

RESEARCH PAPER

Entrepreneurial potential, food security, and environmental services of agriculture and natural resources in Kermanshah province, Iran

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Highlights

- Ecotourism development, proper agricultural activities are driven forces for entrepreneurship among local inhabitants.
- Sustainable natural resources can be achievement through integrated ecotourism management and providing infrastructures necessary facilities.
- Both proper agricultural activities and ecotourism management lead to combating hazardous off-sites impacts such as flooding, soil erosion, siltation and carbon emission.

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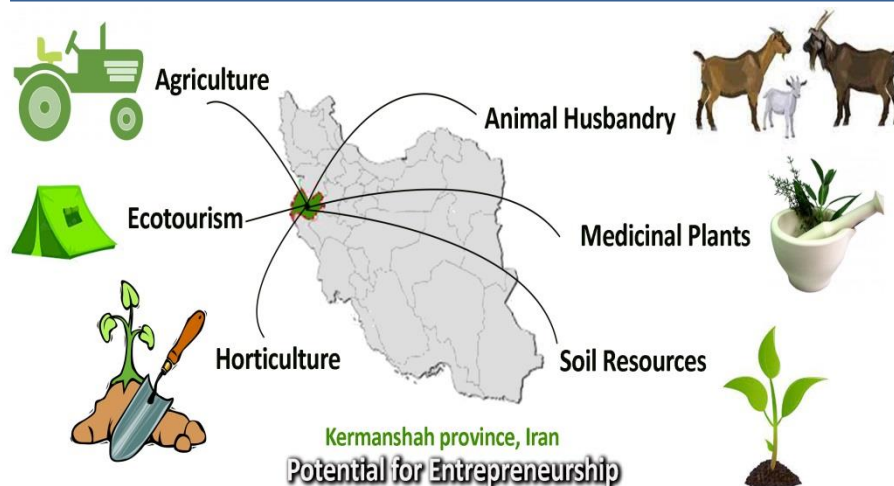
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Graphical Abstract



Abstract

Iran's Kermanshah province is one of the few provinces that have the potential for sustainable development of agriculture, natural resources and employment growth associated with this sector in the face of climate change due to its diverse geological, topographical, climatic, soil, vegetation and geographical conditions. In this context, it is necessary to study the ecotourism potential in relation to different sectors such as horticulture, agriculture, livestock, medicinal plants, soil resources, rivers, forests, pastures and settlement culture at the regional level. This depends on integrated management that focuses on the management system, agricultural financing, effective monitoring, ecotourism facilities, and quality control of agricultural production. However, achieving this goal requires assessing the current situation and resolving management constraints, as well as necessary reforms in these areas to achieve sustainability of crop production and natural resources and entrepreneurship in the agricultural sector of Kermanshah Province, Iran. Due to the insufficient employment situation in the province and the lack of capital resources, the limited resources should be allocated to sectors that have higher employment potential. In this regard, the agricultural sector is a high priority due to its importance to the province's economy and its linkage to other sectors of the economy. Therefore, officials must take measures to solve the problems of this sector and thereby increase production and entrepreneurship in Kermanshah province.

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1. Introduction

In the context of climate change, maintaining production and entrepreneurship of the agricultural sector has particular importance including sub-sectors of agriculture, horticulture, animal husbandry and natural resources (Mujeyi et al., 2021). In general, the agricultural sector accounts for one-third of jobs and the lives of 2.5 billion people in the world's rural community depend on it, and is socially the cause of an interconnected rural culture as a public heritage (FAO, 2014). Accordingly, 24.1 million tons of food is produced daily and in addition, 9.5 million cubic meters of wood is extracted daily from the world's forests. 7.4 trillion liters of water and 3,000 tons of chemical fertilizers worth \$ 7 billion are consumed daily to produce agricultural products (Van der Schatte Olivier et al., 2020). Principled management of agriculture, including optimal use of water, other inputs, and tillage (plowing), leads agriculture to sustainability along with improved food security and leads to water resources storage, flood control, global warming and treatment costs (Through the production of healthy food) (Berhanu et al., 2017).

