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Effectiveness of Educational Intervention based on Protection Motivation Theory to Promotion of Preventive Behaviors from Brucellosis among Ranchers of Farmer

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ABSTRACT

Aims Brucellosis is one of the most important public health problems in developing countries, especially in rural areas closely related to animals. This study determines the effectiveness of an educational intervention based on Protection Motivation Theory on promoting preventive behaviors from brucellosis between the farmer's ranchers in the comprehensive rural health center.

Materials & Methods In this quasi-experimental study, 110 ranchers of the farmer (in two groups of intervention and control) were selected by two-stage cluster sampling. The data collection instrument was a researcher-made questionnaire consisting of two parts; the first part included demographic questions, and the second part related to knowledge of the disease and the Protection Motivation Theory questions. The data were analyzed by SPSS 16 using Mann Whitney, Shapiro-Wilk, Kruskal-Wallis, Regression, Fisher's Exact Test, and Chi-Square.

Findings After the educational intervention, awareness and all protection motivation theory structures in the intervention group compared to the control group have increased significantly ($p<0.05$). Also, the structures of protection motivation theory predicted 0.66% of the variance of preventive behaviors, and among them, self-efficacy and motivation related to behavior were the strongest predictors.

Conclusion This study confirms the effectiveness of an educational intervention based on the Protection Motivation Theory on adopting brucellosis's preventive behaviors.

Keywords Brucellosis; Primary Prevention; Educational Early Intervention; Ranchers; Farmer

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Introduction

About 60% of current infectious diseases are zoonoses (a common disease between humans and animals), and brucellosis is one of the most common zoonoses [1]. Bacteria of the genus Brucella cause the diseases [2]. People at risk are mostly ranchers and their families, farmers, veterinarians, and slaughterhouse workers [3, 4]. The disease occurs in both acute and chronic types in humans and has various clinical manifestations that have made it difficult for physicians to diagnose [5]. Signs and symptoms of brucellosis include fever, fatigue, weakness, headache, muscle aches, and weight loss in people [6]. The most common symptom is musculoskeletal involvement [7]. Brucellosis in animals causes abortion and reduces milk production and fertility [8]. This disease is seen in both human genders, but it is more in males (55.4%) than females (44.6%). Most cases of the disease are seen in spring and summer [5]. The disease threatens people's health worldwide, especially in developing countries such as Central Asia, Africa, South America, and the Mediterranean region [9]. Brucellosis is lower in Western countries than in Asian countries. Countries like Australia, Canada, Japan, Denmark, Finland, the United Kingdom, and Norway have been able to eradicate brucellosis [10]. The countries with the highest prevalence of human brucellosis are Syria (1603.4), Mongolia (391), and Tajikistan (211.9) per 100,000 [11]. According to the World Health Organization, this disease's incidence is 10 to 25 times higher than reported cases [12]. In terms of disease incidence, Iran ranks fourth globally with an average of 43.24 per 100,000 people [13]. According to the report of the Ministry of Health in 2012 in terms of brucellosis infection, the provinces of East Azerbaijan, Hamedan, Lorestan, Markazi, South Khorasan, West Azerbaijan, and Kermanshah have very high infection level (41-31 per 100,000 people), and the provinces of Khorasan Razavi, Kurdistan and Zanjan have high infection level (21-30 per 100,000 people) [5]. Brucellosis is spread to humans through the digestive system by consuming milk and contaminated meat products, respiratory tract, and skin scratches by touching animal carcasses [11]. It is rarely transmitted through breast milk, sexual intercourse, blood transition, and organ transplants. The most common disease transmission is through the digestive system and the consumption of unpasteurized milk and dairy products [9]. Controlling brucellosis in cattle is the key factor to controlling the disease in humans, and the best way to achieve this is through vaccination of cattle, killing infected cattle, and promoting hygienic behaviors such as the use of pasteurized milk and dairy products, which reduces the risk of disease in individuals [8, 14]. Studies show that lack of knowledge about the transmission and prevention of brucellosis are the main causes of the disease. Community training has been mentioned as the most important strategy to prevent brucellosis in a study by Emad al-Din *et al*. [14] on knowledge, attitudes, and behaviors related to brucellosis in farmers in Jordan and a study by Sadeghi *et al*. [15] in Urmia entitled "assessing the level of awareness of dairy producers about brucellosis" as well as in the plan to fight brucellosis conducting by the Veterinary Organization of Iran. Therefore, training can be planned by promoting preventing behaviors of brucellosis in humans and animals. The first step in the planning process of a training program is to choose a health model. The value and effectiveness of health training programs depend on theories and models [16]. One of the theories that have been used to examine the factors affecting a person's motivation and behavior is the theory of protection motivation. This model was introduced in 1975 by Rogers and has since been widely accepted as a framework for predicting and intervening in health-related behaviors. This model assumes that the acceptance of the recommended health behavior (protective behavior) against health risk motivated self-protection [17, 18].

