Impact of perceived social norms on farmers’ behavior of cultivated land protection: an empirical analysis based on mediating effect model

Wenwen Qiu1,2, Zhangbao Zhong2,* and Ya Huang1,2
1 College of Economics and Management, Huazhong Agricultural University, Shizishan Street, Wuhan, 430070, P.R. China; 2 Research Center for Rural Social Construction and Management, Huazhong Agricultural University, Shizishan Street, Wuhan, 430070, P.R. China

Abstract

In this study, the impact of social norms on farmers’ behavior of cultivated land protection and the related mechanism was investigated in terms of direct effect and mediating effect and further verified by logistic and mediation effect estimation of different organic fertilizer application behaviors. An empirical analysis of the data collected from Xiajin County of Shandong, China, revealed that (1) perceived social norms can exert significant and positive effects on the behavior of farmers in cultivated land protection; (2) social norms can stimulate farmers to adopt cultivated land protection behaviors by affecting their related value cognition, risk confidence and skills; and (3) the mediating mechanisms varied in the impact of perceived social norms on different cultivated land protection behaviors, with farmyard manure application being significantly moderated by value cognition, risk confidence and skills, in contrast to a major impact of social network on the application of commercial organic fertilizers. This study enriched the theoretical interpretation of the impact of social norms on farmers’ behavior of cultivated land protection and provided useful information on activation of farmers’ cultivated land protection behavior to promote the sustainable development of agriculture.

Keywords: perceived social norms; organic fertilizer application; cultivated land protection; mediating effect

*Corresponding author: zzbemail@mail.hzau.edu.cn
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1. INTRODUCTION

Cultivated land protection is an issue related to agricultural development and food security. The long-term high-input and high-consumption growth mode in China has posed severe challenges to its agricultural production due to hidden loss of cultivated land, such as the decline in soil fertility and output capacity [1–2]. In China, by the end of 2016, 65.5% of the cultivated land in the monitoring sites had a shallow soil thickness, 25.9% of the monitoring sites had a bulk density higher than that suitable for crop growth, 8.2% of the surveyed areas showed heavy metal pollution and some areas had prominent soil compaction problems, according to National Cultivated Land Quality Monitoring Report (2016) and China Geochemical Survey Report (2016). Thus, increasing attention has been given to strengthening the protection of cultivated land and improving its quality to alleviate the shortage of cultivated land resources and ensure food security.

Cultivated land protection is not only a technical issue but also closely related to social structures and people’s behaviors [3]. Farmers are the major users of cultivated land, and their production behaviors, such as application of agricultural chemicals, sensitivity to soil fertility condition, farming mode selection, etc., will have a direct impact on the quality of cultivated land [4–5]. How to effectively activate farmers’ cultivated land protection behavior has become a hot spot of academic research.
In order to protect cultivated land and enhance farmers' environmental protection willingness, the Chinese government has implemented a series of strict cultivated land protection systems, such as land use control, basic cultivated land protection, cultivated land occupation and compensation and strict control of land protection. Despite an increase in the number of policies and regulations, the implementation results are still not satisfactory [6–7]. Some scholars believe that the effectiveness of the system is affected by the complexity of China's rural problems, differences in historical and cultural bases and economic levels and limitations of farmers' cognitive levels. Additionally, lack of local government supervision tends to make the institutional constraints difficult to continue [8]. The successful experience of Western developed countries revealed other path choices apart from government’s ‘top-down’ institutional constraints, and the most effective way is to form a social norm favorable to cultivated land protection or rely on social forces to activate farmers’ cultivated land protection behavior [9–10]. Under the guidance of social norms, farmers can actively change production modes and protect cultivated land from the source. This informal cultivated land protection mechanism does not rely on government coercion but on social and moral cultural pressures to promote farmers’ participation in cultivated land protection, which forms an effective complement to government administrative means and market mechanism [11]. This approach is more effective in rural China, due to the strong influence of Confucian culture and collectivistic culture.

At present, China’s agriculture is in an important period of transformation and development, and the concept of ‘green agriculture’ has been deeply rooted in the hearts of many people. Protecting cultivated land and transforming the agricultural development model have become a widely accepted social norm. However, several questions remain unanswered: is the farmer’s cultivated land protection incentive strategy based on social norm theory effective? What is the internal mechanism of social norms in encouraging farmers to protect their cultivated land? How to shape good social norms and enhance farmers’ cultivated land protection actions? The answers to these questions not only facilitate the understanding of the effectiveness of current social norms in motivating farmers’ cultivated land protection behavior but also provide useful reference for the choice of cultivated land protection strategies by government management departments.

