

## Designing an Agricultural Occupational Health Behavioral Model

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### ABSTRACT

Occupational injuries have several psychological, economic, social, and institutional consequences. Agriculture is a high-risk industry, but occupational injuries are mainly rooted in the behavior of farmers. The present study was conducted using the qualitative approach and the grounded theory method. The study population included members of the Faculty of Agricultural Science and Occupational Health of the School of Medical Science, agricultural experts, occupational health experts, and farmers who were selected through snowball sampling in Kermanshah province in western Iran. The data was collected through interviews. The findings showed that cognitive, personal management, cultural, organizational and economic factors affect agricultural occupational health behavior. In the research model, healthy growers, healthy products, and healthy society were the consequences of the use of appropriate strategies for agricultural occupational health behavior. Designing a native model of healthy behavior to promote occupational health is a step towards reducing injuries among farmers.

**Keywords:** Agriculture, Agricultural worker health behavior, Farmers, Grounded theory, Occupational safety.

### INTRODUCTION

About 313 million non-fatal occupational injuries occur worldwide annually. These lead to at least four days of absence from work and more than 350,000 fatalities from occupational injuries (International Labor Organization, 2014). Agriculture is a high-risk sector (Kim *et al.*, 2016). Of the 335,000 work-related incidents worldwide, 170,000 deaths occur among agricultural workers per year (Padilla, 2013). Occupational disease is particularly relevant to agriculture and has an incidence rate similar to that of other sectors (Rautiainen,

2011). In other words, farmers are exposed to many different risk factors and diseases (Moradhaseli *et al.*, 2017). Statistics about work-related injuries in the agricultural sector are incomplete in Iran and only limited epidemiologic research has evaluated the health and potential occupational hazards of Iranian farm workers, despite the importance of agriculture and the agricultural workforce (Moradhaseli *et al.*, 2018; Ghafari *et al.*, 2017). Kermanshah province in western Iran is an important agricultural region, but unofficial statistics and studies carried out in Kermanshah indicate that farmers are regularly exposed to diseases and work-

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related injuries (Moradhaseli *et al.*, 2017; 2018; Arkavazi and Zarafshani, 2012). Despite the lack of data, it is arguable that the rate of injury in the agriculture industry is high in Iran, so, it is imperative to study this problem, bearing in mind that the behavior of individuals is a major cause of these injuries (Hosseinzadeh and Ghorbani, 2011).

Behavior has been identified as the most important factor that causes accidents and injuries, which, in turn, has an important role in reducing exposure to work-related damage (Geer *et al.*, 2006). This is only possible if the main determinants of farmer behavior are identified by developing and disseminating an appropriate behavioral model. Several studies have examined safety at work and have provided various models for occupational safety and health. These include the demand-control-support and safety culture models. In addition, various models have been developed to promote occupational health behavior since 1950.

The theory of behavioral change in the field of health can be divided into intrapersonal (theory of reasoned action, health belief model, theory of planned behavior, trans-theoretical model, precaution adoption process model), interpersonal (social cognitive theory) and community (diffusion of innovations theory) theories (Safari and Shojaezadeh, 2008). Intrapersonal theories emphasize internal factors such as awareness, attitudes, beliefs, self-concept and mental history, past experiences, motivation, skills and behavior. Interpersonal theories consist of factors associated with the experiences of individuals and perceptions arising from their living environment in combination with personal characteristics.

Social theories include factors due to the ecological perspective, meaning institutional, social and public policy factors. Institutional factors include laws, regulations and policies of an organization that can affect health behavior. Social factors include social networks and norms, while public policy includes rules that can affect health

behavior (Safari and Shojaezadeh, 2008). Studies show that each theory and behavioral model has its own limitations, and is not localized to the conditions of Iranian farmers (Moradhaseli *et al.*, 2018).

A study of previous research failed to uncover a codified behavioral pattern for farmer health behavior in Iran. It is necessary to describe the safety and health behavior patterns of Iranian farmers to compose a basis for the definition of appropriate prevention strategies. In this light, grounded theory seems to be the most adequate approach for studying Iranian farmer behavior. The aim of this research was to define a farmer occupational health behavioral model that is based on grounded theory.

