

Identifying the Consequences of Explaining the Supply Chain of Rangelands Medicinal Plants

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Abstract

The study aimed to identify the consequences of explaining the supply chain of medicinal plants in rangelands, which is crucial for supporting the production of these valuable resources, developing new markets, protecting the environment, and fostering economic development. The researchers employed a multi-pronged approach, including a literature review, field study, interviews with experts, and focus group discussions. The literature review examined academic studies on the supply chain of medicinal plants, focusing on the consequences of explaining this chain. The field study mapped collection sites, transportation routes, and distribution channels in selected Rangelands, while also conducting interviews with local communities to understand their perspectives. Experts from various fields, such as botanists, ecologists, and supply chain specialists, provided insights into the potential impacts on biodiversity, ecosystem services, and local livelihoods. Focus group discussions with stakeholders, including Rangeland managers, local communities, and policy makers, helped validate the findings and identify additional consequences. The study's results highlight the importance of understanding and explaining the supply chain of medicinal plants in rangelands to support their production, develop new markets, protect the environment, and promote economic development

Keywords: medicinal plants, Supply chain consequences, Biodiversity, economic development.

Introduction

An ecosystem refers to a collection of living organisms with the non-living components of their environment, which interact as a system. Ecosystem services are the benefits that humans get from the ecosystem. These services can include service provision (such as food and water), regulatory services (such as climate regulation), cultural services (such as spiritual and recreational benefits), and support services (such as nutrient cycling) (Velasco-Monez et al., 2022; Bostian and Lundgren, 2022).

Rangelands are indeed a vital component of ecosystems, especially in drylands, covering about 41% of the earth's surface and supporting 65% of the area used for grazing domestic livestock. Rangelands provide important ecosystem services and functions (Gaitán et al, 2014). In addition, rangelands are socio-ecological systems where human activities and decisions at different scales are necessary to produce ecosystem services (Huntsinger & Oviedo, 2014). Human activities are responsible for a significant share of the destruction of Rangeland and the loss of vegetation, water and soil resources (Savari, 2023). Therefore, humans, as the main beneficiaries of natural ecosystems, should be at the forefront of policies and comprehensive management of ecosystem services (Zhao et al., 2024; Stanworth et al., 2024). One of the most important management measures for rangelands is multi-purpose use. Rangelands are areas of land that are primarily used for grazing livestock and are characterized by native vegetation, such as grasses, shrubs, and trees. Multi-purpose use involves managing rangelands for various objectives, including livestock production, wildlife habitat, recreation, and ecosystem services (Hill et al, 2006; Jafari & Zaredar, 2010).

Livestock grazing pressure is an important obstacle in rangelands that affects sustainable land management, soil erosion and rangeland productivity. High grazing pressure can lead to negative effects such as changes in Rangeland composition, soil erosion, and reduction of soil carbon stock (Tarafe et al., 2020; Machrum and Chenchurum, 2022). The multi-purpose use of Rangeland can lead to more sustainable management practices by reducing the pressure of the traditional use of Rangeland, i.e. livestock grazing, which can help preserve the environment, preserve biodiversity and ensure long-term productivity (Motamed and Sohri, 2014; Anishchenko et al. , 2022).

Exploitation of medicinal plants is one of the vital aspects of using Rangeland, especially in areas of the country where these plants are a significant source of income for rural households. Exploitation of biological products of medicinal plants, including seeds, gums, fruits and leaves, is of interest to many rural households in Iran, and some of them rely on these plants as their main or only source of income (Abedi et al., 2022).

medicinal plants are a crucial resource found in rangelands that have significant economic, social, and ecological importance. Preserving and sustainably using these plants is necessary to maintain the health of rangeland ecosystems and the communities that depend on them (Koç et al, 2018). For the effective exploitation of medicinal plants, understanding the current supply chain is crucial. The supply chain of medicinal plants in Rangeland is a basic concept in the field of production and processing of medicinal plants.

The supply chain is related to the movement of materials from the ground to the customer and is more concerned with the aspects of supply and distribution of products. (Taghouti et al., 2022). In other words, supply chain refers to a network of organizations, people, activities, information and resources involved in the production and delivery of a product or service from the raw material stage to the final customer. Supply chain management (SCM) is the coordination and management of activities within this network to maximize customer value and achieve sustainable competitive advantage. This includes integrating key business processes across the supply chain, including sourcing, production planning, inventory management, shipping and logistics (Keshavarz et al., 2023).