On the other hand, the role of sustainable agriculture is also important in preserving agricultural lands and increasing their quality (Paster, 2004). In the current situation, the physical development of agricultural lands causes destruction and land-use change of natural resources and also decrease soil quality. Agricultural lands are not only unsustainable but also declining (Appiah et al., 2019). The current agricultural lands have been destroyed in many cases. According to the FAO (2014), 33% of agricultural land has been damaged by erosion, salinity, crushing and chemical pollution, and 12 million hectares of agricultural land are lost each year due to drought and desertification. In the last decade, 13 million hectares of forests have been converted into agricultural land (Wei et al., 2014). Also, the water crisis and its scarcity are so widespread that it has caused prevalent concern in society, but it seems that a suitable solution has not been devised yet (Jury and Vaux Jr, 2007). Inadequate water consumption in all sectors has reduced water of rivers, springs and groundwater and has caused soil salinity (FAO, 2014). On the other hand, high consumption of pesticides and chemical fertilizers leads to pollution of groundwater resources and downstream drainage systems, which is more severe in calcareous areas due to high porosity (Yargholi and Azarneshan, 2014).

One of the unfortunate consequences of this trend is damage to biodiversity (Lake et al., 2000). Native plant varieties and ecotypes belonging to the vital climates of our country have important value for different uses and adaptation to climate change, rangeland improvement and development, and industrial uses (pharmaceutical, cosmetics and perfume industries), which have unfortunately been neglected and have been in danger of extinction. About 75% of crop genetic diversity will be lost due to plant and animal breeding, and 15 to 37% will be lost by 2015.

Another aspect of sustainable agriculture is ecotourism, in which tourists travel to visit fascinating and special natural phenomena. Such phenomena are mostly intact and include plants, animals, natural features such as mountains, waterfalls, caves, river paths, lagoons, seashores, some orchards and etc., which also have an economic role and in principled management also leads to the survival of natural resources (Choo and Jamal, 2009). The World Ecotourism Association estimates that 83% of developing countries use their natural potential for exports, while some countries, including Costa Rica, Ecuador, Nepal, Kenya, Madagascar and the Antarctic, play a key role in ecotourism, so than in employment and GDP (Bokov et al., 2020).

In general, protection and sustainable use of these valuable resources will be a prerequisite for the continuation of environmental services and production of national wealth (FAO, 2014) and will be the mainstay of combating climate change and agricultural sustainability (Costanza et al., 2017). The financial value of environmental services on a global scale such as climate balance, reduction of environmental disturbances (erosion, floods, droughts, etc.), sustainability of water resources, soil formation, pollution, sustainability of agriculture and tourism is about \$125 trillion in Year (based on 2011), but due to land-use change, these benefits are reduced to about \$20 trillion annually and are sacrificed for the short-term benefits of individuals and groups and expansion of cities (Figgis et al., 2015; Costanza et al., 2017). Feedback to this trend is the exacerbation of environmental crises, in particular, the increase in soil organic carbon emissions into the

atmosphere reduced rainfall and increased dust (Rosenfeld et al., 2001). The purpose of this study was to evaluate the capabilities of agricultural sub-sectors and natural resources of Kermanshah province along with the most important opportunities and threats to their sustainability, which was conducted with the focus on ecotourism in 2017-2020.

2. Materials and methods

2.1. Study of area

This study was conducted in Kermanshah Province, Iran locating in the Zagros mountain chains and lies between $33^{\circ}40'$ to $35^{\circ}10'$ N latitudes and $45^{\circ}30'$ to $48^{\circ}20'$ E longitudes, with 2.5 million ha areas. This province comprises plains, hilly and mountainous areas with forests, rangelands and agricultural lands. The mean annual precipitation and temperature are 480 mm and 17.7°C , respectively (Fig. 1). The average altitude is 1400 m above sea level. Winters are cold enough to drop below zero during winter season, but summers are, relatively cool and dry indicating a semi-arid region. Forest is dominated by oak species (*Quercus persica*) which have provided a wide range of benefits and public services including charcoal, medicinal plants, recreation, water purification, carbon sequestration, soil conservation and biodiversity reservoir. The main types of farmers livelihood are livestock production and farming activities. Winter wheat, barley, chickpea, sugar beet and maize are the crops grown, whereas sheep rearing is the main livestock (Fig. 1).