Previous studies have focused on the impact of perceived social norms on individual economic behavior. Teoh et al. [12] found that for stigmatizing the Apartheid regime in South Africa, US investors, under the pressure of public opinion, reduced their investment in South Africa, even if the profit was good. Heinkel et al. [13] conducted a detailed analysis of how social norms influence the environmental governance behavior of polluting enterprises through capital markets by constructing theoretical models. Li et al. [14] explored the influence mechanism of social norms on individual technology acceptance behaviors through case analysis of information technology. Fu et al. [15] analyzed the impact of social norms on individual private interest behaviors by population sampling. Zhang [16] and Long et al. [17] performed in-depth studies on the internal relationship between social norms and Chinese consumer behavior from different perspectives. These studies provide effective references for identifying the impact of social norms on individual economic behavior. Despite extensive research on the social dynamics behind the micro-behavior and the impact of social norms on individual behavior, the internal mechanism of this effect is still unclear.

Several scholars have tried to explore the impact of social norms on entrepreneurship and the behavioral decisions of actors [18], but their studies are still limited to a single group, and the research on the special group of rural residents is still lacking. Currently, the orientation of China’s rural social relations is strong, and farmers’ behaviors are more susceptible to group identification and social supervision.

The purpose of this paper is to build a research model based on social norm theory and farmer behavior theory and explore the internal mechanism underlying the impact of social norm perception on farmers’ decision making in cultivated land protection behaviors at the theoretical level. The effect and path of social norm perception on farmers’ cultivated land protection behaviors were empirically tested by logistic regression and mediation effect estimation.

2. RESEARCH FRAMEWORK AND HYPOTHESES

2.1. Influence of social norms on the protection behavior of cultivated land

Social norms, an important concept in the field of psychology and sociology, refer to the explicit or implicit rules that regulate social behaviors in specific situations, including customs, traditions, values, trends and standards of conduct for interpersonal interactions [19]. Social norms represent the society’s attitudes to agree with a certain behavior, reflecting the mainstream social opinion [20]. According to behavioral economics theory, ‘institutions and norms should be considered because of bounded rationality of behavior subjects and complexity of environment’ [21]. When unable to make complete rational decisions in the knowledge seeking process, individuals are often more dependent on social values [22], which suggests that the influence of social norms on farmers’ behavioral decisions is strong.

Farmers can perceive the existence of social norms in certain situations, such as other people’s attitudes toward behavioral recognition and the successful experience of others. Perceived norms create a pressure on individual farmers to generate compliance with norms and consistent behaviors with others or groups [23], leading to the internalization of social norms into their beliefs and codes of conduct and stimulating their economic behavior. The direct influence mechanism of social norms on the individual economic behavior of farmers is shown in Figure 1.

The cultivated land protection behavior of farmers refers to their agricultural management behavior with the purpose to improve the quality, soil fertility, water retention and soil conser-
2.2.1. Social norms enhance the attitude of cultivated land protection by influencing value cognition and risk confidence

The attitude toward cultivated land protection is farmers’ propensity evaluation of cultivated land protection, including their understanding of value cognition of cultivated land protection and confidence in responding to the risk of cultivated land protection. Favorable social norms contribute to the formation of active attitude toward cultivated land protection, enabling farmers to have stronger value cognition of cultivated land protection and stronger confidence to face risks.

(1) Social norms affect the value cognition of behavioral subjects, which is conducive to the understanding, acceptance and absorption of mainstream values (including environmental values, economic values and social values of cultivated land protection) [27]. Therefore, the behavioral subject is more likely to perceive the beneficial nature of cultivated land protection, internalize the individual value cognition and stable individual behavior that are consistent with the social value orientation. Additionally, good social norm perception also contributes to the effective implementation of mainstream values and standards. The disciplinary supervision mechanism embedded in social norms imposes a powerful deterrent effect on behavioral subject and reduces individual opportunities in group activities [28–29]. This enables potential land protectors to learn and understand the value of cultivated land protection more consciously and actively participate in the protection actions.

(2) Good social norm perception enhances the confidence of the cultivated land protection subjects in dealing with risks. Risk aversion is a trait of learning and accumulation through social experience. Individual attitudes toward risk are influenced by social norms. When the value cognition of cultivated land protection is absent in social norms, behavior subjects are more likely to fear the loss of interests and show the motivation of passive avoidance [28]. On the contrary, under the influence of good social norm perception, replicable successful cases of cultivated land protection actions or experiences can be widely disseminated among the public, resulting in good demonstration effects, providing examples for potential cultivating land protection behavior subjects to learn and thus enhancing their confidence in response to potential risks.

