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Analysis of Factors Influencing the Development of Green Entrepreneurial Behaviors among Farmers in the Face of Climate Change: Evidence from Tropical Regions of Kermanshah Province

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ABSTRACT

One of the most serious threats facing the agricultural sector worldwide, especially in tropical regions, is the climate change crisis, which has jeopardized food security and the livelihoods of local communities. In these circumstances, traditional agricultural approaches are no longer responsive to the challenges ahead, and the need for a transformation in farmers' attitudes and behaviors with a green entrepreneurship approach is more than ever apparent. In this regard, the development of green entrepreneurship behavior in the agricultural sector as an emerging paradigm is an approach in which farmers not only seek economic profitability but also seek to adapt to climate change and create sustainable added value by adopting environmentally friendly methods and actions. Therefore, the main purpose of this research was to investigate the factors affecting the development of green entrepreneurial behaviors of farmers in the face of the climate change crisis in the tropical regions of Kermanshah province. This research was conducted with a qualitative approach and using the directional content analysis method. The study population of this research included all experts in the field of the subject under study. Purposeful snowball sampling was used to select the interviewees. Sampling continued until data saturation was reached, that is, until no new data was found. In this research, data saturation was achieved through interviews with 15 people from the aforementioned community. Data collection tools included document review, in-depth and semi-structured individual interviews, group discussions, and field note-taking, or often a combination of these methods. Reliability was achieved through the triangulation technique. According to the findings, the most important factors included psychological factors, educational-information factors, economic factors, environmental-climatic factors, social-cultural factors, institutional-governance factors, infrastructure factors, and environmental responsibility. Based on the research results, improving climate knowledge and strengthening green entrepreneurial skills among farmers can provide the basis for increasing their adaptation to the climate change crisis. Finally, based on the findings, practical recommendations were presented, including holding training workshops on climate knowledge and strengthening green entrepreneurial skills.

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Introduction

Agriculture is considered one of the most important and fundamental economic sectors worldwide, playing a crucial role in ensuring food security and economic stability (Aghayari et al., 2024). Estimates indicate that approximately one-eighth of the world's population is active in this sector (Meemken, 2025). Agriculture also holds a significant position in Iran; it accounts for about 15% of the Gross Domestic Product (GDP), 22% of employment, 25% of non-oil exports, and provides more than 94% of the country's food requirements. Furthermore, nearly one-third of Iran's non-oil exports are dedicated to agricultural products (Piramoon et al., 2024).

Nevertheless, the share of employment in Iran's agriculture is projected to decline by 2026, primarily due to rising temperatures, decreased precipitation, and shifting climatic patterns (Nurjati, 2024). Climate change, particularly in tropical regions, has become one of the primary threats to farmers' livelihoods (Nurjati, 2024; Begna, 2025). Rising temperatures, reduced rainfall, periods of drought, irregular precipitation patterns, water stress, and declining soil fertility have presented serious challenges to the agricultural production structure and reduced the resilience of rural households (Al-Kilani, 2024; Ngaira, 2007; Sivakumar, 2009; Nunow, 2024; Nunow, 2013; Moyo, 2012). Consequently, farmers' incomes have decreased significantly and their livelihoods have become vulnerable, forcing them to adopt strategies to maintain and improve their well-being (Akbari et al., 2016). In this context, green entrepreneurial behavior is one of the most vital strategies for adaptation to new climatic conditions (Salam, 2025; Shiri & Badpa 2024; Anabaraonye, 2019).

Green entrepreneurial behavior encompasses a set of innovative and environment-oriented actions and decisions through which farmers can enhance resource efficiency, employ modern low-carbon technologies, establish sustainable activities, and create environmental value (Anabaraonye, 2019; Godara, 2025; Shiri et al., 2022). This behavior not only mitigates negative environmental impacts and promotes sustainable development but also enhances the performance and productivity of production units and increases farmers' income (Salam, 2025). Moreover, the development of green entrepreneurial behaviors strengthens the socio-economic resilience and sustainability of rural communities (Priya, 2024).

The significance of this issue is doubled in Iran, specifically in Kermanshah Province. Characterized by extensive tropical regions, this province is considered one of the most vulnerable areas in the country to climate change (Sotoudeheian, 2022). The heavy dependence of farmers' livelihoods on natural resources, coupled with unstable climatic conditions, highlights the necessity of focusing on innovation and the development of green entrepreneurial behaviors (Sifaei, 2025). However, despite its importance, evidence suggests a lack of sufficient and systematic understanding regarding the factors influencing the formation of such behaviors in the tropical regions of Kermanshah (Noori, 2024; Khoshmaram, 2017).

