

RESEARCH ARTICLE

Drought effects on animal husbandry in Iran: Situations, problems, and approaches

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ABSTRACT

Decreasing amount of rainfall in the past autumn and winter caused deficiency in pastures and shortage and unavailability and very high prices of fodder and forage in most regions of Iran. This unfavorable phenomenon forced many nomadic and rural people that breeding livestock and especially goat and sheep herds to selling their animals even reproductive livestock under normal prices of them in market to middlemen and before maturing them completely and with low weights and killing them in livestock slaughterhouses in Iran. This imposed many economic damages to them. Slaughtering reproductive livestock will cause reducing in milk and dairy production and increasing their various products prices in future. Drought is a spreading phenomenon, and it has caused a lot of damages in different parts of the country in recent years. The driest conditions in 53 years have brought chronic mismanagement of water resources in Iran. According to Iran's meteorological agency, the country's average temperature has increased by 2C since the 1960s, rainfall has decreased 20% in the last 20 years and October 2020 to June 2021 was the driest period in 53 years. Environmental problems in general and water problems in Iran, in particular, are multi-faceted issues. Iran's water resources have been depleted by a lack of rain, the building of hydro-electric dams, and farming of water-intensive products such as rice, wheat and sugar cane. Farmers hit by water shortages are fleeing their villages to live in precarious settlements on the outskirts of cities. Some villagers just do not have water to drink. They have to go and get water from small puddles on the ground. type of doing this research is mainly qualitative that observations, experiences, and field visits of author are main sources for gathering information. in these regards, author in article state various aspects of drought and its effects on nomadic and rural people that breeding livestock and especially goat and sheep herds in Iran. in the end of article present solutions and approaches for confronting to drought and its unfavorable effects on these nomadic and rural people in Iran.

Key words: Drough, effects, nomadic, rural, breeding, livestock, Iran

INTRODUCTION

Iran has been under a prolonged drying condition since the early twenty-first century, revealing itself by vanishing lakes and wetlands along with excessive water stress across the country.^[1]

Drought is a common natural hazard in arid and semi-arid regions. It is a prolonged period of

abnormally low rainfall that negatively affects land managers, ranching enterprises, and pastoral systems.^[1] Drought may be the most complex but least understood of all natural hazards, and it directly affects more people globally than any other natural hazard.^[2]

Drought is a spreading phenomenon, and it has caused a lot of damages in different parts of the country in recent years [Figures 1-3].^[3]

Drought can be defined as a temporary climatic anomaly with no rain, especially during the planting and growing season. It is one of the most complex and least-understood of all natural events and affects

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more people than any other hazard. In contrast to the effects of floods, earthquakes, and hurricanes, the damage created by drought is usually nonstructural but is spread over a larger geographical area. Its effect accumulates slowly over time and lingers for years. Since the onset and duration of drought is difficult to determine; people generally are not fully aware that they are in the midst of such an event [Figures 5-7].^[4]

Iran is a country with significant cross-sectional variations in amenities and climate. While the country has been hit hard by drought, provinces of Iran are not equally affected by drought. Moreover, the provinces have different climates and are unlike Malaysia or Finland where regional areas have almost similar climates [Figures 7 and 8].^[5]

In Iran, geographically distribution of drought showed that southern and southeastern of the country are more sensitive to drought both in intensity and frequency.^[6]

Rainfall had dropped by nearly 50% in South Khorasan province this year compared to the long-term average and by as much as 80% in southeastern Sistan and Baluchistan province.^[4]

Iran enjoys a diverse topography and climate variability. Temperature can vary between -20 and $+50^{\circ}\text{C}$ while precipitation varies from <50 mm to more than 1000 mm per year. Iran's average annual precipitation is 250 mm (less than one-third of the global average) with most of the country receiving <100 mm of rain per year. Iranians have been successful in coping with this natural limitation, establishing one of the world's oldest civilizations and sustaining life for thousands of years in a mostly arid to the semi-arid region with limited water availability. This was done through the invention of ingenious water harvesting techniques, which made farming and food production feasible in a water-scarce region of the world in ancient times [Figures 8-10].^[7]