Medicinal plant supply chain management is a specific application of SCM principles to the production, processing, and distribution of medicinal plants. It involves the coordination and management of activities from cultivation or harvesting to the delivery of medicinal plant products to the end customer, which may include pharmaceutical companies, herbal medicine manufacturers, or consumers. Effective medicinal plant supply chain management is critical to ensure the quality, safety, and efficacy of medicinal plant products, as well as to promote sustainable use and conservation of these valuable resources (Pangriya,2015; Azi et al, 2018) .

The field of medicinal plants is one of the subsets of the country's natural resources and agriculture sector. Due to the diversity of climate and weather, Iran has more than 2400 medicinal and aromatic species. that 1728 species of these plants are exclusively native to Iran (Khazanli et al., 2019). which shows the potential of the field of medicinal plants for economic and industrial development (Nasabian et al., 2011). This field is considered an exclusive capacity for setting up small businesses, especially conversion industries (Movahdi et al., 2013).

In this regard, there is no supply chain for medicinal plants in most parts of Iran, which is a challenge in the direction of optimal exploitation and economic use of Rangelands (Keshavarz et al., 2023).

Therefore, it is very important to identify and analyze the supply chain of medicinal plants for the economic exploitation and development of the medicinal plants market. Several studies have addressed this issue, which shed light on various aspects of the supply chain of medicinal plants: In the study of Variskhanov et al. (2024), the effect of implementing an organizational resource planning system on the efficiency of the Thai medicinal plant supply chain was investigated. In terms of methodology, this research uses Lee and Rim's vision quantification model and uses the Monte Carlo simulation approach to evaluate vision before and after the implementation of enterprise resource

planning. This study, located in northern Thailand, specifically examines the supply chain of Limonella plants, a key medicinal plant.

The results show a significant improvement in supply chain visibility after the implementation of enterprise resource planning, which leads to accelerated delivery times. The findings emphasize the pivotal role of enterprise resource planning systems in strengthening information sharing and coordination among supply chain stakeholders. In order to examine the evolution of the medicinal and aromatic plants market using global supply chain analysis, some researchers (Taghouthi et al., 2022) examined the main challenges facing this sector in Mediterranean countries, and five groups of challenges have been identified, which are mainly They relate to certification and labeling, quality of life and well-being, market development, research development, and conversion and processing. In evaluating the market trend of medicinal and aromatic plants in Italy based on future scenarios, the results of experts indicate the need to increase the acceptance of digital innovations, develop agreements between actors of the supply chain and invest in the training of actors of the supply chain (Spina et al, 2023).

Therefore, in this research, it will be tried to provide insights to the interested and researchers in this field by explaining the supply chain of medicinal plants in line with the sustainable management of Rangelands.

Materials and Methods

We employed a multi-pronged approach to identify the consequences of explaining the supply chain of medicinal plants in Rangelands:

1. Literature review: We conducted an extensive review of academic literature on the supply chain of medicinal plants, with a focus on studies that examined the consequences of explaining this supply chain. This included reviewing journal articles, conference proceedings, and reports from relevant organizations.
2. Field study: We carried out a field study in selected Rangelands to observe and document the supply chain of medicinal plants. This involved mapping the collection sites, transportation routes, and distribution channels. We also conducted interviews with local communities to ask their perspectives on the supply chain and its consequences.
3. Interviews with experts: We interviewed experts from various fields, including botanists, ecologists, and supply chain specialists, to gain insights into the potential consequences of explaining the supply chain of medicinal plants in Rangelands. These experts provided valuable information on the potential impacts on biodiversity, ecosystem services, and local livelihoods.
4. Focus group discussions: We organized focus group discussions with stakeholders, including Rangeland managers, local communities, and policymakers, to discuss the findings from the literature review, field study, and interviewing experts. These discussions helped to validate our findings and identify additional consequences that may have been overlooked.

Research area

This research has been done in an area called Nodushan, is located in Yazd province, Meybod city.