Based on this, we propose Hypothesis 2-1 as follows:

\( H_{2-1} \): social norms activate farmers’ cultivated land protection behavior by positively affecting their attitude toward cultivated land protection, leading to enhancement of their individual value cognition of cultivated land protection and confidence to cope with risks, both of which play a mediating role in promotion of cultivated land protection by social norms.

2.2.2. Social norms improve the effectiveness of cultivated land protection by influencing the acquisition of cultivated land protection skills and the formation of relationship networks

The effectiveness of cultivated land protection, an expectation of whether or not the subject has the ability to achieve the goal of cultivated land protection [30], mainly includes two aspects: (i) the individual’s judgment on his or her own ability, i.e. whether he or she has the skills to carry out cultivated land protection; and (ii) the judgment of the external contact status, i.e. whether there is a relationship network to facilitate communication and cooperation in time.

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**Figure 1. Mechanism underlying the impact of social norm perception on farmers’ economic behavior.**

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**Table 1:**

| Normative rational extension | Normative rational connotation | Rational economic behavior |
|-----------------------------|--------------------------------|----------------------------|
| Perceived social norms      | Internalize                    | Activates                  |
| Personal beliefs and conduct codes |                      |                             |
| Cultivated land protection  |                                |                            |

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Good social norms are conducive to promote the learning of cultivated land protection skills and the foundation of relationship network.

(1) Good social norms provide convenient opportunities for learning, enabling potential cultivated land protection behavior subjects to acquire the related knowledge, experience and information from others through the coordinated function of social norms. This facilitates the understanding of value of cultivated land protection, the acquisition of cultivated land protection skills and the accumulation of experience in cultivated land protection, which is conducive to inspire the thinking of behavior subjects, promote the creation of cultivated land protection plans and improve their related skills [31].

(2) Good social norms can reduce information asymmetry and transaction costs and enhance the credit level of participants, thus shaping a wide network for cultivated land protection behavior subjects and enabling them to establish contact with other individuals and gain trust. This is conducive to mutual encouragement, sharing information and obtaining psychological support [32].

Based on this, we propose Hypothesis 2-2 as follows:

\[ H_{2-2}: \text{social norms positively affect the effectiveness of behavioral subjects in cultivated land protection by enhancing their related skills and relationship network to activate such behaviors, with skills and networks playing a mediating role in promoting cultivated land protection by social norms.} \]

According to the research hypothesis, the theoretical model is constructed and shown in Figure 2. Specifically, the main body of cultivated land protection behavior is the perceived social norms of rural households (X) and transformed them into the intrinsic values of farmers’ identity after absorption and learning, so as to strengthen the attitude of cultivated land protection (M₁) and improve the effectiveness of cultivated land protection (M₂), through which the behavior of cultivated land protection would be activated (Y). Therefore, this model contains both the direct effect of X on Y (H₁) and the intrinsic mechanism underlying the impact of X on Y (H₂-1 and H₂-2).

3. DATA AND METHODOLOGY

3.1. Data collection

Data for this study were obtained by a face-to-face questionnaire survey administered in August 2017 in Xiajin County, Shandong Province of China. Xiajin County is located in northwestern plain of Shandong Province. It is worth noting that Xiajin County is a long-established agricultural area, mainly planting wheat, cotton and corn, and known as ‘Silver Xiajin’, a famous county for flour production as well as a national high-quality cotton production base. In 2017, Xiajin County had a total sown area of 103 800 hm², with grain, cotton, vegetable and oil planting areas accounting for 84.22%, 10.72%, 4.51% and 0.55% of the total, respectively. While the cultivated land area of Xiajin County accounts for 68.15% of the total, the proportion of medium-yield fields and low-yield fields is large, coupled with the problems such as poor soil fertility and difficulty in drainage. The loss of organic matter has a negative effect on soil structure, infiltration capacity and porosity of cultivated land, which in turn produce a negative impact on the regional water cycle, crop productivity and the resilience of agricultural ecosystems, thus affecting crop growth in the long run and causing yield reduction [6].

Multi-stage sampling was employed for the data collection. First, we randomly selected three towns in Xiajin County. Then, three villages were randomly selected from the list obtained in first step. Finally, 35~40 households in each village were randomly selected from the list provided by the village committee. Head of households were asked to answer the questionnaire based on their agricultural management in 2017 and more than 400 rural households were surveyed. Finally, 343 samples were obtained.
after excluding the questionnaires with missing values or contradictory answers.