In this model, response efficiency constructs are a person's expectation that a consistent response can eliminate the risk (Protective behavior against health risk); self-efficacy is the belief that one can perform protective behavior successfully; perceived Vulnerability is a person's belief that he or she is vulnerable to a health risk; perceived severity is a person's belief that he or she is in danger; response costs is a person's estimate of any costs, such as money, person, time, the effort associated with protective behavior, and protective motivation influences the intention to engage in protective behavior against health risks. Protective motivation ultimately triggers health behavior [19] (Figure 1).

This disease cannot be considered an occupational disease exclusively, but the type of job is a risk factor for the disease. Jagatai city is one of the traditional livestock breeding centers in Khorasan Razavi province. Most ranchers of farmers in rural areas are engaged in agriculture, and according to the studies of brucellosis in the health network of Jagatai city in 2012-2013, Jagatai city with an average of 40 per 100,000 people, is one of the cities with a high number of diseases. The highest incidence of the disease in this city is related to farmers ...[20]. Due to direct contact with the carcasses, placenta, and embryos of infected animals, the use of unpasteurized dairy products and livestock manure in agricultural lands has made them more susceptible to brucellosis. Therefore, this study was conducted to determine the effectiveness of training intervention based on the theory of protection motivation in promoting brucellosis prevention behaviors in farmers.

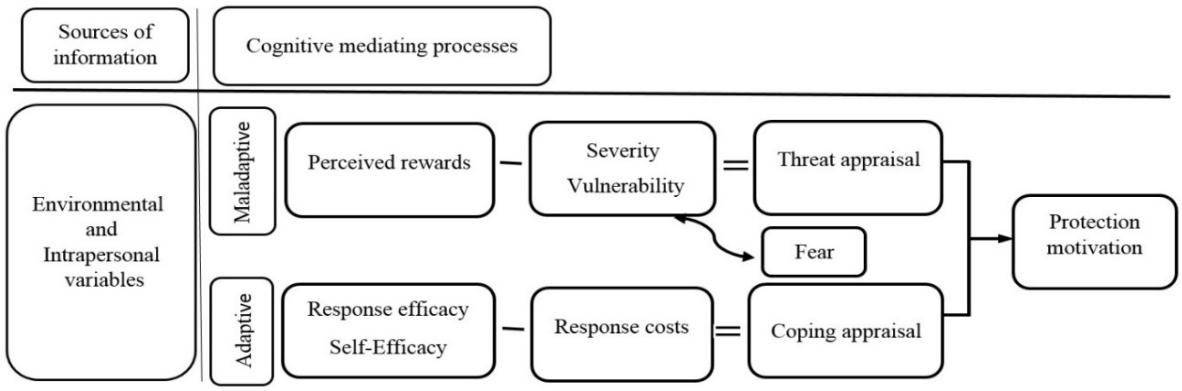

Figure 1) Theory of protection motivation [19]