For example, the pastoral nomads in Kerman province of Iran breed goats, sheep, cattle, and camels in different combinations, but the main livestock are sheep and goat [Figures 1 a-d and 2 a and b, and 12 and 8 and 11].^[6]

Effects of drought on rangeland users (RUs)

In recent decades, the frequency of drought in

arid and semi-arid regions such as West Asia, North Africa, Eastern Australia, and Southwestern United States has been increasing. This climatic phenomenon has negatively affected agriculture (e.g., crop and livestock production) and natural resources (e.g., rangelands and surface waters). RUs in arid and semi-arid regions consider drought to be a significant problem because it can lead to forage production losses between 30% and 100%. Rangelands within advanced economies are not immune to this hazard. For example, from 2014 to 2015, drought caused an 80% forage production loss in San Luis Obispo County, California. The widespread droughts of the early 1990s in particular had a major detrimental impact on rangelands and livestock production. A drought usually entails a number of different and interconnected social, economic, and environmental consequences. For example, a drought will significantly affect rangeland activities, and in developing countries in arid and semi-arid regions, it can be a primary cause of poverty and emigration.^[2]

Turning the focus to Iran specifically, in the past 40 years, the country has experienced 27 droughts. Drought is clearly not an unusual climatic hazard in Iran, but it nonetheless remains a phenomenon that has not been fully considered in the country, despite the clear challenges that drought presents for RUs' livelihoods and environmental management policy making. Droughts in Iran affect large numbers of people, causing tremendous economic losses and social hardships as well as severe environmental damage [Figures 3 a-e and 2 and 6].^[2]

RUs may employ a variety of drought risk management options to minimize drought's effects. More options (e.g., moderate use of rangelands, reduced stocking levels, deferred grazing, and so on) allow for greater flexibility to reduce damage to a rangeland's soils and vegetation, the health of livestock, and the RUs' livelihoods. Although there is no "cookbook" approach to drought risk management, many of these points are principles of range management that can be relevant to all RUs [Figures 1, a-d, and 5 and 10 and 12].

Drought affects rangeland ecosystems in many ways. For rangeland managers, the most concerning impact is lowered soil moisture levels that inhibit plant growth and thereby reduce forage yields [Figures 1 and 2 and 3 and 6 and 9].^[2]