3.2. Model selection
In Figure 2, three paths are shown to be involved in the influence of perceived social norms on the protection of cultivated land. Specifically, perceived social norms directly affects cultivated land protection behavior (H1), and other two ways indicated that perceived social norms indirectly affects cultivated land protection behavior through the attitude and effectiveness of cultivated land protection. According to the utility maximization model, the utility of the farmer whether he or she conduct cultivation behavior or not is assumed to be as follows:

\[ Y_0 = \alpha_0 + \alpha_1 X + \alpha_2 M_1 + \alpha_3 M_2 + \alpha_4 K + u_0 \]  

\[ Y_{01} = \beta_0 + \beta_1 X + \beta_2 M_1 + \beta_3 M_2 + \beta_4 K + u_{01} \]

In the formula, X represents the farmer’s perception of social norms; M1 and M2 represent the farmer’s attitude and effectiveness of cultivated land protection, respectively; K represents the control variable; \( \alpha \) and \( \beta \) represent the parameters to be estimated; \( u \) represents the random error term of the equation. Therefore, if and only if \( Y_{01} - Y_0 > 0 \), the farmer tends to make a decision on the behavior of cultivated land protection.

According to the modeling thinking ways of Baran [33], the path test can be performed by the mediation effect method. The first step is examining the direct impact of social norms on cultivated land protection behavior. As farmers’ decision on cultivated land protection behavior is a typical binary choice problem, the traditional linear regression is not applicable, so the logistic regression model is used for estimation. The second step is to evaluate the indirect impact of social norms on the protection behavior of cultivated land by testing the impact of social norms on mediating variables and the impact of mediating variables on behavior of cultivated land protection. Therefore, the logistic regression analysis of perceived social norms and mediating variables on cultivated land protection behavior was used to estimate the impact of social norms and mediating variables on cultivated land protection. In order to increase the robustness of the results, the cultivated land protection behavior would be classified, and the multi-logistic regression analysis was carried out for the estimating the impacts of perceived social norms and the mediating variables on application of farmyard manure and commercial organic fertilizer. If the above stepwise test is significant, then the mediation effect could be considered significant.

3.3. Variables
3.3.1. Dependent variables
In this study, ‘whether or not to apply organic fertilizer’ was selected as a measure of cultivated land protection behavior. Organic fertilizer can increase the soil organic matters and promote the composite reaction of soil humus and clay minerals, which can improve soil fertility and regulate bioavailability, thus achieving the purpose of cultivated protection [34]. Organic fertilizer application, unlike soil remediation, construction of water conservancy facilities and other collective protection behaviors, needs farmers to collect or purchase, which can better reflect individual agricultural operations [35].

In the questionnaire, the respondent defined the binary selection variable \( Y \) by answering ‘yes’ or ‘no’ to the question ‘Do you apply organic fertilizer?’, where \( Y = 1 \) indicates application of organic fertilizer and \( Y = 0 \) indicates no application of organic fertilizer. Next, the respondent who answered ‘yes’ was further asked the question ‘Is the organic fertilizer farmyard manure or commercial organic fertilizer?’. According to the source of organic fertilizers, the natural fertilizers obtained from the local sources, such as biological wastes and excreta, are defined as farmyard manure, while the organic fertilizers purchased from agricultural stores, cooperatives, farms, enterprises, etc. are defined as commercial organic fertilizers. Accordingly, the interpreted variable is defined as a multiple-choice variable: \( yy = 0 \) (no application of organic fertilizer); \( yy = 1 \) (application of farmyard manure); \( yy = 2 \) (application of commercial organic fertilizer).

3.3.2. Independent variables
At the micro level, the study of social norms focuses on the behavioral choices that are perceived by individuals [36]. Social norms exist objectively, but the individual perception of social norms is subjective, leading to variations in the effects of social norms on behavior of different people. Therefore, while studying the impact of social norms on micro-level farmers’ behaviors, the main measure is the individual perception of social norms. According to the research of Cialdini et al. [37], two levels of injunctive norms and descriptive norms were selected to analyze the perception of social norms. Injunctive norms refer to what groups or others think they should or should not do; descriptive norms refer to what groups or others actually do. Farmers mainly make choices by internalizing the perceptions of these injunctive norms and descriptive norms into individual values and beliefs.

In the questionnaire, the measurement questions corresponding to the injunctive norms and descriptive norms are ‘Do most of the farmers around you think that cultivated land protection should be carried out’ and ‘Do the farmers you trust protect the cultivated land’. If the answer to the former question is ‘yes’, then the implied norm \( x_1 \) is assigned a value of 1, otherwise 0. If the answer to the latter question is ‘yes’, then the \( x_2 \) is assigned a value of 1, otherwise 0. Using the principal component method to weight the average of the injunctive norms, the perceived social norm \( X \) is obtained, and the final social norm variable constructed is a continuous variable with the range of 0~1.