Therefore, given the growing importance of green entrepreneurial behaviors in adapting to climate change and the scarcity of comprehensive research in this field, the present study was conducted to analyze the factors affecting the development of green entrepreneurial behaviors among farmers in the tropical regions of Kermanshah Province. The aim is to provide a clear picture of the mechanisms for strengthening

these behaviors and strategies to enhance farmers' climate adaptation.

Literature Review

Zarghani et al. (2024) stated that climate change can have various impacts on cultivation patterns, crop yield, and quality. Consequently, many farmers seek strategies to increase their awareness of climatic conditions on their farmlands and learn how to cope and adapt to maintain product quality and sustainability. Damanpak et al. (2023), using a scenario-writing approach, presented various scenarios for adapting to climate change through the development of green entrepreneurial behaviors. They noted that key elements for strengthening green entrepreneurial activities in rural areas include proper planning, access to credit and budgets allocated for green production, and the branding and marketing of products.

Savari et al. (2022) demonstrated that most farmers perceived climate change risks as very serious and its damages as severe. These impacts were so intense that they led to the sale of household items, land, livestock, and gold, as well as taking out loans or resorting to activities such as manual labor and street vending to secure a livelihood. This highlights the extensive economic and financial consequences of climate change, which have not only imposed high costs on villagers and farmers in their daily lives over time but have also forced those who attempted to adapt their traditional methods to bear significant expenses.

Moghadamfard et al. (2019) showed that farmers with higher human, social, and physical capital—who had been more affected by climate change in recent years—utilized adaptation strategies more frequently. They suggested further planning to increase farmers' human and social capital and to raise awareness regarding the long-term effects of climate change on the agricultural sector. Pazokinejad et al. (2018) found that farmers' attitudes toward agricultural entrepreneurship for climate change adaptation were positive. Among the influential factors, normative pressure and climate change belief were the most significant determinants of farmers' inclination toward agricultural entrepreneurship.

Rezaei et al. (2016) stated that economic, infrastructural, extension-educational, technical, managerial, and supportive barriers are the primary obstacles to the development of green entrepreneurship in the agricultural sector. Akbari et al. (2016) indicated that about one-third of farmers chose to develop entrepreneurial behaviors to adapt to climate change.

Salam (2025) argued that empowering farmers in green entrepreneurship facilitates improved adaptation to climate change. Nadapdap (2025) identified factors influencing farmers' entrepreneurial orientation, including knowledge support, market access, networks, association membership, experience, risk-taking, and access to the internet and radio. Adıgüzel (2025) examined the challenges faced by green entrepreneurs in the agricultural sector regarding their participation in the green economy and global climate change. In this regard, entrepreneurial farmers stated that they should be supported by the government in Turkey; those operating on a larger scale earned more income, while government support for small-scale entrepreneurs was very limited. They noted that production planning is essential to prevent surplus waste and that those selling high-quality agricultural products see a greater increase

in income.

Savari (2025), in a study titled "Analysis of Psychological and Social Factors Affecting Climate Change Adaptation and Mitigation Behaviors Among Iranian Rice Farmers," showed that improving psychological and social factors significantly influences climate change adaptation behaviors. Hoong (2024) demonstrated that climate change risk perception significantly moderates the impact of variables on innovation behavior and creative performance, while competitive intensity moderates the effects of green entrepreneurship and environmental managerial concerns on climate risk perception. Yasir (2023) showed that environmental value has both direct and indirect effects on attitudes toward sustainable entrepreneurship, and that perceived behavioral control and environmental value support sustainable entrepreneurial intentions.

Akhtar (2020), in a study titled "Fundamental Drivers Influencing Farmers' Sustainable Adaptation Strategies," found that income levels income level, education level, and experience have a positive and significant impact on the selection of climate change adaptation strategies by farmers. This means that well-educated, affluent, and experienced farmers are able to adapt more easily.

Overall, based on the reviewed literature, although the majority of studies have investigated climate change adaptation strategies, less emphasis has been placed on strategies rooted in the development of green entrepreneurial behaviors. Furthermore, no study was found that directly and coherently analyzes the factors affecting the development of farmers' green entrepreneurial behaviors in response to the climate change crisis, specifically in tropical regions, and particularly in the tropical areas of Kermanshah Province using an in-depth qualitative approach. Therefore, the general objective of this research is to analyze the factors influencing the development of green entrepreneurial behaviors among farmers facing the climate change crisis in the tropical regions of Kermanshah Province."