Materials and Methods

This study determines the effectiveness of an educational intervention based on Protection Motivation Theory on promoting preventive behaviors from brucellosis between ranchers of the farmer in Jagatai city in Khorasan Razavi in 2019. The study population was male and female farmers referred to the comprehensive rural health centers in Jagatai city. In this study, the estimated sample size for each group was 27 people based on a 95% confidence level and test power of 90 (53 people in each group). Due to the target group's characteristics and the high probability of statistic drop, 55 people were considered in each group (110 people in each group). Sampling was performed by the two-stage cluster sampling method. Thus, Jagatai city has five comprehensive rural health centers, and each center covers several villages. Out of every five comprehensive rural health centers in Jagatai city, two villages were randomly selected (n=10). Then, of 2 villages selected from each comprehensive health center, one village was randomly selected as a control group and one village as an intervention group (5 villages as a control group and five villages as an intervention group). Then, 51 people of the mentioned villages proportionate to the village population were placed in each of the two intervention and control groups systematically randomized according to the conditions and based on the electronic file. Inclusion criteria include simultaneous employment of male and female in rancher (due to direct contact with livestock), and agricultural (due to the use of animal manures in agricultural fields), with active health record of the health team, completion of written consent to participate in the research, lack of history of brucellosis in the subjects and their family. Exclusion criteria included migration from the village during the present study, absence of more than two training sessions, and dissatisfaction with continuing the study.

Data collection tools included a researcher-made questionnaire consisting of two parts. The first part of the demographic questionnaire questions included age, gender, marital status, education, family income, and animal type. The second part of the questionnaire included questions about awareness, which included five questions about general knowledge (reasons and symptoms), eight questions about knowledge of modes of transmission, seven questions about knowledge of prevention and treatment. The answer to each question was correct-incorrect-I do not know, with scores of 2, 0, and 1, respectively (brucellosis is transmitted from animal to human). Questions related to the constructs of protection motivation theory included 6 questions of sensitivity (eg, male are more likely to be infected by brucellosis than female), 6 questions of perceived intensity (eg, brucellosis causes my family members to spend a lot of time caring for me and my work), 7 questions of perceived self-efficacy (eg, I can allocate money for protective equipment (glasses, gloves, clothes and special shoes)), 7 questions about the effectiveness of the perceived answer (eg, I do not get infected with brucellosis by boiling milk for 3 to 5 minutes), 7 questions about perceived answer cost (eg, providing protective equipment is costly and expensive), 5 questions about fear (the thought of effecting by brucellosis is scary to me), 7 questions about perceived reward questions (eg, slicing meat without gloves is much easier and faster for me), 10 question about protection motivation (eg, I plan to use a mask, gloves and special shoes when collecting animal waste), 9 questions about preventive behaviors from brucellosis (eg, I use fully cooked meat and other viscera of livestock). To answer all the questions in the second part, a 5-point Likert scale was used except for preventive behavior. The items of the scale were scored from 1 to 5 in complete opposition to complete agreement. To answer the constructive question of preventive behavior, four answers (never, sometimes, most of the time, always) were used, and each question was given a score of 1-4. To determine the questionnaire's face validity, 15 copies of the questionnaire were provided to 15 male and female ranchers of farmers, and they were interviewed face-to-face by the researchers. They were asked to comment on the level of difficulty in understanding the concepts, the degree of relevance, and the degree of ambiguity and misconceptions.

Also, they were asked to underline any word or question that was not clear. Based on the comments and suggestions received from the mentioned subjects, eight questions were removed. A quantitative method was used to determine the content validity, which includes two coefficients of content validity ratio and content validity index. The questionnaire was presented to 10 health education specialists and infectious disease specialists, and they were asked to judge each question in three ways: necessary, useful, or unnecessary. CVR values higher than 0.62 were accepted based on the Lawshe table. Nine questions were deleted at this stage. Content validity index: For this purpose, three criteria of relevance, clarity, and simplicity were used using a four-part Likert scale for each item. CVI values above 0.79 were accepted. No questions were deleted at this point.

The questionnaire reliability was investigated by two methods of internal consistency and retesting. To measure internal consistency, a pilot questionnaire was prepared by interviewing 15 farmers, and then the internal consistency (by calculating Cronbach's alpha method) was determined based on their scores. SPSS16 software was used for statistical processing. No questions were deleted at this point. The questionnaire reliability was investigated by the test-retest method. For this purpose, 15 ranchers of farmers from outside the study group were selected, and the test was performed twice with an interval of two weeks. The result of the test-retest method with a 0.74 level was acceptable.

