

1 Understanding Farmers' adaptation behavior against drought: Application
2 of the Health Belief Model

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4 Abstract

5 As climate change intensifies the frequency and severity of droughts, adaptive behavior becomes
6 increasingly crucial. Farmers' capacity to modify their practices in response to evolving climate
7 conditions is vital for ensuring long-term agricultural sustainability and food security. Therefore,
8 this study aims to investigate the psychological factors influencing farmers' adaptation behaviors
9 in response to drought using the Health Belief Model. The sample comprised 380 farmers from
10 Kuhdashat Township, Lorestan Province, and western Iran, selected via a three-stage cluster
11 sampling method. Data were collected using a researcher-designed questionnaire, whose validity
12 and reliability were confirmed. Structural equation modeling (SEM) results indicated that self-
13 efficacy, perceived benefits, perceived vulnerability, and perceived barriers explained about 49%
14 of the variance in farmers' adaptation behavior. Perceived benefits emerged as the strongest
15 predictor of adaptation, while cues to action and perceived severity were insignificant. These
16 findings support the health belief model's practicality and effectiveness in examining water
17 conservation behavior among Iranian farmers.

18 **Keywords:** Climate change, Conservation behavior, Mitigation strategies, Self-efficacy,
19 Vulnerability.

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21 INTRODUCTION

22 The 21st century's climatic changes, including global warming, represent significant global shifts
23 requiring intergovernmental cooperation to address their impacts on ecological, environmental,
24 socio-political, and socio-economic systems (Abbass *et al.*, 2022). Climate change, considered the
25 greatest threat to sustainable development, triggers systemic shocks such as droughts, famines, and
26 biodiversity loss, with drought being the most severe and complex due to its varying characteristics
27 worldwide (Nguyen *et al.*, 2023). Drought, defined as prolonged water shortages, affects over 40%
28 of the global population, with water scarcity projected to worsen, impacting 5 billion people
29 annually by 2050 (Silva, 2024). Water demand is expected to exceed supply by 40% by 2030
30 (Mulwa *et al.*, 2021). Iran, located in an arid region, faces critical water shortages, with only 117

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31 billion cubic meters of water available annually due to high evaporation rates (Rahimi-Feyzabad
32 *et al.*, 2020). Severe droughts, affecting 72% of Iran's area and population, have occurred
33 frequently over the past decades, with ongoing droughts since 1998 being the worst in nine
34 centuries (Delfiyan *et al.*, 2020; Meteorological Organization, 2020). Iran's agricultural sector
35 consumes 92.8% of its renewable water, exacerbating the crisis (Tajeri Moghadam *et al.*, 2018).
36 Without proper management, Iran faces a significant environmental crisis, with water availability
37 projected to halve by 2050 (Delfiyan *et al.*, 2020).

38 Addressing drought involves two main approaches to climate change: mitigation by reducing
39 greenhouse gas emissions and adaptation to new conditions (Wang *et al.*, 2024). While mitigation
40 is a long-term solution with challenges like uneven responsibilities and the free rider effect,
41 adaptation is essential for reducing vulnerability and minimizing costs (Wang and Zhang, 2018).
42 Adaptation, as defined by the IPCC, involves adjusting to the impacts of climate change,
43 particularly in agriculture, where uncertainty presents significant risks (Sharifi, 2020). Farmers in
44 drought-prone areas must modify farming practices to be resilient and implement drought risk
45 management strategies (Tesfahunegn *et al.*, 2016). Adaptation is crucial for mitigating drought's
46 adverse effects, particularly in developing countries, where farmers are key to effective
47 management (Shabanali Femi *et al.*, 2020). Recent research highlights various factors influencing
48 farmers' adaptive behaviors and strategies. For example, Hernández-López *et al.* (2024) analyzed
49 farmers' adaptation to drought in Colombia, finding that socio-economic vulnerability and drought
50 perception were key predictors of adaptive behavior. Similarly, Wens *et al.* (2021) studied
51 smallholder farmers in Kenya, revealing that risk assessment, social norms, self-efficacy, and
52 response efficiency significantly affect adaptive behavior. They also emphasized the role of
53 extension services, early warning systems, and financial assistance in fostering adaptation. In
54 Ethiopia, Gebrehiwot & van der Veen (2020) used the Protection Motivation Theory (PMT) model
55 to show that perceived vulnerability and self-efficacy positively influence the implementation of
56 drought risk reduction measures. In Bangladesh, Anik *et al.* (2021) found that education, income
57 from livestock, participation in organizations, and access to ICT in agriculture significantly
58 affected farmers' adaptation strategies. Similarly, Muthelo *et al.* (2019) studied South African
59 farmers, highlighting the influence of age, gender, and marital status on vulnerability and coping
60 strategies like water restrictions during droughts. Studies in India by Patnaik *et al.* (2019) revealed
61 that livelihood interventions, technical training, and agricultural extension services increase the

62 likelihood of adaptation. Collectively, these studies underscore the multifaceted nature of farmers'
63 adaptive behaviors, shaped by socio-economic, institutional, and behavioral factors.

64 Economic incentives can encourage short-term adaptation, but Iranian policymakers prefer
65 sustainable, voluntary measures (Piñeiro et al., 2020). Understanding farmers' behaviors requires
66 integrating insights from behavioral models. This study uses the Health Belief Model (HBM), a
67 preventive health behavior theory that emphasizing fear and risk perception (Barattucci et al.,
68 2022). The HBM highlights key dimensions, including perceived susceptibility, perceived severity,
69 perceived benefits, perceived barriers, self-efficacy, and cues to action (Subedi et al., 2023). These
70 factors collectively influence decision-making, particularly in drought, where farmers' perceptions
71 of risk and capacity to act are critical. Farmers are more likely to adopt adaptive practices if they
72 perceive themselves as vulnerable to drought and recognize its severe consequences for their
73 livelihoods. In contrast, models like TPB focus on subjective norms and intentions, which may not
74 adequately address the urgency of risk perception in drought-related decisions (Ajzen, 2020). The
75 HBM's incorporation of perceived barriers and benefits provides a balanced view of motivational
76 and practical considerations, unlike the Social Cognitive Theory (SCT), which focuses more on
77 social learning (Hasan et al., 2024). Additionally, the HBM considers external cues to action, such
78 as government warnings or observing neighbors' experiences, which are critical for farmers'
79 adaptation. Other models, like the Stages of Change Model, prioritize internal readiness but may
80 overlook external influences (Cardona et al., 2023). Self-efficacy, or the belief in one's ability to
81 take action, is another crucial aspect of the HBM. For farmers, having confidence in adopting
82 complex strategies, such as implementing new irrigation techniques, is essential. While the HBM
83 was initially developed for health behaviors, its principles are transferable to environmental risks
84 like drought, as both contexts involve similar psychological processes underlying risk perception
85 and decision-making (Raheli et al., 2020).