Research Method

The present study is descriptive research that employs a qualitative approach through Directed Qualitative Content Analysis. Qualitative content analysis is a research method used to discover individuals' perceptions of everyday life phenomena and to interpret the content of subjective data (Manouchehri et al., 2017). Qualitative content analysis is not merely a tool or technique for data analysis but also a research method utilized by various researchers for conducting studies and data collection (Naderi et al., 2025; Rezaei et al., 2022). In other words, scholars such as Neuendorf (2011), Aloe & Kings (2007), Morgan (1993), Weber (1991), Krippendorff (1980), Kerlinger (1973), Maroufi & Yousefzadeh (2009), and Bardin (1996) have stated that the content analysis research method possesses epistemological assumptions and provides a structure for data collection, analysis, and organization to achieve a model or theory (Momeni rad et al., 2013). Therefore, based on these explanations, qualitative content analysis can be defined as an independent research method used to achieve models, describe and summarize data, draw inferences, and formulate frameworks (Rezaei et al., 2022; Naderi et al., 2022).

The study population includes all experts in the field, including faculty members

from the Departments of Entrepreneurship and Rural Extension and Development at Razi University, experienced experts from the Kermanshah Provincial Agriculture Jihad Organization, and expert farmers in the tropical regions of Kermanshah Province. To identify participants, purposive sequential sampling—specifically the snowball sampling technique—was employed. The criterion for determining the sample size was data saturation, which was achieved through interviews with 15 individuals. The research instruments included document review, in-depth and semi-structured individual interviews, group discussions, and field notes, often used in combination. Participants' opinions were recorded simultaneously during the interviews. It is noteworthy that each interview lasted an average of 55 minutes.

The validity and reliability (trustworthiness) of the research were examined using four related concepts: credibility, transferability, dependability, and confirmability (Schwandt et al., 2007). In this regard, to ensure credibility, various questions were posed to key informants during the data collection phase, with a focus on exploring different angles of the primary research question. Furthermore, to enhance transferability, strategies such as involving participants with diverse expertise and collecting and analyzing data at different points in time were utilized. At this stage, to ensure dependability regarding the accuracy of the results, the transcripts and extracted concepts were shared with the research team and other researchers. Finally, for the confirmability of the findings, after data analysis using content analysis and the extraction of concepts and categories, the established relationships were presented to key participants for review and validation. Ultimately, for greater coherence of the results, the research team reviewed and refined the findings once more. For data analysis, Directed Qualitative Content Analysis was employed. According to Momeni rad et al. (2013), content analysis approaches are categorized into three types: conventional, summative, and directed. When existing theories or research regarding a phenomenon are incomplete or require further analysis, the qualitative researcher opts for the directed content analysis approach (Rezaei et al., 2022). The analysis of the interviews was conducted using a three-stage technique of open, axial, and selective coding. In the open coding phase, all interview notes were reviewed, and primary concepts were extracted. In the axial coding phase, axial categories were formed based on the semantic proximity of the extracted concepts. Finally, in selective coding, the relationship between the categories and the core category was determined using the constant comparative technique and story-lining.

Results

After implementing the collected materials, during the open coding stage, through line-by-line review of the data, sentences related to the research topic were extracted. The outcome of this stage was the identification of 68 key concepts in the field of the research topic. Subsequently, based on the nature of the concepts and their interrelationships, preliminary categorization was conducted, and each of the aforementioned concepts was assigned a code; thus, each extracted concept was placed in a cluster, and codes from A to H were assigned to them (Table 1). At the end of this stage, it seemed that these concepts reflected all the factors influencing the development of farmers' green entrepreneurial behaviors when facing the crisis of

climate change in the hot regions of Kermanshah province, because in subsequent visits, the same concepts were reproduced. In fact, data saturation was achieved, and in a way, internal validity of the data was also confirmed at this stage.

Table 1. Conceptualization and Categorization of Data (Data Coding)