1 Previous studies have shown that the best fertilization formula is that the active ingredients of NPK accounts for 50–60% of the total fertilization amount [38]. Therefore, based on this standard and survey samples, this paper uses 50% of the active ingredients of NPK of total fertilization as a judgment index of organic fertilizer application behavior.
3.3.3. Mediating variables
This study selected the attitude toward and the effectiveness of cultivated land protection as the mediation factors. (1) The attitude toward cultivated land protection includes farmers’ value cognition and risk confidence in responding to cultivated land protection. In the questionnaire, the answer to the question ‘Do you think that the protection of cultivated land is conducive to the increase of crop yield’ (yes = 1, no = 0) can reflect the respondent’s value cognition of cultivated land protection (M11). The code of conduct for farmers’ production and management is to maximize utility and increase crop yield. It is an important performance to ensure the economic value of cultivated land protection investment [39]. The answer to the question ‘Do you think the village will adjust farmland during the contraction period?’ (yes = 0; no = 1) can reflect the interviewee’s confidence in the protection of cultivated land (M12), as the stability of land rights is expected to affect the farmers’ confidence in the long-term benefits of cultivated land protection. Therefore, the less the transferred cultivated land adjustment, the more the farmers’ confidence in cultivated land protection. As long as the transfer risk can be reduced for the profits of organic fertilizer application, farmers will have more confidence in protecting cultivated land [40]. (2) The effectiveness of cultivated land protection includes the extent of farmers’ understanding of the technology of cultivated land protection and their access to related technical services. In the questionnaire, the answer to the question ‘Do you know the specific practices of cultivated land protection’ (yes = 1, no = 0) can reflect the respondent’s cultivated land protection skills (M21), and the answer to the question ‘Do you have cooperatives near your home to provide agricultural services’ (yes = 1, no = 0) can reflect the respondent’s relationship network (M22). As previous research has shown, agricultural socialization services can provide farmers a platform for information exchange and reducing the transaction costs of farmers. Therefore, the probability of organic fertilizer might be increased by reducing the transaction costs of farmers [41].

3.3.4. Control variables
In addition to the above variables, the individual and production management characteristics of the respondents will also affect the behavior of cultivated land protection. Therefore, setting the control variables of the model can reduce the estimation errors induced by missing variables.

(1) Individual characteristics of respondents. Studies have confirmed that gender, health status and education have an important impact on the cultivated land protection behavior of agricultural operators [42]. In this paper, the selected individual characteristic variables include the following: gender k1 (male = 1, female = 0), health status k2 (poor = 1, average = 2, good = 3), education level k3 (no schooling = 1, primary school = 2, junior high school = 3, high school or secondary school = 4, college and above = 5).

(2) Respondents’ production and operation characteristics. Variables such as agricultural management scale, soil fertility conditions and agricultural income ratio have been confirmed to have an impact on the cultivated land protection of agricultural operators [43]. In this study, the selected production and operation characteristic variables include the following: farmland scale k4 (the actual cultivated land area of the household, mu), soil fertility status k5 (good = 1, average = 2, poor = 3) and agricultural income proportion k6 (agricultural income as a percentage of total household income in 2016, %).

3.4. Variable description
In this survey, the respondents were mainly males (65.31%) aged 50 years or older (69.73%), with an education level of junior high school and below (86.49) and good health (75.17%). The scale of farmland is concentrated below 15 mu (80.27%), soil fertility conditions are poor (57.82%) and agricultural income is mostly less than half of the total household income (39.80%). Data from the survey demonstrate that 58.16% of the farmers applied organic fertilizer, with 71.93% of them using farmyard manure and 28.07% of them using commercial organic fertilizer, and the details are shown in Table 1.

4. RESULTS
According to the setting of the explanatory variable ‘whether or not to apply organic fertilizer’, the logistic regression model was used to estimate the theoretical path for the impact of perceived social norms on the cultivated land protection in Figure 2, followed by analysis using the mediating effect test methods reported by Preacher and Wen [44–45]. Furthermore, a multi-logistic regression model was used to distinguish the types of cultivated land protection behavior that are influenced by perceived social norms. In each estimation, the characteristics of individual respondents and their household production were used as control variables.