86 This study pioneers the integration of the HBM into agricultural research to analyze farmers'
87 behavioral adaptations to drought, a pressing challenge exacerbated by climate change. Unlike
88 conventional studies focusing solely on economic or environmental factors, this research examines
89 farmers' perceptions of drought susceptibility, severity, benefits of adaptation, and barriers to
90 action. The study identifies regional variations in adaptive behavior by applying the HBM across
91 diverse geographic and socio-economic contexts, offering policymakers targeted strategies to
92 enhance resilience. The study investigates how the HBM's variables influence farmers' adaptive

93 behaviors in Kohdasht, Iran. The objectives are: 1) to apply the HBM in exploring farmers'
94 adaptation behaviors, 2) to identify variables affecting these behaviors, and 3) to evaluate the
95 HBM's explanatory power in this context. By integrating the HBM into the study of drought
96 adaptation, this research provides a comprehensive understanding of the psychological and
97 practical factors influencing farmers' behaviors, contributing to more effective policy and
98 intervention design. The findings are crucial for addressing water scarcity risks and promoting
99 sustainable agricultural practices in the face of climate change. Based on the HBM framework, the
100 study hypothesizes that:

101 - Perceived vulnerability significantly affects farmers' adaptation behaviors.

102 - Perceived severity significantly affects adaptation behaviors.

103 - Perceived benefits significantly affect adaptation behaviors.

104 - Perceived barriers significantly affect adaptation behaviors.

105 - Self-efficacy significantly affects adaptation behaviors.

106 - Cues to action significantly affect adaptation behaviors.

107 Following this introduction, the methodology section outlines the research design, including data
108 collection, sample selection, and analytical techniques. The results section presents key findings,
109 highlighting patterns in farmers' responses to drought. The discussion section interprets these
110 findings in light of existing literature, exploring implications for policy, practice, and future
111 research. Finally, the conclusion summarizes the insights, offers recommendations for improving
112 drought adaptation strategies, and suggests further research on enhancing farmers' resilience to
113 climate change.

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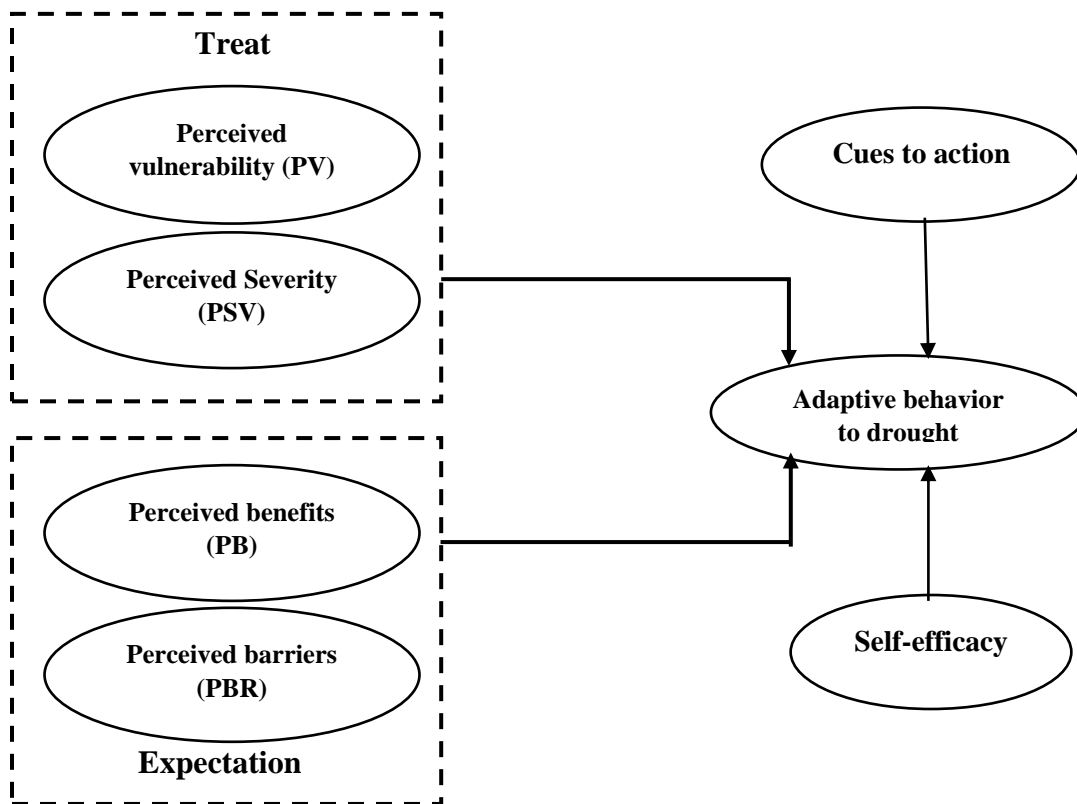
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Figure 1. The extended HBM framework (Rosenstock *et al.*, 1998).

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MATERIALS AND METHODS

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This quantitative cross-sectional study was conducted in Kohdasht Township, west of Iran, with a population of 25,554 farmers. Using the Kerjesi and Morgan (1970) sampling table, the sample size was 380, but 390 questionnaires were completed for greater certainty. A multi-stage cluster sampling method was used due to the large, dispersed population. First, the population was divided into natural clusters based on administrative divisions: central, Tarhan, Kohnani, and Derb Gonbad. These sections were purposively selected for their distinct characteristics. Next, specific districts (Southern Kohdasht, Golgol, West Tarhan, Kohnani, and Derb Gonbad) were chosen to represent diverse farming practices and drought vulnerabilities. A 10% sample of villages in each district was randomly selected, ensuring geographical representation. Finally, a proportional number of farmers from each village was chosen using simple random sampling, maintaining the sample's representativeness. This study followed ethical research principles outlined by Vanclay,

156 Baines, and Taylor (2013). Participants were informed of the study's purpose, risks, and benefits,
157 provided voluntary consent, and were assured confidentiality. Data were anonymized, and
158 participant privacy, dignity, and autonomy were prioritized throughout the research.