The research subjects were justified in how to carry out the plan and the confidentiality of information, as well as the purpose of this plan, and all participants entered the study after obtaining informed consent. The Research Ethics Committee approved this study of the Sabzevar University of Medical Sciences with plan number 97146 and IR's ethic code.MEDSAB.REC.1398.021. In the pre-test stage, the researcher completed a questionnaire for the control and intervention group through interviews, and the most important predictors of brucellosis prevention behaviors were identified. Then, the training content was designed based on the constructs of protection motivation theory, and the training intervention was conducted for the intervention group. Primarily used training content includes general infectious diseases, common diseases of humans and animals, the introduction of brucellosis and the importance of the disease, modes of transmission, symptoms of the disease in humans and animals, complications, time course, the effect of age, gender and occupation on the disease, preventative methods, and the ways of treatment [21-23]. Seven 1.5-hour training interventions were held (one session per week) for five groups, including 11 people. The sessions were held using lectures, brainstorming, group discussion, questioning and answering, showing training videos, inviting the person with brucellosis, preparing training pamphlets, and designed slides (Table 1). The initial post-test was performed for both control and intervention groups immediately after the intervention through a questionnaire and interview. The second post-test was performed again for both intervention and control groups, two months after the intervention.

Table 1) Summary of sessions in the experimental group

Sessions	Objectives	A summary of topics and activities
First	Introduction of intervention and pre-test	-Introduction the number and objectives of the sessions -Introducing the educator -Performing the pre-test
Second	Raising awareness by emphasizing the perceived sensitivity and severity of Ranchers of Farmer to brucellosis	-Common diseases between humans and animals -Geographical prevalence of brucellosis -How animals get brucellosis -Ways of transmitting brucellosis
Third	Promoting preventive behaviors with an emphasis on self-efficacy and motivation	-Clinical signs of brucellosis in animals -Factors and reservoirs of the disease to increase self-efficacy -Introducing the centers for diagnosis and treatment of brucellosis
Fourth	Promoting preventive behaviors with an emphasis on response cost and response efficiency	-Ways to prevent brucellosis -How to treat brucellosis -The importance of proper behavior
Fifth	Promoting preventive behaviors with an emphasis on fear and self-efficacy	-Ways to prevent brucellosis -Improve self-efficacy -The importance of prevention and fear of disease
Sixth	Promoting preventive behavior with an emphasis on motivation and perceived rewards	-Ways to prevent brucellosis -Rewards for Misbehavior -Suitable substitutes for Misbehavior
Seventh	Promoting preventive behaviors with emphasis on preventive behaviors (Review of previous sessions)	-Ways to prevent brucellosis -Descriptions of proper behaviors -Review the general concepts of the previous sessions

Chi-square and Fisher tests were used to investigate the homogeneity and distribution of qualitative variables (demographic) in the intervention and control groups. Mann-Whitney test was used to compare the means of quantitative variables in the two groups. A linear regression test was used to investigate the relationship and impact of the studied variables (structures) and predict predictive structures before the intervention. Analysis of variance with repeated measures was used to examine the differences between the two groups and the intervention's effect over time. Data were analyzed using SPSS 16 software, and $p<0.05$ was considered statistically significant.

Findings

In this study, 110 people participated. Chi-square test and Fisher's exact test showed no statistically significant differences between the control and intervention groups in terms of demographic variables of age, marital status, income, education, type of animal ($p<0.05$). However, the two groups had a statistically significant difference in terms of gender ($p<0.05$), which showed proper matching of the two groups in all variables except gender (Table 2).

The linear regression test was performed to determine the effect of protection motivation theory constructs on ranchers' behavior and identify predictive structures before intervention. The results considering the significance level of $p<0.05$ showed that, in general, the constructs of protection motivation theory predicted 0.66 of the variance of preventive behavior, and self-efficacy and motivation related to behavior were the strongest predictors (Table 3).

The Kolmogorov-Smirnov test results showed that the data did not have a normal distribution ($p<0.05$). The Mann-Whitney test results in Table 4 showed no statistically significant difference in the mean scores of the structures of protection motivation theory between the control and intervention groups before the intervention ($p<0.05$).

After the educational intervention, repeated measures analysis of variance test by adjusting the gender variable showed that the mean scores of knowledge and all constructs of protection motivation theory in the intervention group increased significantly at different time intervals than the control group ($p<0.05$). There was no significant difference in the mean scores of the constructs of protection motivation theory in the control group before, immediately, and two months after the training intervention ($p<0.05$; Table 4).