Categories	Concepts	Code
Psychological factors	Willingness to learn new methods in the field of green entrepreneurship in climatic conditions	A1
	Belief in adaptation to climate change through development of green entrepreneurial behaviors	A2
	Increasing motivation for sustainable resource management	A3
	Enhancing innovation and initiative spirit in the field of green entrepreneurship in climatic conditions	A4
	Increasing risk-taking among farmers for green entrepreneurial actions	A5
	Improving attitude towards green entrepreneurial actions	A6
	Enhancing willingness and motivation to adopt and utilize new technologies in green entrepreneurial actions	A7
	Self-efficacy confidence in adapting to climate change through development of green entrepreneurial behaviors	A8
	Willingness to diversify income with a green entrepreneurship approach in climatic conditions	A9
Educational–Informational factors	Improvement of green entrepreneurial skills, especially the process of identifying and exploiting green entrepreneurial opportunities for adaptation to climate change in hot regions	B1
	Increased awareness of the negative consequences of non-adaptation to climate change (perceived severity)	B2
	Increased awareness of the vulnerability of communities in case of non-adaptation to climate change through development of green entrepreneurial behaviors (perceived vulnerability)	B3
	Increased awareness of methods and strategies for adaptation with a green entrepreneurial approach in hot regions affected by climate change	B4
	Increased awareness in the field of climate-smart agriculture and its role in developing green entrepreneurial actions in hot regions affected by climate change	B5
	Increased access to experts, specialists, and entrepreneurs in adaptation to climate change through development of green entrepreneurial behaviors	B6
	Organizing and participating in training courses for development of green entrepreneurial behaviors for adaptation to climate change in hot regions	B7
	Visiting and modeling from successful and pioneering entrepreneurs in relation to adaptation to climate change through development of green entrepreneurial behaviors in hot regions	B8
Economic factors	Having financial backing and capital for developing green entrepreneurial behaviors	C1
	Allocation of low-interest or interest-free loans to hot regions for adaptation to climate change with emphasis on developing green entrepreneurial behaviors	C2
	Initiating and/or developing green entrepreneurial businesses in hot regions for adaptation to climate change with emphasis on developing green entrepreneurial behaviors	C3
	Guaranteed purchase of green products	C4
	Expanding investments on developing green technologies with the aim of developing green entrepreneurial behaviors in hot regions	C5
	Increasing profitability through developing green entrepreneurial actions in hot regions	C6

Categories	Concepts	Code
	Reducing costs through developing green entrepreneurial actions in hot regions	C7
	Identifying new domestic and international markets and marketing green entrepreneurial products in them	C8
	Efforts to increase exports for foreign currency earnings and higher profitability considering Iraq's proximity	C9
	Efforts to increase market share of existing and even new green product markets through applying marketing principles	C10
	Efforts to stabilize prices and create confidence for entering into green entrepreneurial actions	C11
Environmental–Climatic factors	Intensified drought, decreased rainfall, and reduced water resources among farmers	D1
	Increased regional temperature due to global warming	D2
	Reduced soil fertility	D3
	Increased pests and diseases caused by global warming	D4
	Changes in cropping patterns	D5
	Risk of yield reduction and/or even crop failure	D6
Social–Cultural factors	Development of collaboration between communities with the aim of developing green entrepreneurial behaviors	E1
	Development of communication and collaboration between successful entrepreneurs, farmers, and communities with the aim of developing green entrepreneurial behaviors	E2
	Development of entrepreneurial culture among farmers for developing green entrepreneurial behaviors	E3
	Development of cooperation and teamwork culture among farmers for developing green entrepreneurial behaviors	E4
	Support from families and villagers for green entrepreneurial actions and behaviors	E5
	Enhancing social trust in communities regarding the development of green entrepreneurial actions among local communities	E6
	Reform and improvement of some false rural cultures and beliefs	E7
	Improving villagers' attitudes toward developing green entrepreneurial behaviors with a green approach	E8
	Increasing social cohesion among rural communities for developing green entrepreneurial actions	E9
	Improving teamwork culture among villagers for developing green entrepreneurial actions	E10
	Poverty reduction and improved quality of life through the development of green entrepreneurial behaviors	E11
Political-Institutional factors	Support from relevant regulatory bodies and organizations (Agricultural Jihad Organization, Natural Resources Administration, etc.) for developing green entrepreneurial actions	F1
	Approval of policies and incentive laws for developing green entrepreneurial actions	F2
	Policymaking for monitoring, controlling, and even penalizing actions contrary to environmental issues	F3
	State planning for improving climate change adaptation with emphasis on developing green entrepreneurial behaviors	F4
	Policymaking in the field of guaranteed purchase of green products in hot regions for climate change adaptation	F5
	Facilitating permits for climate change adaptation with emphasis on developing green entrepreneurial behaviors	F6