4.1. Direct effect of social norm perception on the protection of cultivated land
Table 2 reports the estimated results of the influence of perceived social norms on the behavior of cultivated land protection in the model. The estimation coefficients exhibit a direct positive impact of social norm perception on cultivated land protection at the 5% significance level, with a significant positive impact for the two sub-dimensions of the social norm perception (injunctive norms and descriptive norms), which provides a prerequisite for further exploration of the mediating effect. The estimation results of control variables reveal a marginal increase in the impact of health status on cultivated land protection, which was robust in three models. The coefficients of soil fertility condition in models I and II indicate that the cultivated land protection behavior could be activated when the soil fertility status is worse, which agrees with the general production rules of farmers.
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Table 1. Summary of variables used in this study and descriptive analysis.

| Variables                             | Variable description                                                                 | Mean   | Standard deviation |
|---------------------------------------|--------------------------------------------------------------------------------------|--------|--------------------|
| Cultivated land protection behavior   | Y                                                                                     | 0.582  | 0.494              |
| Organic fertilizer application        | Whether farmers applied organic fertilizer, 0 = no, 1 = yes                           | 0.582  | 0.494              |
| Type of organic fertilizer            | Which type farmers applied, 0 = chemical fertilizer; 1 = farmyard manure; 2 = commercial organic fertilizer | 0.745  | 0.720              |
| Perceived social norms               |                                                                                      |        |                    |
| Injunctive norms                      | Whether most of the farmers around you think organic fertilizer should be applied, 0 = no, 1 = yes | 0.782  | 0.413              |
| Descriptive norms                     | Whether the farmers you trust applied organic fertilizer, 0 = no, 1 = yes           | 0.160  | 0.367              |
| Attitude of cultivated land protection|                                                                                      |        |                    |
| Cognition of protection value         | Whether you agree that protection of cultivated land will increase crop yield, 0 = no, 1 = yes | 0.418  | 0.494              |
| Confidence to cope with risks         | Whether you think the village will adjust farmland during the contraction period, 0 = no, 1 = yes | 0.796  | 0.404              |
| Effectiveness of cultivated land protection |                                                                                     |        |                    |
| Protection skills                      | Whether you know the specific practices of cultivated land protection, 0 = no, 1 = yes | 0.786  | 0.411              |
| Relationship network                   | Whether you have cooperatives near your home to provide cultivated land protection services, 0 = no, 1 = yes | 0.262  | 0.440              |
| Individual characteristics of respondents |                                                                                      |        |                    |
| Gender of household head              | 0 = female, 1 = male                                                                  | 0.653  | 0.477              |
| Health condition of household head    | 1 = unhealthy, 2 = average, 3 = healthy                                               | 2.656  | 0.646              |
| Education of household head           | Illiterate = 1, primary school = 2, junior high school = 3, senior high school = 4, college degree or above = 5 | 2.592  | 0.896              |
| Respondents’ production and operation characteristics |                                                                                      |        |                    |
| Farmland scale                        | Actual family farmland (mu)                                                           | 10.350 | 9.420              |
| Soil fertility condition              | Rich = 1, average = 2, poor = 3                                                       | 1.697  | 0.874              |
| Agro-income proportion                | Agricultural income as a percentage of total household income in 2016(%)              | 47.640 | 33.860             |

Table 2. Regression analysis results of the influence of perceived social norms on the behavior of cultivated land protection.

| Variables                             | Coefficient | Standard error | Coefficient | Standard error | Coefficient | Standard error |
|---------------------------------------|-------------|----------------|-------------|----------------|-------------|----------------|
| Perceived social norms               | 0.855**     | 0.376          | 0.624**     | 0.300          | 0.595*      | 0.352          |
| Injunctive norms                      |             |                |             |                |             |                |
| Descriptive norms                     |             |                |             |                |             |                |
| Control variables                     |             |                |             |                |             |                |
| Gender                                | –0.254      | 0.276          | –0.310      | 0.277          | –0.270      | 0.276          |
| Health condition                      | 0.485**     | 0.199          | 0.487***    | 0.199          | 0.491**     | 0.198          |
| Education                             | 0.219       | 0.147          | 0.201       | 0.147          | 0.232       | 0.147          |
| Farmland scale                        | –0.021      | 0.014          | –0.022      | 0.014          | –0.020      | 0.014          |
| Soil fertility                        | 0.256*      | 0.154          | 0.285*      | 0.155          | 0.248       | 0.153          |
| Agro-income proportion                | 0.006       | 0.004          | 0.006       | 0.004          | 0.005       | 0.004          |
| Constant                              | –2.575***   | 0.750          | –2.281***   | 0.706          | –1.942***   | 0.672          |
| Pseudo-R²                             | 0.052       |                | 0.050       |                | 0.0465      |                |
| LR chi²                               | 20.91***    |                | 19.95***    |                | 18.58***    |                |
| Log likelihood                        | –189.39     |                | –189.87     |                | –190.56     |                |

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels.

