agricultural industrialization, the organizational construction of production has an important impact on the promotion of advanced agricultural technology ^[15]. Hence, it should start from the organizational production of corn cultivation. For example, to innovate the cooperative construction mechanism, from the perspective of sharing agricultural machinery, sharing of technical property rights, sharing of quality inspection services, and other aspects of the cooperative construction mechanism, without restricting farmers' single-family planting freedom, short-term, mobile cooperative construction.

4.3. Government policies affect the technology selection behavior of corn farmers

In Gongzhuling, the dependence of corn farmers on agricultural technology publicity and government loan guarantees has a high positive correlation with the choice of planting technology in grain shape. Strengthening policy publicity, improving farmers' awareness and participation in technological development, and improving financial support policies such as loan guarantees will help further promote the wide application of corn planting technology. The government should pay attention to the systematic construction of policies, systematically analyze the compatibility of new planting technology with natural conditions such as geography, climate, and soil in the region, as well as its adaptability to social and economic conditions such as labor force structure and agricultural organization form, and formulate and promote appropriate planting technology policies in a targeted manner.

4.4. The ecological environment affects the selection and popularization of agricultural technology

In Gongzhuling, corn farmers' dependence on the ecological environment and planting convenience had a high positive correlation with their choice of planting technology. The planting conditions and natural resources of farmers should be considered to popularize the planting technique of grain shape in Gongzhuling corn planting. In addition to continuing the conventional ecological environment construction, promoting the work of river length system, straw burning ban, and so on, should be implemented. The government should also continue to further promote the return of farmland to forest and grass, reasonable planning of agricultural planting land, check the unreasonable land use in urban planning, return the land to farming, and integrate agricultural land, to achieve the collaborative construction of agricultural technology and agricultural ecology.

Disclosure statement

The author declares no conflict of interest.

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