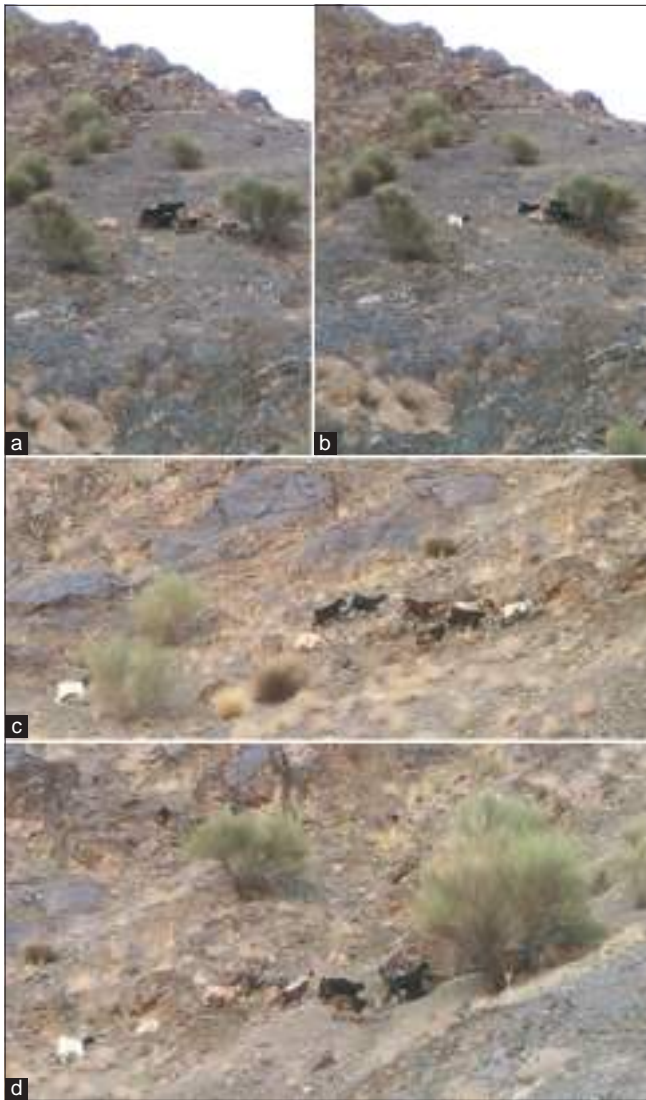


Figure 1: (a-d) A small herd of goats that grazing in the top of a mountain near a village with 15 km distance to Birjand, east of Iran. main reason for grazing goats in the top of a mountain was unavailability of herbs and shrubs in the fields because of facing country with worst drought in the past 50 years (By author, September 09, 2021)

Knowledge and skills on drought management

For effective operation management, drought combat activities the knowledge regarding comprehensive watershed management shall develop and there should be coordination at national and provincial levels among relevant organizations in different levels. Proper drought management methods in agriculture shall reinforce empowerment of farmers and ranchers so that they can adopt proper technology to follow sustainable agriculture principles. Success or failure of strategies and plans towards promotion of water and land use systems



Figure 2: (a and b) Grazing of a small sheep and goat herd in a poor rangeland because of drought, near a village of Darmian city, 220 km distance to Birjand, center of South Khorasan province, East of Iran (By author, summer 2021)

such as water distribution, flood water management, and constructions of artificial feeding pools and methods of mitigating evaporation and sustainable agriculture in farmlands of each province or area is stressed. There is need for proper technologies, management measures, and technical expertise within national strategy framework of drought preparedness. Applying local competence to support sustainable farmland use systems shall be promoted by the involvement of the government in drought preparedness strategies. Also, qanat water network system is a proper method to access underground water resources for irrigation and supply of potable water [Figures 4 a-d, and 9].^[8]

MATERIALS AND METHODS

Type of doing this research is mainly qualitative that observations, experiences and field visits of author are main sources for gathering information. in these regards, author state various aspects of drought and its effects on nomadic and rural people that breeding livestock and especially goat and sheep herds in Iran. The study was conducted on villages and rangelands



Figure 3: (a-e) Slaughtering of sheep and goat herds that purchasing under normal prices of them in market by middlemen, because of drought and unavailability and very high prices of forage and fodder, before maturing them completely and with low weights in a livestock slaughterhouse near Birjand, center of South Khorasan province, East of Iran (By author, summer 2021)



Figure 4: (a-d) Qanat repairing and reconstructing in Binabad village, 70 km distance to Birjand, South East of Iran. Qanat has major role for sustainable exploiting of groundwater resources in Iranian rural people indigenous knowledge (By author, spring 2021)

of Nehbandan, Darmian, Sarbisheh, khoosf and Birjand cities, in south khorasan province, east of Iran at 2020 and 2021.

RESULTS AND DISCUSSION

Economic effects of drought are massive and multifaceted and in subsectors such as change of land use, rain fed, livestock, and range and forest management and at primary and developing levels it surpasses processing and complementary

industries. Lack of occupational opportunities and income, sales of land and livestock, high production costs, low food supply and tax income, and high governmental costs are examples of drought effects. One of the most important measures is to establish effective communication among public and non-governmental organizations with the aim of timely response during emergencies. Establishment of technical crisis committees in the fields of emergency food and water supply and damage control is essential.^[8]

Poor rainfall in Iran this year highlights challenges in providing enough water and energy, adapting to a hotter climate and preventing mass migration, and following:

- Drought leaves many Iranians without water, power
- Climate change and poor policies behind shortages
- Lack of action could drive migration from rural areas.^[9]

CONCLUSION

“May Ahura Mazda protect this land, this nation, from rancor, from foes, from falsehood and from drought.”