Table 2) Characteristics of demographic variables in the target groups

Variables	Experimental		Control	
	Number	Percent	Number	Percent
Gender				
Man	20	36.40	32	58.20
Female	35	63.60	23	41.80
p-value		0.022		
Marital status				
Married	54	98.20	54	98.20
Single	1	1.80	1	1.80
p-value		0.999		
Income				
Very weak	8	14.50	11	20.00
Weak	26	47.30	31	56.40
Medium	15	27.30	11	20.00
Good	6	10.90	2	3.60
p-value		0.317		
Education				
Illiterate	6	10.90	11	20.00
Primary	24	43.60	26	47.30
Secondary	12	21.80	6	10.90
High school	9	16.40	8	14.50
University	4	7.30	4	7.30
p-value		0.461		
Animal type				
Sheep	35	63.60	37	67.30
Cow	19	34.50	18	32.70
Goat	1	1.80	0	0
p-value		0.841		

Table 3) Regression analysis of Protection Motivation Theory before intervention in the target groups (Adjusted R^2=0.66)

Structures	B	Std. Error	β	p-value
Awareness	-0.14	0.03	-0.02	0.649
Sensitivity	0.02	0.09	0.02	0.791
Severity	0.10	0.06	0.12	0.074
Self-efficacy	0.35	0.08	0.35	0.001
Costs	0.01	0.07	0.01	0.813
Response Efficacy	-0.08	0.06	-0.10	0.198
Fear	0.01	0.05	0.01	0.808
Protection motivation	0.37	0.06	0.46	0.001
Reward	0.14	0.08	0.12	0.073

Table 4) Constructs of protection motivation theory in experimental and control groups before, immediately after, and two months after the intervention

Groups	Before	Immediately	After two months	Repeated Measure ANOVA (p-value)
Awareness				
Experimental	25.25±5.57	40.00±0.00	39.61±0.89	0.001
Control	25.14±5.60	25.10±5.61	25.07±5.62	
Mann–Whitney (p-value)	0.848	0.001	0.001	
Sensitivity				
Experimental	21.96±2.30	30.00±0.00	29.89±0.36	0.001
Control	21.76±2.23	21.74±2.22	21.74±2.22	
Mann–Whitney (p-value)	0.587	0.001	0.001	
Severity				
Experimental	21.50±3.38	29.36±1.02	29.25±1.04	0.001
Control	21.58±3.37	21.58±3.42	21.52±3.39	
Mann–Whitney (p-value)	0.834	0.001	0.001	
Self-efficacy				
Experimental	22.18±2.78	29.92±1.19	29.87±1.15	0.001
Control	21.61±2.87	21.65±2.91	21.58±2.87	
Mann–Whitney (p-value)	0.479	0.001	0.001	
Costs				
Experimental	23.27±2.95	32.45±2.68	32.30±2.79	0.001
Control	23.30±2.34	23.32±2.22	23.30±2.19	
Mann–Whitney (p-value)	0.810	-	-	
Response Efficacy				
Experimental	26.3±29.39	35.0±0.00	34.0±80.40	0.001
Control	25.3±18.15	25.3±20.13	25.3±18.13	
Mann–Whitney (p-value)	0.137	0.001	0.001	
Fear				
Experimental	17.83±3.66	23.76±1.76	23.72±1.77	0.001
Control	18.58±3.31	18.54±3.31	18.56±3.32	
Mann–Whitney (p-value)	0.148	0.001	0.001	
Protection motivation				
Experimental	32.05±3.58	47.61±1.00	47.47±1.10	0.001
Control	30.00±3.20	30.01±3.22	29.98±3.17	
Mann–Whitney (p-value)	0.300	0.001	0.001	
Behavior				
Experimental	22.80±3.07	36.00±0.00	29.98±3.17	0.001
Control	22.41±2.64	22.40±2.62	35.87±0.33	
Mann–Whitney (p-value)	0.668	0.001	0.001	
Reward				
Experimental	18.14±2.72	29.29±1.80	29.05±1.81	0.001
Control	17.40±2.02	17.26±2.00	17.87±2.33	
Mann–Whitney (p-value)	0.183	0.001	0.001	