This area is located in the southwest of Yazd province, and in terms of geographical location, it has geographical coordinates of 31 degrees and 53 minutes north latitude and 54 degrees and 22 minutes east longitude. Nedushan region is geographically located near the city of Yazd, as one of the important regions of Iran in terms of medicinal plant production, due to its special weather and soil conditions, as one of the centers of medicinal plant production. It is known for its high quality in the country. This region is very important in terms of production of medicinal plants and is considered as one of the main sources of supply of these plants in Iran. In this article, an attempt has been made to investigate the consequences of explaining the supply chain of medicinal plants in the Rangelands of Nedoshan region of Yazd province.

This research can help to better understanding and improve the processes of production and supply of medicinal plants in this region. The value of this research might be very valuable for improving the quality and management of natural resources and providing high quality medicinal plants.

Potentials

1. concentrated population in the city and the village
2. rich rangelands (around 3500km)
3. active mines in the area
4. medicinal plants
5. suitable agricultural products such as pomegranate and pistachio
6. The existence of rangeland livestock
7. Lives based on animal husbandry
8. the availability of necessary Utilities such as water, electricity, roads, etc.
9. local communities with appropriate age mix

Limitations

1. Drought, financial problems and lack of training and empowerment
2. deprivation of the area
3. Lack of insurance coverage for stockbreeder
4. Lives only based on rangelands
5. Increase in mining activities and negative impact on people's lives
6. dring up of qanats because of drought and mining activities
7. disinclination to establish an industry in the area

as a result, consecutive droughts and mining activities had led to numerous social problems and people's pessimism, and since there are many industrial pollusions in Yazd-Ardakan plain, many problems are created and people do not get to establish industries, and in this situation, alternative livelihood seems is the best solution to the problems. Their empowerment, awareness and training in order to reduce the pressure on rangeland and develop and cultivate medicinal low water-demanding plants such as saffron can be used to solve the existing problems, and natural resources cooperative projects such as the Manarid project in the Nedoshan are important steps in removing deprivation. and empowerment of ranchers and users of natural resources.

Table 1- Demographic information

household	population	man	woman	man (0-14 y.o.)	man (15-65 y.o.)	over 65 y.o.
450	1372	679	680	134	458	87

woman (0-14 y.o.)	woman (15-65 y.o.)	woman over 65 y.o.	man (over 6 y.o.)	woman (over 6 y.o.)
161	430	89	624	621

over 6 y.o.	man (over 10 y.o.)	woman over 10 y.o.	over 10 y.o.
1245	590	581	134

Table 2- employment status

employed man	employed woman	Working population	employed man	employed woamn
396	430	467	13	10

employed population	agricultural workers	Service staff	industry workers
23	259	88	105

Table 3- Housing status

No. residential units	No. residential units (steel structure)	No. residential units (reinforced concrete)	No. residential units (other)
417	0	53	105

Table 4- Marital status in Nodushan

single	married	divorced/seperated	widowed	marital status (not declared)
342	750	2	77	0

Table 5- Literacy rate in Nodushan

literate man	literate woman	literate population	male student	female student
535	475	1010	160	147