159 The data collection instrument was a researcher-developed questionnaire based on the Health
160 Belief Model (HBM) and related studies. A 5-point Likert scale (1 = Strongly Disagree to 5 =
161 Strongly Agree) was used. Experts validated the questionnaire, and a pilot test with 30 farmers in
162 Khorramabad confirmed its reliability, with Cronbach's alpha coefficients ranging from 0.77 to
163 0.95, indicating acceptable internal consistency (Hair *et al.*, 2010). Table 3 presents all items of
164 the questionnaire. Data were analyzed using Structural Equation Modeling (SEM) with SPSS25
165 to assess direct and indirect causal relationships, evaluate the model's goodness of fit, and validate
166 latent constructs. SEM is particularly suited for analyzing multiple variables and testing complex
167 theoretical models (Lowry and Gaskin, 2014).

168 RESULTS

169 Sociodemographic Characteristics

170 The descriptive analysis revealed that most farmers (98.2%) were male, while 10.8% were female.
171 The average age of the respondents was 49 years (SD = 12.33, ranging from 18 to 82 years). The
172 majority of farmers (21.8 percent) had a diploma. The range of changes in farmers' agricultural
173 experience was between 2 and 70 years, and their average work experience was 33.61 years. For
174 most farmers (55.1%), rainfall served as the primary source of irrigation water. 32.3% of farmers
175 use wells, 7.9% from rivers, and 4.6% of studied farmers use spring water to irrigate their lands.
176 Most farmers (65.7%) irrigate their land using traditional irrigation methods, while 27.4% use rain
177 irrigation systems and 6.9% use drip irrigation.

179 Descriptive analysis of HBM constructs

180 The descriptive results for the HBM constructs showed that cues to action among farmers had the
181 highest average score (mean = 3.62, SD = 0.73). Following, these were perceived benefits (mean
182 = 3.29, SD = 1.08), perceived obstacles (mean = 3.27, SD = 1.06), perceived intensity (mean =
183 3.27, SD = 1.11), self-efficacy (mean = 3.15, SD = 1.02) and perceived vulnerability (mean = 3.12,
184 SD = 1.06), all of which showed relatively high scores among the samples. Subsequently, we
185 examined the relationships between the seven constructs using Spearman's correlation coefficient.
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187 According to Table 1, there was a significant relationship between drought adaptation behavior and
188 other constructs of the HBM.

189 **Table 1.** The results of the variables correlation matrix.

| Constructs | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------|---------|---------|---------|---------|---------|--------|---|
| PS(1) | 1 | | | | | | |
| PSV(2) | 0.662** | 1 | | | | | |
| PB(3) | 0.598** | 0.606** | 1 | | | | |
| PBR(4) | 0.616** | 0.598** | 0.961** | 1 | | | |
| SE(5) | 0.658** | 0.575** | 0.584** | 0.595** | 1 | | |
| CA(6) | 0.260** | 0.186** | 0.197** | 0.203** | 0.157** | 1 | |
| Behavior(7) | 0.632** | 0.542** | 0.581** | 0.572** | 0.635** | 1.69** | 1 |

190 *P < 0.05. **P < 0.01.

191 Structural model results

193 SEM was utilized to explore the relationships between study variables and adaptive behaviors.
194 Six indices were used to assess model fit, and the results indicated that the hypothesized model fit
195 the data well: $\chi^2/df = 0.941$, $CMIN/df = 1.43$, (P-value = .09, $P > 0.05$), $NFI (\Delta 1) = 0.962$, RFI
196 $(\rho 1) = 0.988$, $GFI = 0.979$, $TLI (\rho 2) = 1.000$, $CFI = 1.000$, $RMSEA = 0.000$ (see Table 2). The
197 model is depicted in Figure 1, and detailed path coefficients are presented in Table 4. The final
198 model derived from SEM analysis revealed that four HBM constructs could predict 49% of the
199 variance in drought adaptation behavior (Figure 2). This value indicates that the proposed models
200 had moderate explanatory power. Hair et al. (2017) suggested that a model that only accesses R^2
201 values is untrustworthy. Therefore, to evaluate the predictive relevance of the structural model,
202 Stone (1974) introduced Q2. Latent exogenous constructs in the structural model have predictive
203 relevance if the value of Q2 is more significant than zero (Chin, 2009). Q2 value of 0.56 was
204 higher than zero, which means that endogenous constructs had enough predictive relevance.

205 Moreover, the result revealed that the most critical predictor of adaptive behavior was perceived
206 benefits associated with implementing adaptation measures ($\beta = 0.50$, $p < 0.000$). Afterward,
207 perceived barriers ($\beta = 0.35$, $p < 0.001$), self-efficacy ($\beta = 0.34$, $p < 0.000$), and perceived
208 vulnerability ($\beta = 0.20$, $p < 0.000$). However, certain constructs, such as "cues to action" and
209 "perceived severity," were not significant predictors of behavior (Figure 2). Table 3 provides the
210 standardized factor loadings, R-square values, standardized beta coefficients, SMC, CR, and AVE.