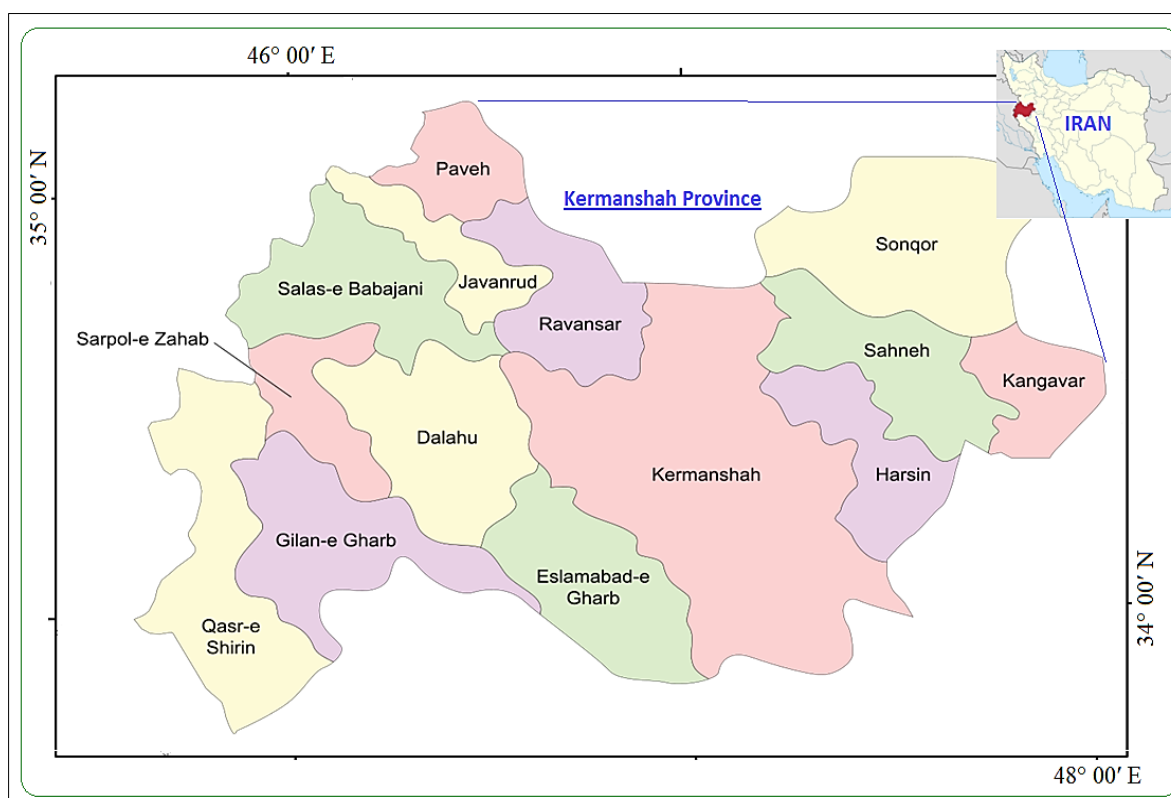


Fig. 1. The geographical location of Kermanshah province in Iran.