Discussion

Based on this study's results, the constructs of motivation and self-efficacy were introduced as the most important predictors of behavior. Among these, the role of protection motivation was more than other variables. Bagheri Moghadam *et al*. [17], Tezwal *et al*. [24], and Sharifi Rad *et al*. [25] introduced motivation as the most important predictive construct related to behavior. Also, in the present study, the self-efficacy construct was identified as the second predictive construct. In the studies by Moaeeni *et al.* [18] and Ebadi Fardazar *et al.* [26], self-efficacy was introduced as the most important predictive construct of behavior. Emphasis on self-efficacy and the stage before the behavior (motivation) can positively affect the final behavior of

the person [27]. Therefore, the more confident people are in their ability to use protective behaviors, the more probability of adaptive behavior in their actions. The rate of mean knowledge changes was significantly higher in the intervention group than the control group immediately and two months after the intervention. Increasing the mean changes in knowledge score in the intervention group showed a positive effect of training. According to a study by Asakura *et al*. [28] on the risk factors for brucellosis in farmers, one of the most important risk factors for the disease is farmers' low awareness. Also, in the study of Eskandari *et al*. [29], which was conducted on the promotion of preventive behaviors in ranchers, awareness of the pathogen's features is the most important factor in reducing the incidence and prevalence of brucellosis in humans. The findings of the present study are consistent with the study of Masoudi *et al*. [30].

The constructs of perceived sensitivity were significantly increased in the intervention group immediately and two months after the intervention, which is consistent with the study of Baghani Moghadam *et al*. [17], Hosseini *et al*. [31], and Ghaffari *et al*. [32]. Increased perceived sensitivity leads farmers to believe that they are at risk for brucellosis and to develop a tendency to take preventive behaviors.

The rate of perceived severity changes after the intervention was significantly higher in the intervention group than the control group, immediately and two months after the intervention. The findings of the present study are in accordance with the study of Khiali *et al*. [16], Ebadi *et al*. [26], and Khosravi *et al*. [33] but did not consistent with the findings of Dehdari *et al*. [34] and Demirtas *et al*. [35].

These results showed that the more ranchers of farmers are aware of the disease's seriousness and its complications, social and occupational consequences, the more preventive behaviors they will do.

The perceived self-efficacy construct's value was significantly higher in the intervention group than the control group immediately and two months after the intervention. Increasing awareness and providing appropriate training resources, and using succession experiences can increase the self-efficacy of farmers. The present study's findings are consistent with the study of Qahramani *et al*. [36] and Khosravi *et al*. [33].

The present study's findings are consistent with the study of Ebadi Fardazar *et al*. [26]. In the study of Tezval *et al*. [24], the mean scores of protective behaviors also increase with increasing the mean scores of response efficiency. The more ranchers of farmers are confident that preventive behavior can eliminate the threat, the more preventive behavior. Response efficiency is a key component in accepting preventative behaviors. These results are not consistent with the studies of Khiali *et al*. [16] and Qahramani *et al*. [36].

The fear construct level was significantly improved in the intervention group immediately and two months after the intervention. The findings of the present study are consistent with the study of Qahramani *et al*. [36]. However, in the study of Dehdari *et al*. [34], the fear factor had little effect on the rate of Pap smear. Fear of brucellosis in terms of physical, psychological, and social complications can motivate a person to change their behavior and increase their motivation to protect themselves against brucellosis.

The rate of perceived reward changes and perceived response cost was significantly higher in the intervention group than the control group immediately and two months after the intervention. The present study's findings are consistent with the studies of Morvati *et al*. [18] and Khayali *et al*. [16]. Increasing the reward that people perceive for preventive behaviors against the costs of performing brucellosis prevention behaviors will motivate them to protect themselves.

The amount of protective motivation and preventive behaviors of brucellosis increased significantly in the intervention group compared to the control group immediately and two months after the intervention. The present study's findings are consistent with the studies of Qahramani *et al*. [36] and Masoudi *et al*. [29].

The illiteracy of participants and the dispersion of the region were among the limitations of the study. To solve this problem, a questionnaire was completed using an interview.

Considering the positive effect of the training program designed based on the theory of protection motivation and low cost of prevention activities, and the need to control brucellosis, it is recommended that this factor be considered an important strategy to promote preventive behaviors brucellosis in high-risk groups.

Conclusion

This study showed the effectiveness of an educational intervention based on protection motivation model constructs in promoting prevention behaviors in farmers.

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