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Table 2. The indices of goodness of fit test.

| Indices of the goodness of fits | Evaluation criteria of acceptable values of indices |
|---------------------------------|--------------------------------------------------------------------------|
| $\chi^2 / df = 0.941$ | Nonsignificant ≥ 0.05 (Jöreskog and Sörbom, 1993) |
| CMIN/df = 1.43 | < 2 (Hair et al., 1998) |
| NFI ($\Delta 1$) = 0.962 | ≥ 0.95 good , 0.90 to 0.95 acceptable (Bentler, 1990) |
| RFI ($\rho 1$) = 0.988 | > 0.90 (Bentler, 1992) |
| TLI ($\rho 2$) = 1.000 | ≥ 0.95 Or ≥ 0.90 (Hu and Bentler, 1999; Weston and Gore, 2006) |
| CFI = 0.979 | ≥ 0.90 (Hu and Bentler, 1999; Weston and Gore, 2006) |
| RMSEA = 0.000 | ≤ 0.5 : Very good fit (Browne and Cudeck, 1993; Kline, 2005) |

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Table 3. Measurement results.

| Constructs | Factor Loading | R-square value | SMC | CR | AVE |
|---------------------------------------------------------------------------------------------------------------|----------------|----------------|-------|-------|-------|
| PV ($\alpha = 0.85$) ($\beta = 0.0.20^{**}$) | | | | | |
| 1. I believe that my relatives and I are vulnerable to the adverse effects of drought. | 0.84 | 0.70 | 0.781 | | |
| 2. I believe that drought can reduce my agricultural production. | 0.79 | 0.62 | 0.744 | | |
| 3. I believe that drought can reduce my income. | 0.79 | 0.62 | 0.712 | 0.845 | 0.578 |
| 4. I believe the weather conditions (rainfall and temperature) have changed compared to the past. | 0.70 | 0.49 | 0.824 | | |
| 5. I believe that the availability of water for agriculture and even drinking has decreased. | 0.79 | 0.62 | 0.767 | | |
| PS ($\alpha = 0.84$) ($\beta = 0.0.10$) | | | | | |
| 1. Drought has severely affected the water resources of our village. | 0.75 | 0.56 | 0.818 | | |
| 2. Drought has severely affected the environment and vegetation of our region. | 0.76 | 0.57 | 0.767 | | |
| 3. Drought causes irreparable damage to agricultural production and income. | 0.77 | 0.59 | 0.798 | 0.766 | 0.537 |
| 4. Drought causes irreparable damage to the quality of my agricultural products. | 0.81 | 0.65 | 0.845 | | |
| 5. Drought causes irreparable damage to my property. | 0.76 | 0.57 | 0.756 | | |
| PB ($\alpha = 0.83$) ($\beta = 0.0.50^{**}$) | | | | | |
| 1. Adopting strategies to adapt to drought prevents water loss and the depletion of water resources. | 0.73 | 0.53 | 0.713 | | |
| 2. Adopting drought adaptation strategies will prevent the reduction of my crop production and income. | 0.75 | 0.56 | 0.744 | | |
| 3. Adopting strategies to adapt to drought will prevent migration and evacuation of villages. | 0.76 | 0.57 | 0.860 | 0.712 | 0.580 |
| 4. Adopting strategies to adapt to drought will preserve agricultural production and food security. | 0.82 | 0.67 | 0.798 | | |
| 5. Adopting strategies to adapt to drought will preserve agricultural production and food security. | 0.78 | 0.60 | 0.744 | | |
| PBR ($\alpha = 0.82$) ($\beta = 0.0.35^{**}$) | | | | | |
| 1. I do not have sufficient financial resources to implement strategies for adapting to drought. | 0.82 | 0.67 | 0.713 | | |
| 2. I do not have the necessary knowledge and skills to implement drought adaptation strategies | 0.72 | 0.51 | 0.706 | 0.824 | 0.651 |
| 3. I do not have adequate infrastructure to implement drought adaptation strategies. | 0.79 | 0.62 | 0.768 | | |
| 4. Appropriate and affordable tools and technology to implement drought adaptation solutions are unavailable. | 0.75 | 0.56 | 0.722 | | |

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|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-------|-------|-------|
| 5. There is no necessary cooperation and participation among villagers to adapt to drought | 0.72 | 0.51 | 0.703 | | |
| SE ($\alpha = 0.81$) ($\beta = 0.034^{**}$) | | | | | |
| 1. In the face of drought, I have enough awareness and knowledge to implement adaptation strategies. | 0.80 | 0.64 | 0.801 | | |
| 2. In the face of drought, I possess the necessary experience and expertise to implement adaptation strategies. | 0.74 | 0.54 | 0.764 | | |
| 3. In the face of drought, I can implement drought adaptation strategies. | 0.82 | 0.67 | 0.730 | 0.760 | 0.542 |
| 4. In the face of drought, I have enough motivation and energy to implement drought adaptation strategies | 0.68 | 0.46 | 0.721 | | |
| 5. In the face of drought, I have adequate financial resources to implement adaptation strategies. | 0.72 | 0.51 | 0.733 | | |
| CA ($\alpha = 0.71$) ($\beta = 0.006$) | | | | | |
| 1. I have heard from my farmer family and friends about the risk of drought and strategies to adapt to it. | 0.72 | 0.51 | 0.765 | | |
| 2. I have received information from agricultural experts about the risks of drought and the relevant adaptation strategies. | 0.56 | 0.31 | 0.721 | 0.751 | 0.579 |
| 3. I have heard about the risks of drought and adaptation strategies through local and national radio and television. | 0.87 | 0.75 | 0.735 | | |
| 4. I have heard about the risk of drought and drought adaptation solutions from cyberspace. | 0.85 | 0.72 | 0.787 | | |
| Behavior ($\alpha = 0.90$) ($R^2 = 0.049^{**}$) | | | | | |
| 1. Planting seeds and modified cultivars with high yield and drought resistance (less water requirement) | 0.61 | 0.37 | 0.836 | | |
| 2. Planting seeds deeper to absorb more moisture | 0.74 | 0.54 | 0.750 | | |
| 3. Changing the planting and harvesting dates according to weather conditions (planting earlier or later) | 0.74 | 0.54 | 0.735 | | |
| 4. Use crop rotation (wheat, barley, peas, alfalfa and other legumes). | 0.80 | 0.64 | 0.768 | | |
| 5. Insuring agricultural and livestock products | 0.74 | 0.54 | 0.780 | | |
| 6. Modifying the way to guide and transport water (turning earthen streams into concrete streams, using metal or polyethylene pipes to transport water) | 0.71 | 0.50 | 0.812 | 0.812 | 0.545 |
| 7. Construction of pools and ponds to collect water | 0.72 | 0.51 | 0.761 | | |
| 8. Watering during the cool hours of the day (dusk, night, or early morning) for optimal results. | 0.69 | 0.47 | 0.735 | | |
| 9. Using new irrigation methods (drip, rain, and underground irrigation). | 0.76 | 0.57 | 0.756 | | |
| 10. Timely service and maintenance of equipment such as pump, filtration station, and other equipment installed in the farm | 0.77 | 0.59 | 0.801 | | |