2.2. Methods

The steps of this research were as follows:

- Primary data and information about agriculture, ecology, society, main crops production, handicraft and environmental quality were collected through authorized offices (agriculture, provincial government, rural extension tourism etc.).
- Additional and relevant research data were collected through literature and expert opinion. Interviewing pertaining experts considering the possible solutions on enhancement livelihoods and factors impacting

current level of agricultural activities and possible solutions for its flourishing combined with sustainable natural resources. The focus of the questions was the following:

- Possible solution for enhancement of entrepreneurship potential and food security in Kermanshah province.
 - Infrastructure and facilities needed for ecotourism development in Kermanshah province.
 - Necessary issues requirements for sustainable agricultural activities and environment.
- c) Field survey was conducted on ecotourism destinations, nomadic sites, famous villages special agricultural activities, animal husbandry, horticulture, handicrafts, by-products.

Thus, several discussion meetings carried out with relevant experts and local managers in Kermanshah province. The respondents were in the field of geography, watershed management, tourism, economy, forest, rangeland, agriculture and extension.

3. Results and Discussion

3.1. Entrepreneurship potential of Kermanshah agricultural sector

The entrepreneurship potential of the agricultural sector of Kermanshah province is remarkable derived from geological, topographic, climatic and soil conditions. According to Table 1, the agricultural potential of Kermanshah province can be divided into ten cases. The most important problems of low employment in this sector are as follows:

- a) Lack of capable and efficient management: Perhaps this is the most important factor in the problems of the province in comparison with the large and central provinces of the country that agricultural decision-makers have lack experience, ability and compassion commensurate with the ability of agriculture. This issue is evident in conferences, specialized meetings, spending time and motivation of senior agricultural managers of the province.
- b) Inefficiency of water, soil and vegetation resources: Unfortunately, the factors of human degradation and improper use of these valuable resources in various forms, including change of national land use, destruction of forests and pastures, improper plowing, improper use of fertilizers and pesticides, soil erosion, the release of various pollutants into water and soil sources and etc.
- c) Lack of development in processing, food and branding industries suitable for agricultural products and livestock products of this province. This requires proper marketing and an increase in employment and income.

Table 1. The most important agricultural entrepreneurship capabilities of Kermanshah province.

No	Subsection	entrepreneurship potential	The most important opportunities and threats with a focus on entrepreneurship	
			opportunities	threats
1	Agriculture	Wheat	Food security, entrepreneurship from harvesting, transportation, warehousing and processing industries (flour, etc.)	The monopoly of some related industries, product wastage, weakness and limitations of conversion industries, lack of support, weak export management, intermediary system (brokerage)
		Pea	Food security, seasonal employment, processing and food industries	Cheap purchase from farmers (monopoly and brokerage system), lack of industries and packaging system, insufficient use for export
		Forage (alfalfa and straw)	Providing part of the fodder needed by the country, good employment, the prosperity of livestock in the province	Insufficient attention, lack of investment, limited bank facilities, intermediation

Table 1. Continue

2	Horticulture	Employability due to the variety of garden products, fruits, vegetables	Variety of products (olives, figs, pomegranates, apples, citrus fruits, grapes, etc.), branding capability for export (pomegranates, citrus fruits, etc.) and food industries (juice, paste, sauce, etc.)	Insufficient attention, lack of investment, limited bank facilities, intermediation
3	Animal husbandry	Light livestock (sheep and goats)	Branding capability (mutton and goat), organic meat (nomadic livestock)	Lack of active and reluctant management and possibly monopoly and intermediaries
		Dairy products	Animal oil	Lack of proper branding
4	Medicinal plants	Turpentine gum, Tragacanth, Licorice, Saffron	Ability to export and create added value	Investment and financial support (bank credits or, guaranteed purchase, insurance, etc.)
5	soil resources	Production base and performance of agricultural products	Soil diversity, lack of salinity, suitable depth and lack of wetland	Erosion, waste of organic carbon, pollution and poisoning and reduced fertility (improper plowing, excessive use of fertilizers and pesticides, especially leased land for planting potatoes and corn)
6	Agricultural Engineering and Natural Resources Organization	Employability of agricultural graduates	Organizing graduates and providing employment and support; Establishment of entrepreneurship companies and agricultural services	Unemployment insurance for unemployed graduates, The need to support and upgrade start-ups and facilitate referrals to work and services, The inability of the engineering system to regulate the employment of agricultural graduates in the relevant government departments
7	Administrative –Financial sectors	Strengthen executive departments	Ability to properly and timely care of the farm, proper and effective monitoring	Lack of sufficient equipment, large differences in administrative and financial facilities compared to the headquarters
8	Water and Irrigation	Entrepreneurship through the improvement of irrigation systems	A key role in increasing the efficiency of water resources and improving irrigation methods	It is necessary to refer the works of this unit to the related companies in cooperation with the Engineering System Organization and observing the tender formalities.
9	Agricultural monitoring and product quality control	Employment requires the sustainability of production and marketing resources	Establishment of laboratories related to soil, water and food products produced	Documenting substandard food and contaminants in water and soil resources is not to the liking of managers
10	Ecotourism	Significant entrepreneurship potential	Beautiful natural landscapes (mountains, valleys, caves, rivers), forests, pastures, mirages, unique villages and the integration of music culture, handicrafts, historical monuments and nomadic life with ecotourism	Land-use change, natural landscape degradation, pollution, fire, plantation, lack of planning and investment in this field