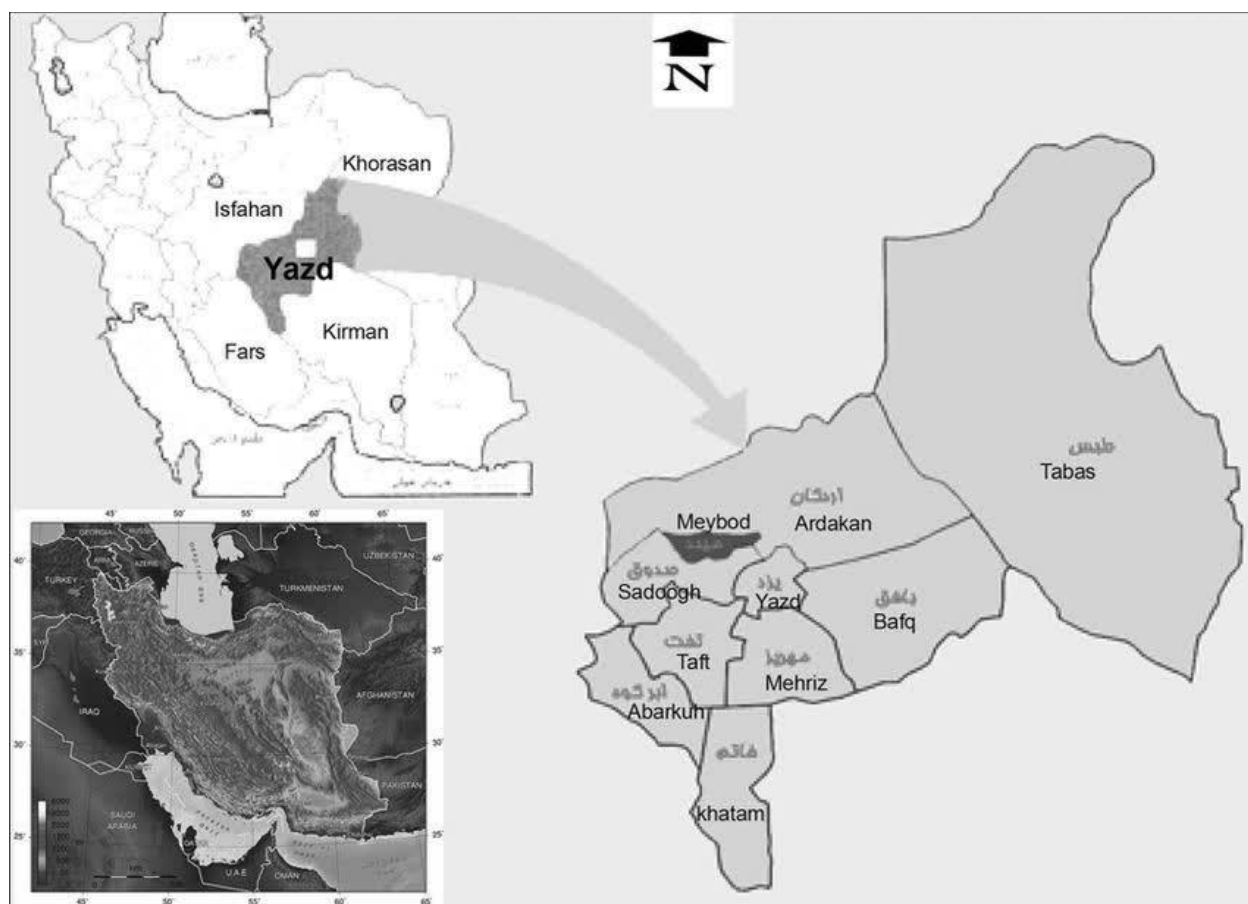


Figure 1: Map of the research area

Results

To understand the consequences of explaining the supply chain of medicinal plants in rangelands, we can analyze the provided sources. The most relevant concepts related to this query are:

- Supporting the production of medicinal plants
- Development of new markets
- Environmental Protection
- Economic Development

Explaining the supply chain of medicinal plants in rangelands supports the production of medicinal plants by highlighting the importance of sustainable harvesting practices, conservation efforts, and cultivation methods. This understanding aids in the development of new markets for these plants, ensuring their availability and economic viability. Moreover, by emphasizing environmental protection through regulated collection and cultivation, it contributes to the preservation of biodiversity and ecosystem health in rangelands. Ultimately, this comprehensive approach fosters economic development by promoting the sustainable use of medicinal plants, creating opportunities for local communities, and safeguarding the natural resources essential for the production of these valuable plants.