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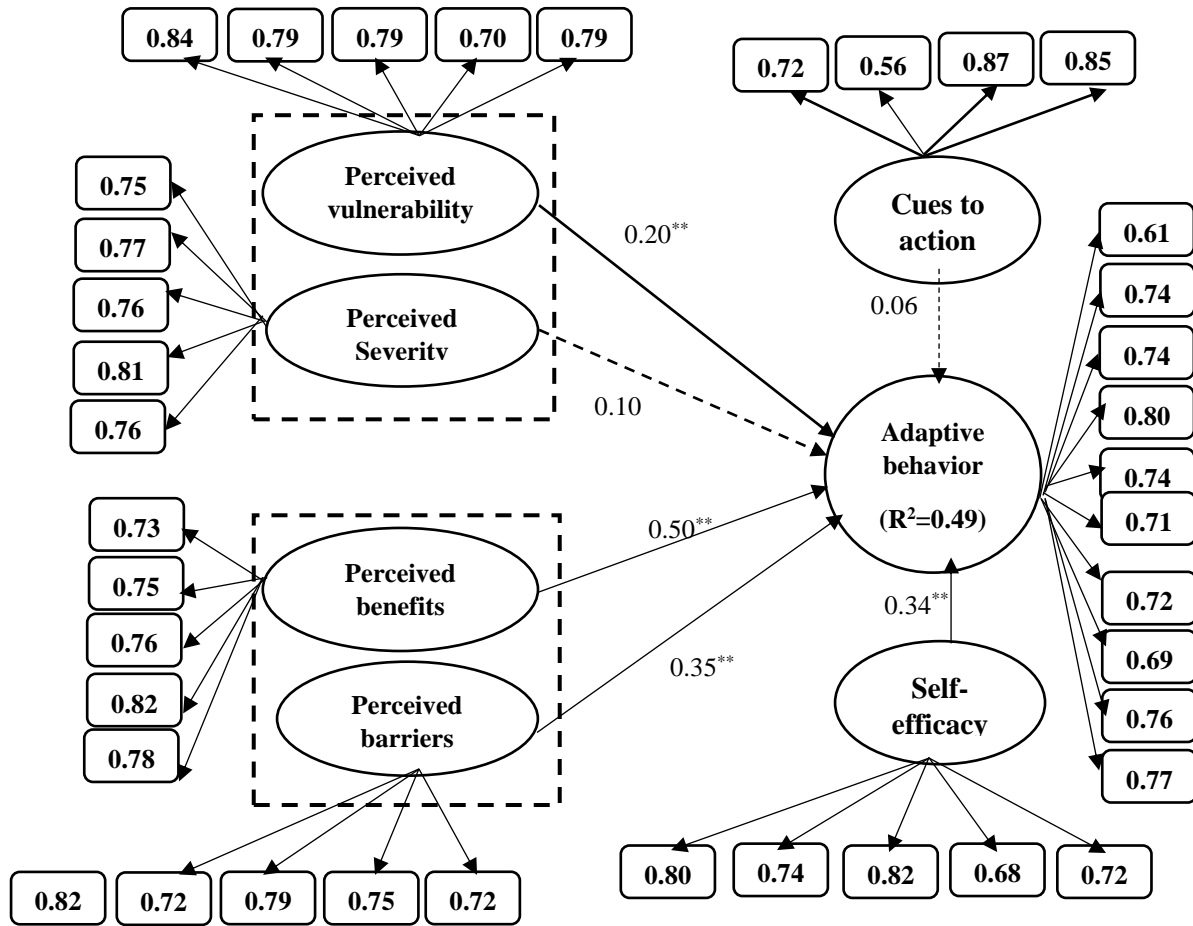


Figure 2. Structural path model (-----► Non-significant, *P< 0.05, **P< 0.01).

DISCUSSION

This study aimed to identify factors predicting drought adaptation behavior among farmers in Kohdasht Township, western Iran, using the Health Belief Model (HBM). To date, this is one of the first global studies to use the Health Belief Model (HBM) to predict farmers' water conservation behaviors. This study is among the first globally to apply the HBM in predicting farmers' water conservation behaviors. The findings revealed that 49% of the variance in farmers' adaptive behavior could be explained, confirming the model's predictive utility, as supported by previous studies (Tajeri Moghadam et al., 2020; Zobeidi et al., 2021; Yazdanpanah et al., 2022).

The results showed that perceived benefits had the most direct impact on adaptive behavior. Farmers were motivated by the belief that adaptation measures could conserve water, reduce crop losses, secure livelihoods, ensure community food security, and protect the environment. This aligns with studies in China, Sub-Saharan Africa, and Vietnam, where emphasizing economic and environmental benefits encouraged adaptation (Wong et al., 2021; Bagagnanet et al., 2019b; Luu

257 et al., 2019). Governments and agricultural agencies should highlight these benefits through
258 targeted campaigns to enhance adoption rates.

259 This study also found that perceived barriers significantly hindered drought adaptation
260 behavior. These barriers include obstacles that may prevent a farmer from implementing
261 adaptation measures, such as insufficient financial resources, limited knowledge, and skills to
262 implement adaptation strategies, lack of necessary infrastructure, inappropriate tools and
263 technology, and lack of cooperation and participation among farmers. This finding aligns with
264 similar studies in Ethiopia (Gebrehiwot & van der Veen, 2020) and Nigeria (Von Abubakari *et al.*,
265 2024), where lack of resources and infrastructure were reported as key barriers. However, our
266 results diverge from findings in high-income countries, such as Australia (McIlwain *et al.*, 2022),
267 where institutional support mitigated the impact of perceived barriers. Implementing appropriate
268 support policies and empowering farmers economically and through education can reduce these
269 barriers and promote adaptive behaviors.

270 Self-efficacy is another significant predictor of farmers' adaptive behavior. Consistent with
271 findings from Ethiopia (Gebrehiwot & van der Veen, 2020) and India (Mitter *et al.*, 2024), self-
272 efficacy positively influences farmers' ability to adapt to drought by enhancing confidence in their
273 skills and resources. However, this contrasts with results from Iran (Delfiyan *et al.*, 2020), where
274 self-efficacy showed a weaker impact. Therefore, enhancing farmers' self-efficacy—by improving
275 access to information, advancing technical skills, and increasing financial support through targeted
276 subsidies and low-interest loans—should be a priority for agricultural sector planners in this
277 Township.