3.2. Paying attention to the ecotourism potential of Kermanshah province

The ecotourism capability of Kermanshah province is due to the unique natural facies with orchards, rural life, nomadic life, handicrafts, medicinal plant products, the province dams, antiquities, Iran-Iraq war, and remnants of the terrible earthquake in the fall of 2017 (Ebrahimi et al, 2021). Thirteen facies and natural landscapes with ecotourism capability were identified in Kermanshah province, including mountains, forest parks, forest reserves, waterfalls, caves, rivers, mirages, alluvial fans, pastures (along with nomadic life), tourist villages and a memorial to the holy defense (Bazideraz mountain). These areas have 53 sites with ecotourism capabilities in Kermanshah province. In the current situation, due to road construction, the abundance of cars and lack of supervision, these areas are exposed to serious damage due to land-use change, shrubbery, overgrazing, plowing, fire, possession by influential people and pollution, and not only their valuable plant species are being destroyed along with their water, soil and natural form, but also the local community is not taking full advantage of its income-generating and employment potential (Ebrahimi et al, 2021).

Assessing the potential of ecotourism in Kermanshah province is one of the main concerns to create the job. Therefore the solution of its sustainable exploitation has been identified based on analysis of opportunities, threats, strengths and weaknesses, which one example is related to Chalabeh Forest Park (proposed) (Table 2). The development of ecotourism requires the preservation of the appearance of natural facies and their vegetation (Fig. 2).



Fig. 2. The basic condition for the prosperity of ecotourism is to maintain the appearance of its natural features and vegetation. Unfortunately, due to the lack of appropriate technologies, mountain degradation is very worrying for road construction, gas supply and mines (A, B, and C). On the other hand, the forests of Zagros can be considered abandoned; because the preparation of charcoal (D), uncontrolled plowing (E) and deliberate burning of oak trees (F) continue astonishingly. The result is desert and dust and wasted valuable soil (G) that continues with the bulldozer (H) and tractor.

Table 2. Ecotourism strategies of Chalabeh Natural Park in Kermanshah based on SWOT analysis.