## MATERIALS AND METHODS

In spite of the aforementioned studies in the literature and due to the nature of the issue and the lack of comprehensive research on the causes of agricultural occupational health behavior in Kermanshah province and in Iran, there was an urgent need to take an explorative approach to examine this phenomenon in details. Since the existing methods in the qualitative paradigm have the potential to detect subtle details and profound information about phenomena and areas with scarce literature, the qualitative paradigm was adopted in the present study because of its high quality and systematic structure in grounded theory. Grounded theory refers to a theory directly extracted from data collected and analyzed during a study on a regular basis.

### Participants and Sampling Strategy

The participants of the study were faculty members of agricultural science and occupational health of medical science, agriculture experts, occupational health experts, and the leading farmers who had used modern agricultural implements and had

attended the agricultural extension courses. This study used purposive and snowball sampling methods to select the sample, while theoretical sampling was employed to identify the research direction. During the theoretical sampling of the study, the concepts collected by the interviews were studied by the researcher for adequacy and this process continued as long as the researcher did not feel the adequacy. Such sampling continued until the saturation of the data. Then, at theoretical saturation stage, new data included in the research could not change the categorization or could not be a source of new category (Kalaki, 2010). The data from the interview reached saturation through in-depth individual interviews with 47 participants (faculty members, agriculture experts, occupational health experts, selective farmers). All the participants of the study were interviewed by a trained researcher who conducted the interviews on their farms or in their residences in Kermanshah province, Iran.

### Interview Strategy

Data were gathered through in-depth interviews, observations and group discussion. Unstructured interviews were performed with follow-up questions with group discussion until “reaching saturation”.

### Data Coding and Analysis

Data analysis was performed using continuous data analysis and Strauss and

Corbin's method. To this end, the transcribed interviews were studied and analyzed after each interview session. Then, data coding (including open, axial and selective coding) procedure was performed. To have open coding, texts relevant to each interview were carefully studied line by line and elements containing a point related to the main research question were identified and labeled with the same theme. The output was some extracted themes related to the subject of the study. Then, the resulting themes were carefully examined and compared in terms of similarities and differences. After that, themes of the same nature or with relevant meaning were classified as categories. After identifying the categories, their features and aspects were specified to thoroughly distinguish them from each other and to determine their exact nature. In the next step, the main categories and sub-categories were linked during the axial coding process. After axial coding stage, selective coding was done. At this stage, the core category was selected and communicated with other categories. Research validity and reliability were ensured by simultaneously using multiple methods, creating a database, and using the interviewees' points of view when completing and revising the research report (Table 1).

## RESULTS AND DISCUSSION

The quotations used below have been extracted from interviews as concepts. After

**Table 1.** Example of concepts, subcategories, and extracted categories in the coding stage.

Interview text	Concepts	Sub-categories	Categories
My cousin pays attention to safety at work, he always uses suitable work clothes, masks and ... I influenced him	Modeling others to pursue safety	Role model	Social factors
If we supply the knowledge that it may hurt you, are there, for example, any gloves for him to wear? The person in the village is mixing the poisons but his gloves are torn! Where can he buy gloves in the village? There are a number of chain issues here. Even if I as an expert experience such a situation, I have to do unsafe things.	The unavailability of protective equipment	Unsafe physical conditions	Farm environment



extracting the concepts, these units were given a code to reflect that idea or concept. Next, similar concepts were classified into one of several categories. A total of 165 concepts, 22 subcategories and 17 categories were extracted (Table 2). After the coding steps and identification of categories, selective coding was performed in which the categories identified in the previous stage were integrated and combined to yield a conceptual framework (Figure 1).