4.2. Mediating effect of social norm perception on cultivated land protection behavior

Table 3 reports the regression analysis results of influence of perceived social norms and mediating factors on the behavior of cultivated land protection. Firstly, perceived social norms and mediating variables all pass the test at the 5% significance level, indicating that the conclusion of a positive impact of perceived social norms on cultivated land protection behavior remains unchanged. Secondly, the coefficient of social norm perception is smaller after adding the mediating variables, indicating that the mediating variables weaken the partial impacts of social norm perception on the protection of cultivated land. Moreover,
the mediating test results of model II illustrate that the value cognition, risk confidence, skills and relationship network play positive mediating roles in the impact of perceived social norms on cultivated land protection behavior. Specifically, farmer’s stronger perception of social norms would contribute to the activation of their cultivated land protection value cognition, risk confidence, skills and relationship network, which can stimulate their implementation of cultivated land protection behavior. The results show that, under the influence of social norms, farmers showed an increase value cognition level of cultivated land protection to a certain extent, more confidence to deal with risks, as well as reliance on the relationship network for information supply and skill learning among community members, which jointly drive farmers more inclined to adopt cultivated land protection behavior. From the perspective of control variables, after adding the mediating variables, health status still significantly affects the cultivated land protection behavior and occupies the dominant position of control variables. Meanwhile, agricultural income proportion became statistically significant in model II, indicating that the higher the agricultural income status, the more the emphasis on cultivated land protection.

Table 4 reports the binary logistic regression model of the impact of social norm perception on mediating variables. The social norm perception is shown to have a significant positive impact on the value cognition of cultivated land protection, confidence to cope with cultivated land protection risks and learning of cultivated land protection skills but not the enhancement of relationship network.

In summary, the significance of each model parameter is tested step by step based on Wen’s work [45]. Except for relationship network, social norm perception shows a significant (5%) effect on other regression coefficients. Mechanically, social norm perception affects the cultivated land protection behavior through mediating effects of cultivated land protection value cognition, risk confidence and skills, which fully support H1 and H2-1 and partially support H2-2 in the hypotheses.
4.3. Mediating effect of social norm perception on different types of cultivated land protection behaviors

In order to enhance the robustness of the mediating effect test, this paper classifies the independent variables and uses a multiplicative model to compare the impact of social norm perception on different types of cultivated land protection behaviors. The results are shown in Table 5.

Model I shows the direct impact of perceived social norms on application of farmyard manure and commercial organic fertilizer. At the 5% significance level, the impact of social norms on the behavior of farmyard manure application is significantly positive, in contrast to no significant impact on the application of commercial organic fertilizer. From the perspective of control variables, the health status and the proportion of agricultural income significantly affect the application of farmyard manure, while the application of commercial organic fertilizer is significantly affected by the education status of farmers, implying that the impact of health status of the labor force on application of farmyard manure can be attributed to high physical strength, while farmers with higher education are more likely to accept the promotion of commercial organic fertilizers. After adding the mediating variables in Model II, farmyard manure is still shown to be significantly affected by perceived social norms but not the commercial organic fertilizer. The added mediating variables of the application of farmyard manure and commercial organic manure are positively affected by the value cognition of cultivated land protection, indicating that farmers pay more attention to the economic value brought by cultivated land protection. The effects of risk confidence and protection skills are significant on farmyard manure application but not commercial organic fertilizer application, indicating that farmyard manure application requires certain risk-taking ability and practical operation experience for cultivated land protection. The construction of relationship network has significant and positive effect on commercial organic fertilizer application but not on farmyard manure application, indicating that commodity organic fertilizer application depends on promotion of relationship network.

The integrated estimation results of Table 4 and Table 5 reveal value cognition, risk confidence and skill of cultivated land protection as the mediating factors for the impact of perceived social norms on cultivated land protection. Social norms tend to activate farmers’ cultivated land protection behavior by improving the value cognition level, risk confidence and skills, which is consistent with the overall test results. The application of commercial organic fertilizer depends on the construction of relationship network to promote their applications by farm households.

5. CONCLUSIONS AND DISCUSSIONS

5.1. Conclusions

From the perspective of institutional theory and farmer behavior theory, this study analyzes the internal mechanism underlying the impact of social norm perception on cultivated land protection in terms of direct effect and mediating effect, using the survey data from farmers in Xijin County of Shandong Province for an empirical analysis. The main conclusions are as follows:

(1) Generally, the perception of social norms has a significant positive impact on the protection of cultivated land, which is further supported by the significant influence of both injunctive norms and descriptive norms on the behavior of cultivated land protection with strong robustness.