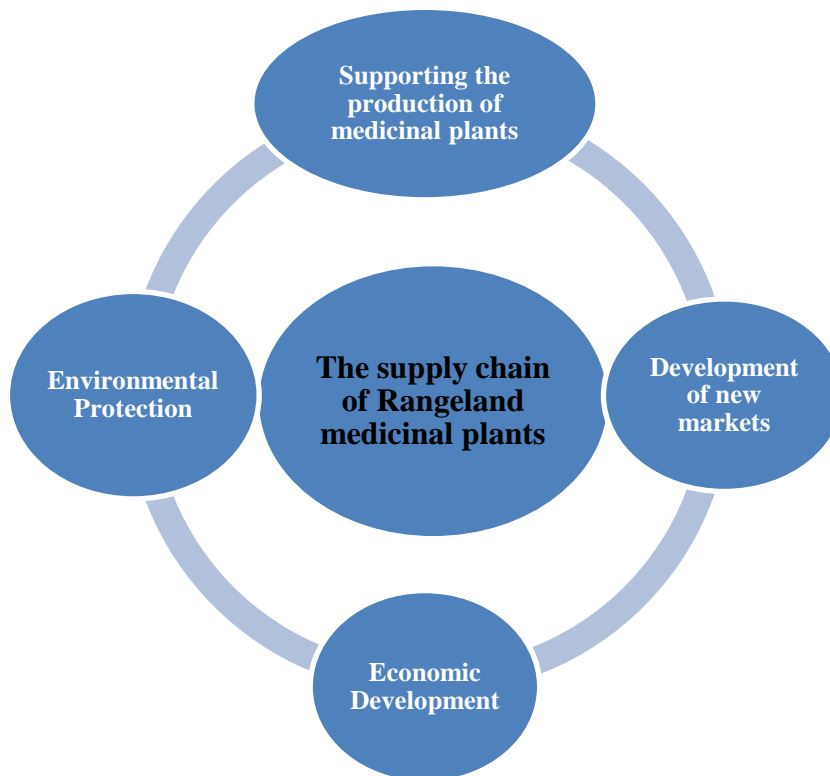


Figure 2: Consequences model for explaining the supply chain of medicinal plants in Rangelands

Conclusion

According to the findings of the study, the consequences of explaining the supply chain of medicinal plants in rangelands are as follows:

- **Supporting the production of medicinal plants:** The supply chain analysis of medicinal plants in various regions emphasizes the significance of sustainable practices, conservation, and cultivation methods, which support the production of these plants. These results are in line with the research results of Ndou et al. (2019). Because clarifying the standard of value chain and supply chain of medicinal plants can ultimately support the production and producers with the prosperity of the market of medicinal plants.
- **Development of new markets:** Understanding the supply chain of medicinal plants aids in the development of new markets by ensuring the availability and economic viability of these plants. According to the findings of this research, in line with the study of Taghouti et al. (2022), it can be concluded that the correct explanation of the value chain and the supply of medicinal plants can ultimately solve the challenge of developing new markets.
- **Environmental Protection:** Emphasizing environmental protection through regulated collection and cultivation practices is crucial in the supply chain of medicinal plants. This approach contributes to the preservation of biodiversity and ecosystem health in rangelands. Therefore, according to the findings of the current research, it can be concluded that explaining the value chain and supply of medicinal plants can protect the environment. These results are in line with the results of the study by Jose and Omesh (2010).
- **Economic Development:** By promoting sustainable practices and highlighting the economic value of medicinal plants, the supply chain analysis supports economic development. It creates opportunities for local communities and contributes to the sustainable use of natural resources. The present results are consistent with the results of Mazhari et al.'s study (2019). Therefore, it can be concluded that the value chain and supply of medicinal plants can cause economic development with entrepreneurship and job creation.

Suggestions

Development of Alternative Supply Chain Models:

To mitigate the risks associated with supply chain disruptions, alternative supply chain models such as vertical integration, diversification of suppliers, and development of local cultivation practices should be explored. This could help reduce dependence on a single supplier or region, ensuring a more stable supply of medicinal plants.

Investment in Research and Development:

Governments and private organizations should invest in research and development to improve the cultivation, harvesting, and processing of medicinal plants. This could lead to the development of more resilient and disease-resistant plant varieties, reducing the impact of supply chain disruptions.

Implementation of Early Warning Systems:

Early warning systems should be established to detect potential supply chain disruptions, enabling stakeholders to take proactive measures to mitigate the impact. This could include monitoring weather patterns, disease outbreaks, and geopolitical tensions that could affect the supply of medicinal plants.

Promotion of Sustainable Harvesting Practices:

Sustainable harvesting practices should be promoted to ensure the long-term availability of medicinal plants. This could include certification programs for sustainable harvesting, education and training for harvesters, and the development of sustainable harvesting guidelines.

Development of International Cooperation and Standards:

International cooperation and standards should be developed to ensure the quality and consistency of medicinal plants across different regions. This could include the establishment of common standards for cultivation, harvesting, and processing, as well as the development of international certification programs.

These suggestions aim to provide a starting point for addressing the consequences of supply chain disruptions of medicinal plants and ensuring a more stable and sustainable supply of these critical resources.

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