Categories	Concepts	Code
	Allocation and distribution of inputs based on climate change adaptation with emphasis on developing green entrepreneurial behaviors (green fertilizer instead of chemical fertilizer, etc.)	F7
	Designing cropping patterns based on developing green entrepreneurial actions	F8
	Signing international agreements for developing cooperation in supplying inputs and marketing green products	F9
	Special support for knowledge-based companies in the field of green entrepreneurial actions	F10
	Further expanding cooperation between relevant departments (Agricultural Jihad, Rural Cooperation, Natural Resources, etc.) to facilitate developing green entrepreneurial behaviors	F11
	Developing employment-creating projects and home businesses in the field of green entrepreneurial actions	F12
	Policymaking for developing insurance services in the field of green entrepreneurial actions	F13
	Special financial support for green entrepreneurs	F14
Infrastructure factors	Development and implementation of modern and smart technologies	G1
	Development and implementation of modern and up-to-date software	G2
	Facilitating increased access to basic infrastructure for entrepreneurial actions (water, electricity, gas, etc.)	G3
	Development of physical communication infrastructure (roads, etc.)	G4
	Development of communication and information infrastructure	G5
Environmental Responsibility factors	Increased commitment to environmental protection	H1
	Increased concerns about environmental issues	H2
	Increased environmental concerns	H3
	Strengthened environmental values	H4

As shown in (Table 1), in the subsequent step, axial coding, the formed categories were expanded in such a way that through continuous comparison of coded data with each other, subcategories were organized into clusters compatible with the categories. In the end, 8 comprehensive categories of factors affecting the development of green entrepreneurial behaviors among farmers facing the climate change crisis in the tropical regions of Kermanshah province were formed, and each was named according to its conceptual weight, namely: Psychological Factors (A1–A9), Educational–Informational Factors (B1–B8), Economic Factors (C1–C11), Environmental–Climatic Factors (D1–D6), Social–Cultural Factors (E1–E11), Institutional–Governance Factors (F1–F14), Infrastructure Factors (G1–G5), and Environmental Responsibility (H1–H4).

In the final stage, namely selective coding, the research process of reviewing the narrative storyline, integrating and combining categories, and understanding their relationship based on continuous back-and-forth interactions and with a cumulative vision, along with reviewing the design for internal coherence and absence of logic gaps, was carried out to integrate and refine the research. All research stages were reviewed with a holistic vision. This feedback system in the method of directed content analysis allowed researchers to identify and eliminate shortcomings. Subsequently, to assess the validity of the research, the findings were shared with key participants, and after their final approval, finally, the extracted categories were arranged around a central concept: “Development of Green Entrepreneurial Behaviors

among Farmers in Response to Climate Change Crisis in the Tropical Regions of Kermanshah Province", and the research model was formed (Figure 1).

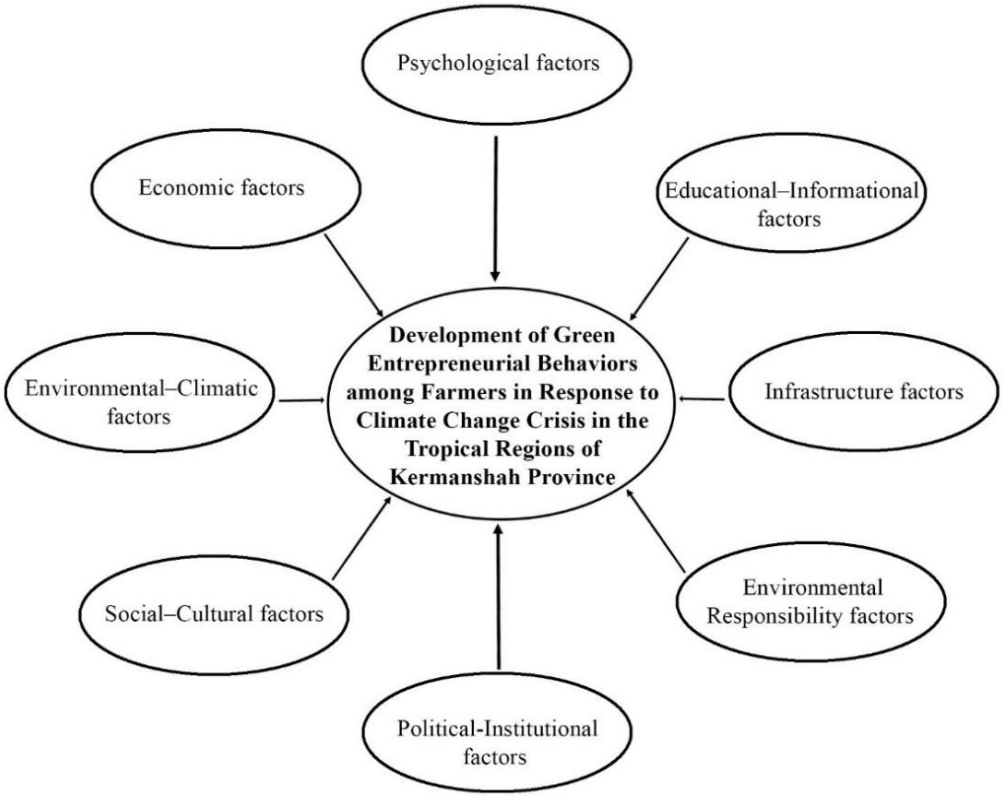

Figure 1. Research Model: Analysis of Factors Affecting the Development of Green Entrepreneurial Behaviors among Farmers in Response to Climate Change Crisis in the Tropical Regions of Kermanshah Province