Darius the Great (550 B.C.) King of the Iranian (Persian) Achaemenid Empire.

Decreasing amount of rainfall in the past autumn and winter caused deficiency in pastures and shortage and unavailability and very high prices of fodder and forage in most regions of Iran. This unfavorable phenomenon forced many nomadic and rural people that breeding livestock and especially goat and sheep herds to selling their animals even reproductive



Figure 5: (a-h) Grazing a medium size of numbers of sheep herd in a good and rich rangeland that has favorable conditions, in last year when amount of rainfall was better in this region. Near a village of Sarbisheh city, 100 km distance to Birjand, center of South Khorasan province, East of Iran (By author, spring 2020)



Figure 6: (a-h) Referring nomadic and rural people that breeding livestock and especially goat and sheep herds to Agriculture Jihad organization for catching imported barley, soybean meal, forage and fodder with low and subsidized prices in khoosf city, 35 km distance to Birjand, center of South Khorasan province, East of Iran (By author, summer 2021)

livestock under normal prices of them in market to middlemen and before maturing them completely and with low weights and slaughtering them in livestock slaughterhouses in Iran. This imposed many economic damages to them. Slaughtering reproductive livestock will cause reducing in milk and dairy production and increasing their various products prices plus increasing meat price in future.^[10]

Drought is a spreading phenomenon, and it has caused a lot of damages in different parts of the

country in recent years. The driest conditions in 53 years have brought chronic mismanagement of water resources in Iran.

Drought is a normal, recurrent feature of climate that may occur anywhere, even if its characteristics and impacts vary significantly from one region to the next.^[2]

Iran has been experiencing long cycles of drought for the past 50 years.^[5]

Vulnerability factors such as an under-developed infrastructure, lack of facilities, absence of



Figure 7: Rural people that breeding livestock and especially goat and sheep herds all -together in farms and pastures besides rural areas in Hariwand village (a-f) plus cow and ass/donkey in Ark village (g-u) in order 50 and 80 km distance to Birjand, center of South Khorasan province, East of Iran (Pictures by author, January and February 2021)



Figure 8: Petroglyph of goat that belonging to 7000 B.C) Before Christ (in Zagros Mountains in west and south of Iran.

authority, lack of communication between political and economic systems, ineffective markets, lack of social benefits, and inadequate institutional support contribute to the negative effects of drought on

a country-wide scale. High population growth, urban development, expansion of deserts, and deforestation are additional factors that intensify drought. The effects of drought can occur months or years after the drought has ended. These effects are largely nonstructural and are spread over a larger geographical area than those from other natural disasters. The nonstructural characteristic of drought hinders the development of accurate, reliable, and timely estimates of severity.^[4]

The Iranian climate is mostly arid or semi-arid and it is heavily affected by depleting water resources, as a result of rising demand, salinization, groundwaters overexploitation, and increasing drought frequency. The drought disaster is placing an extreme strain on water resources, drinking water supply systems, livestock and agriculture. It is the cause of great hardship and human suffering, impacting vulnerable groups, particularly in rural areas, who have no alternative source of income and are still feeling the



Figure 9: Visiting of author from Gol and Freeze villages with 50 Km distance to Birjand, center of South Khorasan province, east of Iran. An old man (father of author’s friend) that breeding goats in his traditional home plus his farming, gardening, carpet weaving, etc. works of him and his family members (Pictures by author, Spring 2015).



Figure 10: Visiting of author with his children from garden of his friend in a village with 5 Km distance to Birjand, center of South Khorasan province, east of Iran. Author’s friend that breeding goat (more) and sheep (less) herds all -together in farms and pastures besides of his garden (Pictures by author, Summer 2020).

heavy losses they incurred last year. The drought has adversely affected nearly all drinking water supply systems in both rural and urban areas.