278 Perceived vulnerability also significantly influenced behavior. Echoing findings from Vietnam
279 and Sub-Saharan Africa, heightened awareness of risks motivated adaptive actions. In Kohdasht,
280 drought and reduced rainfall have caused water shortages, decreased yields, unemployment, and
281 migration. Raising awareness of these risks can encourage farmers to adopt adaptive measures
282 (Luu *et al.*, 2019; Bagagnan *et al.*, 2019a). In conclusion, enhancing understanding of adaptation
283 benefits, reducing barriers, building self-efficacy, and addressing vulnerability is essential for
284 promoting drought adaptation behavior. These findings provide valuable insights for policymakers
285 aiming to support sustainable farming in drought-prone regions.

286 The results revealed that perceived severity and cues to action did not significantly influence
287 farmers' adaptation behavior to drought. This could stem from farmers not fully perceiving drought

288 as a severe threat, especially if they have previously coped with droughts. Over time, they may
289 view droughts as a natural part of farming or assume conditions will improve without intervention.
290 External cues, such as weather forecasts or government warnings, may not reach farmers
291 effectively or be distrusted. If advice seems irrelevant to local conditions, farmers may ignore it.
292 Additionally, a lack of knowledge about drought-resistant practices or water management
293 strategies can leave farmers uncertain how to adapt. Economic barriers, such as the high cost of
294 adaptation measures like water conservation technologies or irrigation systems, further complicate
295 the situation, especially for farmers with limited resources. Overcoming these challenges requires
296 integrating approaches to address economic, psychological, social, and informational barriers. The
297 study found that perceived benefits had the most significant impact on adaptation behavior.
298 Agricultural extension services should emphasize the long-term benefits of adaptation, such as
299 water conservation, crop resilience, and environmental sustainability. Outreach campaigns and
300 workshops can raise awareness of these advantages. Policies must address financial barriers
301 through subsidies, low-interest loans, or grants for adopting drought-resistant technologies.
302 Improving farmers' confidence through tailored training, demonstrations, and mentorship can
303 encourage adaptive behavior.

304 CONCLUSIONS

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307 This research highlights the critical factors influencing drought adaptation behavior among
308 farmers in western Iran, focusing on the Health Belief Model (HBM). The study found that HBM
309 effectively predicts farmers' drought adaptation behaviors, explaining 49% of the variance in
310 adaptive behavior. Perceived benefits emerged as the most significant predictor, indicating that
311 when farmers recognize the individual and collective advantages of adaptation measures—such as
312 protecting water resources, maintaining livelihoods, and ensuring food security—they are more
313 likely to adopt these behaviors. However, perceived barriers, including financial constraints,
314 limited knowledge, inadequate infrastructure, and lack of cooperation, significantly hinder
315 adaptation efforts. The study underscores the importance of supportive policies and educational
316 programs to empower farmers economically and enhance their technical skills, thereby reducing
317 barriers and increasing adaptive behaviors. Additionally, the positive impact of perceived
318 vulnerability on adaptation behavior suggests that raising awareness of drought-related damages
319 can further motivate farmers to implement adaptive strategies. Overall, the findings emphasize the

320 need for targeted interventions that address the perceived benefits and barriers to foster widespread
321 adoption of drought adaptation behaviors among farmers.

322
323 **LIMITATIONS**

324 This study has several limitations that need future consideration. First, reliance on self-reported
325 data may introduce subjectivity; mixed-method approaches combining surveys with objective
326 measures like drought data are recommended. Second, the HBM overlooks social norms and
327 cultural values; incorporating constructs from Social Cognitive Theory or ethnographic studies
328 could address this gap. Third, the HBM focuses on short-term decisions, necessitating longitudinal
329 studies to explore sustainable adaptation behaviors. Fourth, factors like institutional trust and
330 technical knowledge access should be integrated into the model. Lastly, context-specific findings
331 require comparative studies across diverse regions to enhance generalizability.

332
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335 respondents who kindly gave their time to make this research possible.

336
337 **REFERENCE**

338 Abbass, K., Qasim, M. Z., Song, H., Murshed, M., Mahmood, H., and Younis, I. 2022. A review
339 of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environ.*
340 *Sci. Pollut. Res.*, **29(28)**: 42539-42559.

341 Ajzen, I. 2020. The theory of planned behavior: Frequently asked questions. *Hum. Behav. Emerg.*
342 *Technol.*, **2(4)**: 314-324.

343 Anik, A. R., Rahman, S., Sarker, J. R., and Al Hasan, M. 2021. Farmers' adaptation strategies to
344 combat climate change in drought prone areas in Bangladesh. *Int. J. Disaster. Risk. Reduct.*, **65**:
345 102562.

346 Bagagnan, A. R., Ouedraogo, I., and Fonta, W. M. 2019a. Perceived climate variability and farm
347 level adaptation in the central river region of the Gambia. *Atmosphere*, **10(7)**: 423.

348 Bagagnan, A. R., Ouedraogo, I., Fonta, W. M., Sowe, M., and Wallis, A. 2019b. Can protection
349 motivation theory explain farmers' adaptation to climate change decision making in the Gambia?
350 *Climate*, **7(130)**: 1-14.

351 Barattucci, M., Pagliaro, S., Ballone, C., Teresi, M., Consoli, C., Garofalo, A., ... and Ramaci, T.
352 (2022). Trust in science as a possible mediator between different antecedents and COVID-19
353 booster vaccination intention: an integration of health belief model (HBM) and theory of planned
354 behavior (TPB). *Vaccines*, **10(7)**: 1099.

355 Cardona, M. I., Monsees, J., Schmachtenberg, T., Grünewald, A., and Thyrian, J. R. 2023.
356 Implementing a physical activity project for people with dementia in Germany—identification of
357 barriers and facilitator using consolidated framework for implementation research (CFIR): a
358 qualitative study. *PLoS One*, **18(8)**: 0289737.

359 Chin, W. W. 2009. How to write up and report PLS analyses. In *Handbook of partial least*
360 *squares: Concepts, methods and applications* (pp. 655-690). Berlin, Heidelberg: Springer Berlin
361 Heidelberg.