Discussion

This study was conducted to identify and categorize factors affecting the development of green entrepreneurial behaviors among farmers facing the climate change crisis in the tropical regions of Kermanshah Province. The findings indicate that adaptation is a multi-dimensional and complex phenomenon that cannot be analyzed from a single perspective; it requires a systematic and holistic analysis.

The model presented in this research (Figure 1) explains these dimensions through 8 main categories: Psychological Factors (A1–A9), Educational–Informational Factors (B1–B8), Economic Factors (C1–C11), Environmental–Climatic Factors (D1–D6), Social–Cultural Factors (E1–E11), Institutional–Governance Factors (F1–F14), Infrastructure Factors (G1–G5), and Environmental Responsibility (H1–H4).

In the psychological dimension, it was determined that the willingness to learn, innovation, and belief in climate change are the main prerequisites for any adaptive behavior and action. Without internal motivation, even in the presence of other factors, the likelihood of farmers accepting new adaptive methods and approaches significantly decreases.

Therefore, this dimension includes subcategories such as: willingness to learn new methods in the field of green entrepreneurship under climatic conditions, belief in climate change adaptation through the development of green

entrepreneurial behaviors, increased motivation for sustainable resource management, enhanced innovation and initiative spirit in green entrepreneurship under climatic conditions, increased risk-taking among farmers for green entrepreneurial actions, Improved attitude toward green entrepreneurial actions, enhanced willingness and motivation to adopt and implement new technologies in green entrepreneurial actions, confidence in capabilities (self-efficacy) for climate change adaptation through the development of green entrepreneurial behaviors and willingness to diversify income with a green entrepreneurship approach under climatic conditions.

These results align with the findings of (Bukchin, 2018; Rodríguez-Cruz, 2021; Haden, 2012; Feng, 2017). Overall, based on various psychological theories in the field of behavior improvement, including: Theory of Planned Behavior (TPB) (Ajzen, 1991), Norm Activation Model (NAM) (Schwartz, 1977), Value-Belief-Norm (VBN) Model (Stern et al., 1999), Technology Acceptance Model (TAM) (Davis, 1989), Protection Motivation Theory (PMT), (Rogers, 1975), (Savari et al., 2022), the first step in improving behaviors is to modify attitudes.

In this regard, it is recommended to hold educational classes focused on increasing farmers' motivation and belief in their capability for climate change adaptation with a focus on developing green entrepreneurial behaviors.

Regarding the educational-informative dimension, it should be stated that educational factors and information processes are effective when they can strengthen farmers' awareness and understanding of climate change adaptation through green entrepreneurial actions. Such processes, by creating a continuous flow of knowledge, reduce farmers' knowledge gaps regarding climate change adaptation through green entrepreneurial actions and strengthen the possibility of more informed decision-making. Ultimately, when message transmission is clearer, more continuous, and comprehensible, it can lead to behavior improvement and enhanced farmer participation in constructive actions.

This dimension includes subcategories such as: improvement of green entrepreneurial skills, especially the process of identifying and exploiting green entrepreneurial opportunities for climate change adaptation in tropical regions, increased awareness of the negative consequences of non-adaptation to climate change (perceived severity), increased awareness of the vulnerability of communities in case of non-adaptation to climate change through the development of green entrepreneurial behaviors (perceived vulnerability), increased awareness of adaptation methods and strategies with a green entrepreneurial approach in tropical regions affected by climate change, increased awareness of climate-smart agriculture and its role in developing green entrepreneurial actions in tropical regions affected by climate change, increased access to experts, specialists, and entrepreneurs in climate change adaptation through the development of green entrepreneurial behaviors, holding and participating in educational courses on developing green entrepreneurial behaviors for climate change adaptation in tropical regions and visiting and modeling successful and leading entrepreneurs in relation to climate change adaptation through the development of green entrepreneurial behaviors in tropical regions. This section aligns with the findings

of (Ullah, 2022; Masi, 2022).