RUs in some areas of arid and semi-arid regions (such as in southwest Iran) have developed and applied coping strategies to manage drought effects.^[2]

Because drought is one of the most existential threats facing pastoralists in arid and semi-arid regions, they

can use similar strategies to cope with drought in their own local contexts. Such strategies may prevent or reduce the effects of drought and grant RUs access to more rangeland resources. Such strategies also increase forage production during drought, reduce the impacts of drought on livestock and the range, and hasten recovery once the drought subsides. Among these strategies, those that are needed in the short term



Figure 11: Visiting of author from breeding research station of Raehni Cashmere goat in Sarbisheh city with 70 Km distance to Birjand, center of South Khorasan province, east of Iran. Most of goats' crack export to foreign countries and this play an important role in the economy of nomad and rural people in this region (Pictures by author, Autumn 2019).

to improve rangelands (e.g., the gradual reduction of inefficient, elderly, and sick livestock) are more important from the RUs' point of view. Accordingly, it is necessary to reconsider and develop short-term strategies during drought. Moreover, because the damage that results from drought may take a long time to ameliorate, long-term strategies (protection/exclosure) along with the short-term ones should be considered as complementary tools.

These strategies, especially long-term ones such as range protection/exclosure, are socially and economically acceptable and implementable among all of the RUs and what alternative livelihoods may be practical for RUs while their rangelands are under exclosure.

In the last two decades, recurring drought becomes a challenge for Iran's economy, which is located in a drought-prone area, and it has been expected that drought will become more severe and frequent in the future.^[11]

In countries such as Iran, the nonexistence or deficit of inter-ministerial cooperation is a challenge

to drought management. It is clear that effective drought management requires intensive cooperation and accurate programming in different divisions. Drought management requires cooperation between ministries and between organizations.^[4]

Farmers do not have enough water to grow their crops and that the over-use of aquifers has led to subsidence and sinkholes.

"If you don't have water, you have to leave and in the last few decades, millions of villagers have left their homes behind and migrated to slums and shanty towns."^[12]

According to Iran's meteorological agency, the country's average temperature has increased by 2C since the 1960s, rainfall has decreased 20% in the last 20 years and October 2020 to June 2021 was the driest period in 53 years.

A recent Nature study found that this trend is set to continue. Compared to 1980–2004, 2025–2049 is going to have more frequent and severe heatwaves, droughts, and floods.

Over 90% of Iran's water is used for agriculture. Due to international sanctions, the government wants the country to be self-sufficient and has encouraged farmers to grow water-intensive crops such as wheat, rice, and sugar cane.

"Iranian officials have acknowledged that outdated agricultural and irrigation systems, as well as poor water management policies in the past three decades, have contributed to nationwide water shortages.

It is suggested that addressing the following issues:

- National and regional coordination networks to reduce the effects of drought and to exchange information and know how and establish links for regional drought response as well as develop regional plans and mitigation activities
- While political boundaries are important in planning and responding to droughts, improving the geographical/regional effects of drought need to become better-integrated into future drought preparedness and response
- Cross-border livestock migration is a regular feature of rangeland use in all of the countries in the region. Rangeland management (as well as issues of disease transfer) is an important issue for all concerned.

In the end, following solutions can recommend for improving conditions and solving problems of

nomadic and rural people that breeding livestock and especially goat and sheep herds in present drought crisis in Iran:

- Guaranteed purchase of livestock and especially goat and sheep herds from nomadic and rural people by government
- Security of supply imported forage and fodder to livestock breeders with low and subsidized prices by government
- Preparing approaches for preventing nomadic and rural people that breeding livestock and especially goat and sheep herds from selling and slaughtering their reproductive livestock
- Providing balance between number of goat and sheep herds and capacity of rangelands in all of the regions of country. With considering this important point that according to last statistics

from the Ministry of Agriculture Jihad in 2021, there are more than 75 million head of light trap and small livestock (goat and sheep) in country whereas capacity of rangelands only can feed 60 million of them. This most consider as an important strategy in government policies of Iran.

CONFLICT OF INTEREST

The author declared that there is no conflict of interest.

APPENDIXES

Complementary field research pictures.



Figure 12: Visiting of author from nomadic region in Khash city in Sistan and Baluchestan Province, South east of Iran. Because of drought conditions of this region goat herds are dominant to sheep herds in number and density (Pictures by author, Spring 2019).

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