362 Delfiyan, F., Yazdanpanah, M., Forouzani, M., and Yaghoubi, J. 2020. Farmers' adaptation to
363 drought risk through farm-level decisions: The case of farmers in Dehloran County Southwest of
364 Iran. *Clim. Dev.*, **13(2)**: 152–163. <https://doi.org/10.1080/17565529.2020.1737797>.

365 Gebrehiwot, T., and van der Veen, A. 2020. Farmers' drought experience, risk perceptions, and
366 behavioural intentions for adaptation: evidence from Ethiopia. *Clim. Dev*, **13(6)**: 493–
367 502. <https://doi:10.1080/17565529.2020.1806776>.

368 Hair, J., Black, W., Babin, B. Y. A., Anderson, R., and Tatham, R. 2010. *Multivariate Data*
369 *Analysis* (7th ed.). New Jersey: Pearson Prentice Hall.

370 Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M. A. 2017. *Primer on Partial Least Squares*
371 *Structural Equation Modeling (PLS-SEM)*, 2nded; Sage Publications Limited Inc.: London, UK;
372 Thousand Oaks, CA, USA.

373 Hasan, M. M., Chang, Y., Lim, W. M., Kalam, A., and Shamim, A. 2024. A social cognitive
374 theory of customer value co-creation behavior: evidence from healthcare. *J. Health Organ.*
375 *Manag.*, **38(9)**: 360-388.

376 Hernández-López, J. A., Puerta-Cortés, D. X., and Andrade, H. J. 2024. Predictive Analysis of
377 Adaptation to Drought of Farmers in the Central Zone of Colombia. *Sustainability*, **16(16)**: 7210.

378 Jeong, J.Y., and Ham, S. 2018. Application of the Health Belief Model to customers' use of menu
379 labels in restaurants. *Appetite*, **123**: 208–215. <https://doi.org/10.1016/j.appet.2017.12.012>.

380 Krejcie, R. V., and Morgan, D. W. 1970. Determining sample size for research activities. *Educ.*
381 *Psychol. Meas.*, **30(3)**: 607–610.

- 382 Lowry, P. B., and Gaskin, J. 2014. Partial least squares (PLS) structural equation modeling (SEM)
383 for building and testing behavioral causal theory: When to choose it and how to use it. *Trans.*
384 *Profess. Commun.*, **57**: 1-2.
- 385 Luu, T. A., Nguyen, A. T., Trinh, Q. A., Pham, V. T., Le, B. B., Nguyen, D. T., ... Hens, L. 2019.
386 Farmers' Intention to Climate Change Adaptation in Agriculture in the Red River Delta Biosphere
387 Reserve (Vietnam): A Combination of Structural Equation Modeling (SEM) and Protection
388 Motivation Theory (PMT). *Sustainability*, **11(10)**: 2993. <https://doi:10.3390/su11102993>.
- 389 Maddocks, A., Young, R. S., and Reig, P. 2015. Ranking the world's most water-stressed
390 countries in 2040. *World Resources Institute*, 26.
- 391 McIlwain, L., Baldwin, C., Manathunga, C., Baird, J., and Pickering, G. 2022. Climate change
392 mitigation discourses in the institutional instruments that shape catchment governance in
393 Queensland, Australia. *Australas. J. Environ. Manag.*, **29(3)**: 258-274.
- 394 Meteorological Organization of Mazandaran. 2020. Resource document Available from:
395 <http://www.irimo.ir/far/wd/720>.
- 396 Mitter, H., Obermeier, K., and Schmid, E. 2024. Exploring smallholder farmers' climate change
397 adaptation intentions in Tiruchirappalli District, South India. *Agric. Human. Values.*, **30**: 1-17.
- 398 Mulwa, F., Li, Z., and Fangninou, F. F. 2021. Water scarcity in Kenya: current status, challenges
399 and future solutions. *OALib Journal.*, **8(1)**: 1-15.
- 400 Muthelo, D., Owusu-Sekyere, E., and Ogundeji, A. A. 2019. Smallholder farmers' adaptation to
401 drought: identifying effective adaptive strategies and measures. *Water*, **11(10)**: 2069.
- 402 Nguyen, T. T., Grote, U., Neubacher, F., Do, M. H., and Paudel, G. P. 2023. Security risks from
403 climate change and environmental degradation: Implications for sustainable land use
404 transformation in the Global South. *Curr. Opin. Environ. Sustain.*, **63**: 101322.
- 405 Patnaik, U., Das, P. K., and Bahinipati, C. S. 2019. Development interventions, adaptation
406 decisions and farmers' well-being: evidence from drought-prone households in rural India. *Clim.*
407 *Dev.*, **11(4)**: 302-318.
- 408 Piñeiro, V., Arias, J., Dürr, J., Elverdin, P., Ibáñez, A. M., Kinengyere, A., and Torero, M. 2020.
409 A scoping review on incentives for adoption of sustainable agricultural practices and their
410 outcomes. *Nat. Sustain.*, **3(10)**: 809-820.