Based on major psychological theories, including the "Protection Motivation Theory" (PMT) (Rogers, 1975), one factor that contributes to improving attitudes and modifying behaviors, especially adaptive behaviors with a green entrepreneurship approach, is the increased evaluation of environmental threats, including the examination of perceived sensitivity and perceived vulnerability. In other words, when farmers have more awareness of the current situation, they will have more motivation to confront and adapt to these threats. Therefore, increasing awareness of the current situation and improving green entrepreneurial skills will lead to the development of green entrepreneurial behaviors for increasing climate change adaptation by farmers.

In this regard, it is recommended to improve farmers' green entrepreneurial skills, visit the farms of successful entrepreneurs and models, and ultimately increase their climate knowledge through various means, including holding educational workshops.

From an economic perspective, profitability and financial risk reduction are powerful motivators for behavior change. Accordingly, farmers will only turn toward developing green entrepreneurial behaviors when they are assured of economic justification and financial support (such as green facilities and insurance). In other words, increasing the financial capability dimension of farmers is the main motivation for developing green entrepreneurial behaviors, and this, when realized, leads to increased adaptation to the climate change crisis.

This dimension includes subcategories such as: having financial backing and capital for developing green entrepreneurial behaviors, allocating low-interest or interest-free facilities to tropical regions for climate change adaptation with emphasis on developing green entrepreneurial behaviors, launching or developing green entrepreneurial businesses in tropical regions for climate change adaptation with emphasis on developing green entrepreneurial behaviors, guaranteed purchase of green products, developing investments in green technologies with the goal of developing green entrepreneurial behaviors in tropical regions, increasing profitability through developing green entrepreneurial actions in tropical regions, reducing costs through developing green entrepreneurial actions in tropical regions, identifying new domestic and international markets and marketing green entrepreneurial products there, efforts to increase exports with the goal of generating foreign currency and greater profitability, considering the country's border with Iraq, efforts to increase market share of existing and even new green products through applying marketing principles and efforts toward price stability and creating confidence for entering green entrepreneurial actions.

This section of results aligns with the findings of (Masi, 2022; Muddassir, 2020; Ullah, 2022; King, 1995).

Overall, based on psychological theories, one variable includes perceived benefits. In other words, if farmers are aware of the advantages and benefits of green entrepreneurial actions, they will be more motivated to adopt such behaviors. If farmers become aware of green entrepreneurial opportunities from an economic perspective, they will undoubtedly move toward developing green entrepreneurial

behaviors and actions for climate change adaptation. In this regard, it is recommended to allocate special financing facilities with low interest rates and long-term terms, provide consulting teams to establish businesses and actions such as marketing products in export markets, or offer guaranteed product purchases.

It is clearly observed that increasing drought, decreasing rainfall, and declining groundwater levels, as an "objective imperative," compel farmers to reconsider traditional methods. In fact, these factors act as one of the influential factors in behavior modification.

This dimension includes subcategories such as intensification of drought, decrease in rainfall, and reduction of water resources among farmers, increased regional temperature due to global warming, reduced soil fertility, increased pests and diseases caused by global warming, changes in cropping patterns, and the risk of reduced yield or even crop destruction. This section of results aligns with the findings of (Mobeen, 2025; Hassan, 2023). Accordingly, if farmers are informed about environmental-climatic threats and their consequences, they will have greater motivation to compensate for damages caused by climate change, which will lead to the development of green entrepreneurial behaviors and actions for climate change adaptation.

In this regard, it is recommended to increase information and awareness among farmers regarding the adoption of adaptation strategies with a green entrepreneurship approach through conducting educational workshops.

In the social and cultural arena, the role of social networks, local community norms, and modeling from leading farmers is very important. Social acceptance of new methods and family support create the necessary foundation for innovation development in green entrepreneurship. Therefore, this dimension includes subcategories such as: development of inter-community participation with the goal of developing green entrepreneurial behaviors, development of communication and participation between successful entrepreneurs, farmers, and communities with the goal of developing green entrepreneurial behaviors, development of entrepreneurial culture among farmers for developing green entrepreneurial behaviors, development of cooperation and teamwork culture among farmers for developing green entrepreneurial behaviors, family and rural community support for green entrepreneurial actions and behaviors, enhancing social trust in communities regarding the development of green entrepreneurial actions among local communities, correction and improvement of some false rural cultures and beliefs, improving rural villagers' attitude toward developing behaviors with a green approach, increasing social cohesion among rural communities for developing green entrepreneurial actions, improving teamwork culture among villagers for developing green entrepreneurial actions and poverty reduction and improvement of quality of life through developing green entrepreneurial behaviors This section aligns with the findings of (Ren, 2022; Reproto, 2024).