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### Causal Conditions

Causal conditions are events that create

**Table 2.** Number of concepts, subcategories, categories and external factors derived in the coding stages.

Row	Number of concepts	Sub-categories	Categories	External factors	
1	5	Knowledge	Cognition	Causal conditions	
2	2	Skill			
3	7	Emotion			
4	5	-----	Economic		
5	11	Individual management	Individual management		
6	4	Perceived risk			
7	14	Management challenges	Organizational factors		
8	5	laws and Policies			
9	10	Monitoring and Evaluation			
10	7	Corporate Engagement	Cultural factors		
11	5	Sub-cultures			
12	6	Intelligence agents and the media			
13	5	Culturalization			
14	6	Unsafe physical conditions	farm environment	Contextual conditions	
15	6	Unsafe mental conditions			
16	7	Nature of agricultural work			
17	3	Social beliefs	Social factors	Intervening conditions	
18	2	Pattern recognition			
19	3	Public entities			
20	9	-----	Motivators and inhibitors		
21	2	-----	The employer system		
22	2	-----	Personal and Family characteristics		
23	4	-----	Perceived severity		
24	15	Technical Specifications and Extension of education programs	Educational factors		
25	2	Characteristics of educator			
26	1	Manufacturers of Inputs	Safety requirements of agricultural machinery and inputs manufacturers	Strategies	
27	2	Manufacturers equipment and Agricultural machinery			
28	9	-----	Supporting factors and Entities		
29	3	-----	Healthy grower	Consequences	
30	1	-----	Healthy products		
31	2	-----	Healthy society		
sum	165	22	17	-----	



Other causal factors extracted from the interviews were related to the category of cognition. This category includes the sub-categories of knowledge, emotion and skill. Participants stated that information on how to work properly with the equipment and use of inputs were important on a farm. A lack of knowledge by a farmer about working with equipment and inputs can cause irreparable damage.

A 47-year-old farmer whose eyes had been damaged by exposure to chemicals said, "...Farmers are unaware of the consequences of their work. If they knew that the poisons they are spraying can be absorbed through the skin, causing various diseases and cancer, they would pay more attention to safety at work." Moradhaseli *et al.* (2014) concluded that the first step in changing behavior is to have enough knowledge about the problem. Knowledge is a prerequisite for changing behavior.



Another important category was individual management. This category includes the sub-categories of individual management and perceived risk. An individual that considers his/her personal management style and accepts that well-being should be a dominant feature would have the ability to consciously control every situation and move towards the goal. Such a person recognizes the goals and submits to the discipline needed for the conscious and focused activity to be successful.

Organizational factors are part of causal conditions and include the sub-categories of management challenges, laws and policies, organizational interaction, and monitoring and evaluation. Many experts have suggested that the lack of internal and cohesive external management is a major challenge to occupational health behavior in agriculture. Organizations prefer to keep track of their enterprise applications by developing communication and integration for achieving a common goal. If island-oriented activities and separate paths are taken without coordination with other organs, it will be impossible to achieve occupational promotion of health behavior and promote manufacturer health.

Participants in the sub category of perceived risk noted the role and importance of experience or observation of events when focusing attention on occupational health behavior. Those who had experienced or observed events tried to follow safety rules at work as they become aware of the consequences of non-compliance with safety at work. In other words, learning from experience can be a source of lasting change in behavior.

Cultural factors compose other causal conditions. This category includes the sub-categories of sub-culture, information and media factors, culturalization and social beliefs. Interviews suggest that, in certain sub-cultures and cultural atmospheres in villages and on farms, safety and compliance with occupational health behavior are not given actual value. The terms of "safety" and "occupational health behavior" are alien

to many rural and agricultural communities. In this case, the low level of sophistication among participants and their negative reactions to occupational health behavior were effective factors. The participants believed that with the development of infrastructures such as the internet and media in rural communities, programs can be prepared to teach about safety at work and accident prevention. From the interviews, it was concluded that the behavior of individuals is rooted in fatalistic and superstitious beliefs.

### Contextual Conditions

Contextual conditions form the context in which strategies are executed (Martin and Henry, 2012). In this study, the farm environment condition was investigated. The farm environment category included the sub-categories of unsafe physical conditions, unsafe mental conditions and nature of agricultural work. Several issues have been raised in this regard. If a situation is psychologically and physically insecure, the individual is prone to human error. Such circumstances can render any activity unsafe and non-compliance with occupational health behavior is inevitable. On the other hand, many activities must be completed in each seasonal period, which causes fatigue, stress and mental concern for farmers. Several studies, such as that of Reiner *et al.* (2016) confirm this finding.