(2) Strengthening the perception of social norms not only significantly enhances farmers’ value cognition of cultivated land

Table 5. Regression analysis results of perceived social norms, mediating variables and application of farmyard manure/commercial organic fertilizer.

| Variables               | Farmyard manure | Coefficient | Commercial organic fertilizer | Coefficient | Farmyard manure | Coefficient | Commercial organic fertilizer | Coefficient |
|-------------------------|-----------------|-------------|-------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|
| Perceived social norms  | 0.992** (0.431) | 0.550 (0.539) | 1.017** (0.470) | 0.845 (0.975) |
| Mediating variables     |                 |             |                               |             |
| Cognition of protection value |             |             |                               |             |
| Confidence to cope with risks |             |             |                               |             |
| Protection skills       | 0.683 (0.366)  | 0.748 (0.705) | 1.751*** (0.389) |             |
| Relationship network    | 0.442 (0.455)  | 1.390* (6.323) |                 |             |
| Control variables       |                 |             |                               |             |
| Gender                  | -0.481 (0.294) | 0.376 (0.421) | -0.501 (0.320) | 0.800 (0.634) |
| Health condition        | 0.484** (0.217) | 0.482 (0.318) | 0.558** (0.232) | 0.699 (0.512) |
| Education               | 0.156 (0.159)  | 0.356* (0.212) | 0.108 (0.172) | 0.451 (0.351) |
| Farmland scale          | -0.022 (0.015) | -0.018 (0.021) | -0.007 (0.017) | -0.011 (0.039) |
| Soil fertility          | 0.265 (0.165)  | 0.235 (0.218) | 0.286 (0.181) | -0.054 (0.340) |
| Agro-income proportion | 0.099** (0.004) | -0.003 (0.006) | 0.009** (0.004) | 0.006 (0.010) |
| Constant                | -2.903*** (0.826) | -3.991*** (1.161) | -5.553*** (1.079) | -2.579 (6.326) |
| Pseudo-R²               | 0.056           |             |                               |             |
| LR chi²                 | 33.53***        |             |                               |             |
| Log likelihood          | -284.591        |             |                               |             |

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, and the numbers in brackets denote standard error.
protection but also reduces the uncertainty of farmers’ behaviors in cultivated land protection and improves their cultivated land protection skills. However, the effect of perceived social norms on the construction of relationship network fails to pass the significance test.

(3) The internal mechanism underlying the impact of perceived social norms on cultivated land protection reveals that perceived social norms can encourage farmers to adopt cultivated land protection behaviors by affecting their cognition of cultivated land protection value, risk confidence and skills. Among them, social norm perception is the driving force to promote cultivated land protection behavior, with value cognition, risk confidence and skills playing a mediating role in this process.

(4) The internal mechanisms underlying the impact of perceived social norms on cultivated land protection vary with the types of cultivated land protection behaviors. For farmyard manure, cultivated land protection value cognition, risk confidence and skills still play positive and significant mediating roles. For commercial organic fertilizers, the construction of relationship networks can significantly promote farmers’ cultivated land protection behavior.

5.2. Discussions
This paper explores the intrinsic logic of the influence of perceived social norms on cultivated land protection, interprets the farmers’ internalized perception process of social norms, such as current social hotspots and mainstream public opinions, and reveals the path of social norm perception to the decision making of farmers’ land protection behavior. Furthermore, the impact of social norms on different types of organic fertilizer application and the related mechanism are explored with a different conclusion from that of the overall test, which contribute to the explanation of the impact of perceived social norms on farmers’ behavior of cultivated land protection. Our results also shed light on the incentives for farmers’ cultivated land protection behavior. First of all, the effects of social norms on farmers’ behavior of cultivated land protection should be activated through the promotion of village leaders, media popularization and large-scale demonstration, enabling farmers to fully understand the necessity of cultivated land protection application and enhance their cognition of economic and ecological effects on cultivated land protection. Secondly, the operational skills of cultivated land protection should be improved by reducing the related technical threshold through the vocational training of farmers and the improvement of professional services. Finally, farmer’s land operation rights should be protected and the income confidence should be increased to encourage more farmers to participate in green, eco- and environment-friendly agricultural production. Though this study significantly contributes to the literature about the influence of perceived social norms on the farmers’ decision making of cultivated land protection, it nevertheless has some limitations. The empirical analysis is performed with cross sectional data from the Xiajin County. Though the robustness of the research results is further enhanced by examining the effects of the two sub-dimensions (injunctive and descriptive norms) of social norms on the behaviors of cultivated land protection, we are cautious in claiming any causal effect between social norms perception and farmers’ decision making of cultivated land protection. Further research should be conducted with longitudinal data and samples from the other largest agricultural producing areas.

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CONFLICTS OF INTEREST
The authors declare no conflict of interest.

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