Institutional and governance factors are macro frameworks that determine the possibility or impossibility of adaptation. Incentive laws, systematic government programs, effective supervision of water resources, and support for knowledge-based companies play a decisive role in guiding farmers toward sustainability.

Therefore, this dimension includes subcategories such as: support from relevant authorities and organizations (Agricultural Jihad Organization, Natural Resources Administration, etc.) for developing green entrepreneurial actions, approval of incentive policies and laws for developing green entrepreneurial actions, policy-making regarding supervision, control, and even punishment for actions contrary to environmental issues, government planning for improving climate change adaptation with emphasis on developing green entrepreneurial behaviors, policy-making in the field of guaranteed purchase of green products in tropical regions for climate change adaptation, facilitation of permit issuance for climate change adaptation with emphasis on developing green entrepreneurial behaviors, allocation and distribution of inputs based on climate change adaptation with emphasis on developing green entrepreneurial behaviors (distribution of green fertilizer instead of chemical fertilizer, etc.), formulating cropping patterns based on developing green entrepreneurial actions, signing international agreements to develop cooperation in the field of input supply and green product marketing, special support for knowledge-based companies in the field of green entrepreneurial actions, further development of cooperation between relevant departments (Agricultural Jihad, Rural Cooperation, Natural Resources, etc.) with the goal of facilitating the development of green entrepreneurial behaviors, development of job creation plans and home-based businesses in the field of green entrepreneurial actions, policy-making to develop insurance services in the field of green entrepreneurial actions and special financial support for green entrepreneurs. This section of findings is consistent with the research results of (Kaiss, 2025). In this regard, it is recommended to facilitate and expedite permit issuance and provide and approve policies and incentive laws for developing green entrepreneurial actions.

Infrastructure factors are practical tools for achieving adaptation. These factors become prominent when they enable tasks to be performed faster, more accurately, and at a lower cost, while reducing traditional constraints through the creation of innovative tools. By improving access to information, streamlining processes, and increasing predictability, these factors provide the groundwork for more efficient decision-making and the implementation of new initiatives. Overall, the more adaptable and user-friendly the technologies, the greater the capacity of farmers and organizations to innovate, manage risks, and exploit green entrepreneurial opportunities.

This dimension includes sub-categories such as the development and application of modern and smart technologies, the development and use of innovative and up-to-date software, facilitating increased access to basic infrastructure for entrepreneurial actions (water, electricity, gas, etc.), the development of physical communication infrastructure (roads, etc.), and the development of information and communication infrastructure. In this regard, the development of technological infrastructure, communication and information systems, and infrastructure development in tropical regions are recommended.

Ultimately, environmental responsibility signifies a personal and collective commitment to protecting natural resources, reducing environmental damage, and

taking actions that maintain ecological balance. This dimension encompasses sub-categories such as increasing commitment to environmental protection, raising concerns regarding environmental issues, increasing environmental anxieties, and strengthening environmental values. Enhancing social responsibility leads to an increase in farmers' understanding of environmental issues; this, in turn, heightens environmental concerns and ultimately leads to the adoption of protection-based solutions for climate change adaptation, including the development of green entrepreneurial behaviors.

In this context, organizing awareness-raising workshops regarding environmental issues and consequences is suggested with the aim of increasing the environmental responsibility of farmers.

Conclusion

The main purpose of this research was to investigate the factors affecting the development of green entrepreneurial behaviors of farmers in the face of the climate change crisis in the tropical regions of Kermanshah province. According to the findings, the most important factors included psychological factors, educational-information factors, economic factors, environmental-climatic factors, social-cultural factors, institutional-governance factors, infrastructure factors, and environmental responsibility.

The presented model clearly shows that successful adaptation is the result of dynamic interaction with all aspects identified in the present study. lack or weakness in any of these layers (i.e. high motivation but lack of financial support, or lack of awareness) can disrupt the entire process of adaptation or even fail. Therefore, adopting an integrated, systematic and multi- dimensional approach to all these aspects is essential.

Limitations and Future Research

Based on the findings, practical recommendations is presented as follows:

1. Comparative study of factors affecting entrepreneurial behavior in different climates;
2. Study of factors affecting entrepreneurial behavior in cold regions of Kermanshah province;
3. Designing intelligent models for prediction of green behavior patterns in agriculture.

Also, the most important limitations of the research include lack of cooperation some key participants due to the lack of time, dispersion of key participants, who had time consuming and costly data collection.

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Conflicts of Interests
The authors declare no conflict of interest.

Generative AI statement
The authors declare that AI is not used in this study.

Data availability statement
The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Considerations
The authors avoided data fabrication, falsification and plagiarism, and any form of misconduct.

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