### Intervening Conditions

Intervening conditions are those that facilitate or restrict the adoption of a strategy (Hasting *et al.*, 2011). One such category is social factors, which includes the sub-categories of role model and public institutes. Interviews showed that a role model is an important mechanism in the development of human behavior. Modeling is an important mechanism in the development of human behavior and

observing the consequences of a behavior can prevent blindly doing something or encourage its performance. Observation of the behavior of others can calm or reduce fear and anxiety and improve learning so that a new behavior or behavior pattern can be learned (Clissold *et al.*, 2012).

Based on the interviews, another intervening factor includes motivators and inhibitors. In this respect, the participants stated that motivation to increase production could endanger the health of the individual. It can be inferred that motivators play an important role in human behavior as they elicit safe or unsafe behavior. On the other hand, the inhibiting factors are equally influential, as they can prevent an undesirable activity or its continuation.

Another factor that is important to adoption of a strategy is the employer system. Participants pointed to the important role of employers in worker safety. The absent employer is a common feature of traditional agriculture. The active participation of employers is necessary to the promotion of safe behavior among employees.

Another factor effective in strategy adoption is the concept of "perceived severity". In this regard, one participant stated, "...Due to very high costs of illnesses, the person understands that it's better to follow safety roles; otherwise, he/she will pay the price" (A 34-year-old farmer). Participants argued that if a person takes the incident and disease seriously and health threatening, she/he will definitely move towards compliance with occupational health behavior.

The results of the interviews indicate that personal and family characteristics are intervening conditions. The participants believed that educational level is undoubtedly an important factor underpinning healthy occupation behavior as it can facilitate the training strategy. Educated individuals or farmers who live in an educated family can more easily undergo training or read and disseminate brochures and manuals to others. Adequate education

makes it possible to make informed decisions about health and promote healthy behavior.

### Core Phenomenon

The core phenomenon or axial category is the base of the process. This concept is similar to a concept or title that is considered to be the framework or plan. In a general perspective, the study population emphasized that their occupational health behavior was derived and abstracted from other major categories and was affected by a number of factors. With regard to the model, occupational health behavior is presented in the context of the farm environment and can be affected by many contextual, causal, and intervening factors. Appropriate strategies will enable achievement of healthy growers, healthy products, and healthy communities.

### Strategies for Agricultural Occupational Health Behavior

Actions and interactions represent intentional activities taken in response to a core phenomenon (Martin and Henry, 2012). In this study, occupational health behavioral strategies included educational factors, safety requirements of equipment and input producers and supporting factors. The category of educational factors was identified as having strategic relevance. A group of participants stated that, "...The training methods need to be changed--the training methods that we use require change. This field should be reconsidered carefully to make training methods more attractive to farmers."

The results of the interviews suggest that it is of crucial importance to raise awareness, hold educational classes and provide training. However, training should start at an early age and the individuals should not be close-minded. Educational intervention is needed in this regard on a regular basis, not just periodically. These findings were



consistent with the results of Brown *et al.* (2009) and Verbeek *et al.* (2016).

The findings from the interviews showed that the concept of safety requirements of equipment and input producers was another strategy related to phenomenon. A 50-year-old farmer said, "...I know someone who hurt himself as he was carrying heavy sacks". Pesticide producers are also responsible in this area. For example, they can decrease the weight of the sacks from 50 to 25 kg so that they can be handled easily. Manufacturers also should behave in accordance with international standards and regulations.

The next category, based on the interviews, was supporting factors. Participants noted the supportive role of government in this phenomenon as a strategy. Interviews indicated that the government has not played an adequate role in health promotion among producers. The participants asserted that the government has ignored the future of the countries farmers. Participant opinions on this issue suggest that, for example, the government can help secure the supply of new equipment with subsidies so that farmers can use equipment safely. This could enhance occupational health behavior. It should be noted that when producers know that the government is actively involved in the protection of farmer health and not only for the production of crops, they would be motivated to exhibit occupational health behavior in the workplace.