<u>Opportunity points (O)</u>	<u>Strength points (S)</u>	<u>Weakness points (W)</u>	<u>Threat points (T)</u>
1) The possibility of sustainable and significant employment. 2) Opportunity for revival and stability of Climax species (oak with perennial wheat, deciduous broad-leaved species including herbaceous species, vetches, alfalfa and annual clover. 3) An opportunity for fun and happiness of the citizens of Kermanshah province (considering that there is no natural park in Kermanshah province. 4) Having water resources in a significant part of the year and the possibility of drilling wells in the downstream alluvial fan. 5) High natural potential for tourism, including its karst valley for a suspension bridge, cable car, mountaineering, rock climbing, water park, etc. 6) Significant potential for biodiversity conservation (considering having important and key Zagros forest and rangeland species. 7) Good potential of sports groups (including climbers) and non-governmental organizations for protection and optimal use of this area.	1) Proximity to the city of Kermanshah and its infrastructure (airport, main road, hotel, etc. 2) Having electricity supply facilities for development. 3) Proximity to the center of the province (about 10 km and location on the Tehran-Kermanshah-Karbala road. 4) Possibility of providing relief as soon as possible (fire, etc.). 5) Possibility of establishing a market and a small exhibition of handicrafts, agricultural products and food.	1) Fear of high profits for individuals and lobby groups and reduction of its employment level) (if it becomes a natural park). 2) Fear of lack of effective monitoring and managerial inefficiency and lack of effective protection.	1) Fear of changing the use and acquisition of downstream lands (basin exit) with the influence of lobby groups. 2) Vulnerability to fire (intentional and unintentional). 3) Grazing livestock that is being done illegally. 4) Pruning the plant and severe branching due to the dense presence of people, especially in spring. 5) Release of various wastes (plastic containers, sanitary waste, broken glass containers, etc.) in this area by tourists. 6) Common hunting in the area.
Strategic options (in order of priority)			
1) Legal acquisition of Chalabeh watershed and rocky, destroyed and low-slope lands at the exit of the watershed (previously the loan site of the cement factory) for the development of a natural park (parking lot, amusement park, etc.) based on land audit plans and other documents. Valid (T1). 2) Carrying out comprehensive studies and design (executive phase) of Chalabeh Natural Park by a specialized team with the management of the governorate and coordination of the General Departments of Natural Resources, Environment, Tourism (W1). 3) From a legal and administrative point of view, it is necessary that its management is related to the above departments and the selection of the employer and the executor are also related to the legal process and the supervision of non-governmental organizations and be transparent so that while creating employment, it also protects natural resources (W). 4) Identification of fire vulnerabilities and necessary measures in this field (T2). 5) Preparation and accurate forecasting of forestry and rangeland studies in order to provide the necessary financial, administrative, technical and legal arrangements and equipment to eliminate livestock grazing or livestock grazing management (equal to the capacity of forage production and without damage to Stability of declining and endangered species). 6) Economic calculations (income forecast / employment rate / cost / number of tourists / entrance ticket price, etc.).			

3.3. Other cases related to agriculture in Kermanshah province

- a) Protection of forests and pastures.
- b) Paying serious attention to the entrepreneurship potential of special and traditional food products of Kermanshah province through branding and providing necessary arrangements for their introduction in foreign markets (especially Iraq), the most important of which are: Kermanshahi butter oil, Pomegranate paste, Tarkhineh, and nomadic mutton.
- c) Kermanshah rural culture (a collection of music, agricultural and nomadic culture) and their real documentation and having a museum in this field.
- d) Special support for successful agriculture-related business owners.
- e) Compiling a comprehensive research plan on the most important harms and capabilities of the agricultural sector and natural resources of the province and most importantly the human resources in this field (including managers, experts, university professors, researchers, graduates).

4. Conclusions

Kermanshah province has a high potential for entrepreneurship due to its diversity of geology, topography, climate, soil, vegetation and geographical location. These potentials include horticulture, agriculture, ecotourism, animal husbandry, production of medicinal plants, soil resources, Agricultural Engineering and Natural Resources Organization, administrative-financial sectors, water and irrigation, agricultural monitoring and product quality control. These potentials are always accompanied by opportunities and threats, which are detailed in Table 1. Also, the ecotourism strategies of Chalabeh Natural Park in Kermanshah based on SWOT analysis are considered as an example to assess the potential of ecotourism in Kermanshah province. Due to the insufficient employment situation in the province and the lack of capital resources, limited resources should be allocated to sectors that have higher employment potential. In this regard, the agricultural sector has a high priority due to its importance in the province's economy and its connection with other economic sectors. Therefore, the officials must take action to solve the problems of this sector, and through this, to increase production and entrepreneurship in the province.

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