- 411 Raheli, H., Zarifian, S., and Yazdanpanah, M. 2020. The power of the health belief model (HBM)
412 to predict water demand management: A case study of farmers' water conservation in Iran. *J.*
413 *Environ. Manage.*, **263**: 110388.
- 414 Rahimi-Feyzabad, F., M. Yazdanpanah, R. J. Burton, M. Forouzani, and S. Mohammadzadeh.
415 2020. The Use of a Bourdieusian 'Capitals' Model for Understanding Farmers' Irrigation Behavior
416 in Iran. *J. Hydrol.*, **591**: 125442. <https://doi.org/10.1016/j.jhydrol.2020.125442>.
- 417 Rosenstock, I.M., Strecher, V.J. and Becker, M.H. 1998. Social Learning Theory and the Health
418 Belief Model. *Health. Educ. Q.*, **15**: 175-183.
- 419 Savari, M., and Shokati Amghani, M. 2021. Factors influencing farmers' adaptation strategies in
420 confronting the drought in Iran. *Environ. Dev. Sustain.*, **23**: 4949-4972.
421 <https://doi.org/10.1007/s10668-020-00798-8>.
- 422 Shabanali Fami, H., Azizi, S., and Alambeigi, A. 2020. Clarifying the Role of Drought Adaptation
423 Strategies on Changing Farming Mode by Livestock Farmers: Evidence from Komijan Township,
424 Iran. *J. Agr. Sci. Tech.*, **22(2)**: 333-346.
- 425 Sharifi, A. 2020. Co-benefits and synergies between urban climate change mitigation and
426 adaptation measures: a literature review. *Sci. Total Environ.* **750**: 141642.
- 427 Silva, J. A. 2024. Circular water management: benefits and challenges to improve water
428 availability. *Manag. Environ. Qual.*, **35(6)**: 1397-1414.
- 429 Stone, M. 1974. Cross-validators choice and assessment of statistical predictions. *J. R. Stat. Soc.*,
430 **36(2)**: 111-133.
- 431 Subedi, S., Leal Filho, W., and Adedeji, A. 2023. An assessment of the health belief model
432 (HBM) properties as predictors of COVID-19 preventive behaviour. *J. Public. Health.*, **14**:1-11.
- 433 Tajeri Moghadam, M., Raheli, H., Zariffian, S., and Yazdanpanah, M. 2018. Predicting wheat
434 farmers' behavior in Neyshabur plain and determination of factors affecting on them in relation to
435 water resources conservation. *J. Agric. Sci. Sustain. Produc.*, **28(2)**: 199-215.
- 436 Tajeri Moghadam, M., Raheli, H., Zarifi S., and Yazdanpanah, M. 2020. The power of the health
437 belief model (HBM) to predict water demand management: A case study of farmers' water conser-
438 vation in Iran. *J. Environ. Manage.*, **263**: 110388.
- 439 Tesfahunegn, G.B., Mekonen, K. and Tekle, A. 2016. Farmers' perception on causes, indicators
440 and determinants of climate change in northern Ethiopia: Implication for developing adaptation
441 strategies. *Appl. Geogr.*, **73**:1-12.

442 Von Abubakari, F., Inkoom, E. W., Kwadwo, M., and Opoku, M. 2024. Barriers of smallholder
443 farmers to climate change adaptation decisions: Evidence from semi-arid region of Ghana. *African*
444 *J. Agric. Res.*, **20(8)**: 729-735.

445 Wang, K., and Zhang, A. 2018. Climate change, natural disasters and adaptation investments:
446 inter-and intra-port competition and cooperation. *Transp. Res. B Methodol.* **117**: 158–189.

447 Wang, Y., Wang, Z., Zhao, M., and Li, B. 2024. The influence of technology perceptions on
448 farmers' water-saving irrigation technology adoption behavior in the North China Plain. *Water*
449 *Policy.*, **26(2)**: 170-188.

450 Wens, M. L., Mwangi, M. N., van Loon, A. F., and Aerts, J. C. 2021. Complexities of drought
451 adaptive behaviour: Linking theory to data on smallholder farmer adaptation decisions. *Int. J.*
452 *Disaster. Risk. Reduct.*, **63**: 102435.

453 Wong, B. Y. M., Lam, T. H., Lai, A. Y. K., Wang, M. P., and Ho, S. Y. 2021. Perceived benefits
454 and harms of the COVID-19 pandemic on family well-being and their sociodemographic
455 disparities in Hong Kong: a cross-sectional study. *Int. J. Environ. Res. Public Health.*, **18(3)**: 1217.

456 Yazdanpanah, M., Feyzabad, F.R., Forouzani, M., Mohammadzadeh, S., and Burton, R.J. 2015.
457 Predicting farmers' water conservation goals and behavior in Iran: A test of social cognitive theory.
458 *Land Use Policy*, **47**: 401-407.

459 Yazdanpanah, M., Moghadam, M. T., Zobeidi, T., Turetta, A. P. D., Eufemia, L., and Sieber, S.
460 2022. What factors contribute to conversion to organic farming? Consideration of the Health Belief
461 Model in relation to the uptake of organic farming by Iranian farmers. . *Environ. Plan. Maneg.*,
462 **65(5)**: 907-929.

463 Zobeidi, T., Yazdanpanah, M., Komendantova, N., Sieber, S., and Lohr, K. 2021. Factors
464 affecting smallholder farmers' technical and non-technical adaptation responses to drought in Iran.
465 *J. Environ. Manage.*, **298** :113552. <https://doi.org/10.1016/j.jenvman.2021.113552>

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473 درک رفتار سازگاری کشاورزان در برابر خشکسالی: کاربرد مدل اعتقاد بهداشتی

474 مصطفی مریدی، رضوان قنبری موحد، مهدی رحیمیان، و سعید غلامرضایی

475 چکیده

476 همانطور که تغییرات آب و هوایی فراوانی و شدت خشکسالی ها را تشدید می کند، رفتار انطباقی به طور فزاینده ای حیاتی
477 می شود. ظرفیت کشاورزان برای اصلاح شیوه های خود در پاسخ به شرایط آب و هوایی در حال تحول برای تضمین پایداری
478 کشاورزی بلندمدت و امنیت غذایی حیاتی است. لذا این مطالعه با هدف بررسی عوامل روانشناختی مؤثر بر رفتارهای سازگاری
479 کشاورزان در پاسخ به خشکسالی با استفاده از مدل اعتقاد بهداشتی انجام شد. نمونه شامل 380 کشاورز از شهرستان کوهدشت
480 استان لرستان و غرب ایران بود که به روش نمونه گیری خوشه ای سه مرحله ای انتخاب شدند. داده ها با استفاده از پرسشنامه
481 محقق ساخته جمع آوری شد که روایی و پایایی آن تایید شد. نتایج مدل سازی معادلات ساختاری (SEM) نشان داد که
482 خودکارآمدی، مزایای درک شده، آسیب پذیری درک شده و موانع درک شده حدود 49 درصد از واریانس رفتار سازگاری
483 کشاورزان را توضیح می دهند. مزایای درک شده به عنوان قوی ترین پیش بینی کننده سازگاری ظاهر شد، در حالی که نشانه
484 های عمل و شدت درک شده ناچیز بود. این یافته ها از کاربردی بودن و کارایی مدل اعتقاد بهداشتی در بررسی رفتار صرفه
485 جویی در مصرف آب در بین کشاورزان ایرانی حمایت می کند.