### **Consequences of Compliance with Occupational Health Behavior**

Some of the categories represent outcomes that can be achieved by adopting certain strategies. The consequences of occupational health behavior include healthy growers, healthy products, and healthy society. The farmers believe that they can be hurt when they do not follow the rules. The findings from the interviews indicate that, when the grower is healthy and behaves safely, he will

consider the type of product produced. Participants stated that when occupational health behavior is followed, farmers would preserve their health, which will improve their performance.

## **CONCLUSIONS**

The nature of occupational health behavior is complex. Unofficial statistics indicate that Kermanshah province has a high rate of occupational injury. Occupational health behavior is a major reason for occupational injuries; thus, it is necessary to have an in-depth perception of this phenomenon. In the current study, researchers used a qualitative approach and grounded theory methodology to investigate this subject and develop a model.

Overall, the theory of behavioral change in health generally includes intrapersonal, interpersonal and community theories. If the developed model is compared with these theories, it is believed that it encompasses these theories and patterns. It includes intrapersonal factors such as cognitive domain, past experience and motivation. When compared to interpersonal theories that combine the factors of social structure and individual characteristics, along with individual factors, social factors are also considered. For example, intervening conditions consider social factors alongside individual factors. In comparison with community theories, this model more comprehensively encompasses institutional factors, social factors, and public policy. In addition, educational factors, the safety requirements of agricultural machinery and input manufacturers and supporting factors, employer system, economic factors and farm environment were also considered. The components of the model are specific to agriculture and its conditions and are not applicable to the general public. They are capable of explaining farmer professional behavior in the real environment.

The recommendations of this research are in line with the strategies presented in the



model. The strategies that can promote occupational health behavior among farmers. It can be said that education is essential, but not sufficient. In a rural environment, it is necessary to create an appropriate cultural infrastructure that can draw the attitude of individuals and society toward the formation of new social norms in order to focus attention on health behavior rather than economic efficiency. Institutions and the media should coordinate in this task to help farmers understand the diseases and injuries that can be caused by work and can limit production and work and impose direct and indirect costs on farming families and the community.

### Limitations

This study had some limitations. One limitation was the lack of generalizability of the results, given that the results of qualitative research are not generalizable. Another limitation of the research was determination of which variable should fall into the causal condition, contextual condition, and intervening condition. In other words, the boundary of the categories was not sharp.

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### طراحی مدل رفتار بهداشت حرفه‌ای کشاورزی

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#### چکیده

آسیب‌های و جراحات شغلی دارای پیامدهای روانشناختی، اقتصادی، اجتماعی و نهادی است. کشاورزی یک صنعت با خطرات و آسیب‌های شغلی بالا است، اما آسیب‌های شغلی به‌طور عمده در رفتار کشاورزان ریشه دارد. مطالعه حاضر با استفاده از رویکرد کیفی و روش تئوری زمینه‌ای انجام شد. جامعه مورد مطالعه شامل اعضای دانشکده علوم کشاورزی و بهداشت حرفه‌ای دانشکده علوم پزشکی، کارشناسان کشاورزی، کارشناسان بهداشت حرفه‌ای و کشاورزان بود که از طریق نمونه برداری گلوله برفی و هدفمند در استان کرمانشاه واقع در غرب ایران انتخاب شد. داده‌ها از طریق مصاحبه‌ها جمع‌آوری شد. یافته‌ها حاکی از آن است که عوامل حوزه شناختی، مدیریت فردی، عوامل فرهنگی، سازمانی و اقتصادی از جمله عوامل اصلی تأثیرگذار بر رفتار بهداشت حرفه‌ای کشاورزی می‌باشد. در مدل تحقیق، تولیدکننده سالم، محصولات سالم و جامعه سالم، از پیامدهای بکارگیری راهبردهای مناسب برای رفتارهای بهداشت شغلی کشاورزی استخراج گردید. طراحی یک مدل زمینه‌ای و بومی رفتار سالم برای ارتقای بهداشت شغلی گام مؤثری برای کاهش آسیب‌ها در میان کشاورزان است.