

## Examining the natural impacts of the drought on the Nomads in Kerman province of Iran

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**Abstract.** The purpose of this research was to examine the effects of the drought on pastoral nomads from the perspective of natural ecosystems over a period of approximately ten years in South East of Iran. Jiroft and Roudbar Townships were selected because the greatest losses were suffered from the recent drought. A semi qualitative-quantitative survey approach was employed in this research. The result showed that pastoral nomads in the research area were very vulnerable in face of the drought. Descriptive findings showed that drought has had notable effects on nomadic style of livelihood. As well as severe shortage of fodder, even the lack of grazing, and inaccessibility to adequate and safe water for livestock and human, were the most important issues with the highest frequency during nearly 10 years drought.

**Keyword:** Drought, Nomads, Natural Ecosystem, Kerman Province

### 1. Introduction

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. Records from the Provincial Nomadic Office showed that there are more than three million livestock including cattle, sheep, goat and camel which are distributed in 65 percent of total rangelands. Table 1 presents various aspects of the impacts of drought on natural ecosystems in the pastoral nomads of Iran.

For the period 2000-2004, on an average annual basis one in 19 people living in the developing world was affected by a climate disaster and the forth assessment of the IPPC asserts that the world's area affected by drought has likely increased in the past 37 years [1,2,3]. World Bank predicted that by the year 2035, three billion people will live in the tough conditions because of water shortage [4]. According to UNDP [5] in Iran, in 2001, it was estimated that these losses increased to US \$ 2.6 billion.

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, 7]. Iran Meteorological Organization [6] reported that in the year 2008 against the average precipitation of the last year/2007, mean average of precipitation in the country 53% decreased and compared with long-term average, 51% decreased. In the year 2008, in Kerman province precipitation was 50% less precipitation than the normal rate.

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Estimation of the damage of drought crisis in a period of ten years (1989-1999) in Kerman showed that the majority of cities and more than 1500 villages damaged. As well as 567857 head of livestock killed, and 250000 hectares of lands damaged [8]. Kerman province despite the diversity climate in terms of water resources and rainfall is considered among the poorest regions of the country. The main resource of water supply in the region from ancient time to today has been groundwater [9].

	<b>Some Impacts</b>	<b>Some implications</b>
<b>Pasture and range land</b>	-Reduced production of forage in range land -Development of sabulous and desert areas -Reduced utilization of range land and forest byproducts -Changes in vegetation composition of range lands	-Increased hay prices/high fodder prices -High cost/unavailability of feed for livestock -Increased dust storms -Livestock poisoning due to grazing toxic forage
<b>Livestock</b>	-High livestock mortality rate -Lack of livestock pregnancy and abortion occurred -Weight loss in livestock -Loss from dairy and livestock production	-Low productivity rate, low price of livestock products -Average sale weight reduction -Increased malnutrition and famine -Increased need to loan and credits
<b>Agricultural Crops</b>	-Abandoned lands in wasteland -Garden dried	-Loss of income from agriculture
<b>Environment and Desert</b>	-Loss of natural ecosystems / biodiversity -Sand influx -Cutting of forests -Damage to shrub by livestock -Increase desertification -Increased ground water mining	-Loss of resilience -Increased wind and soil erosion -Saline-water intrusion
<b>Other</b>	-Loss of employment, population migration and consequences	-Increase anxiety -Conflicts between water users

Adapted from: [10, 11, 12, 13, 14]

The emotional impact of the recent drought was clearly expressed in the margins of the research where one of the pastoral nomads told: «The year 1994 was the beginning of the drought. Nargesan district (located in south of Kerman province) was the origin of amaryllis, eight consecutive years of drought which destroyed, so that since then amaryllis is not seen in the region. Drought had a significant effect on ecosystem. Jebal bareze Jonoubi district (of Anbarabad Township in southern Kerman Province) was the origin of the animals such as deer, ram, goats and Jebeer Gazelle. The drought caused many animal species to migrate. As well as this region was the host of two rare animals named Asian black bear and Asian cheetah. In addition fresh water fish was a valuable resource of the Nargesan River that became extinct» [15]. He added: «The predominant ranges in the area were grass that many varieties destroyed. Moreover has remained a small amount of the species of Leguminosae family in the area.» In table 2, some evidences of the drought impacts has shown.

<b>Region / Country Reference</b>	<b>Theme</b>	<b>Statement</b>	<b>Coping strategies</b>
<b>United States of America [16]</b>	Drought, multiple impacts and strategies	-Grazing capacity dropped from 16 to 31% below normal. Winter feed production decreased from 18% below normal in 2000 to 35% in 2004	-Purchasing additional winter feed -Partial herd liquidation -Leasing additional grazing -Early weaning of calves
<b>Viet Nam / Mekong [14]</b>	Considering some aspects of the recent droughts in the Mekong	-Increase in deforestation, partially due to forest fires -Environmental pollution -Extinction of endangered species and loss of bio-diversity	-Educate farmers on best management practices -Offer training in fodder-storage practices -Establish community-based fodder banks
<b>Tamil Nadu New Delhi, India [17]</b>	Drought impact and assessment	The worst drought years in the past 15 years are identified 1980, 1982, 1983, 1987, and 1989. -Nilgiri hills; Destruction of more than 6000 hectares of tea plantation. -About 6000 villages, 3 lakh hectares of crops, and 108 lakh cattle were	-Major programs: water facilities for wildlife, afforestation work. -training farmers to enable them to gain employment in fisheries. -Novel approaches: the creation of commercially useful plantations, fish farming; ecological farming.

		affected.	
<b>Afghanistan / Helmand and Kandahar province [18]</b>	A survey of drought impacts and coping measures (The drought of 1999-2001)	-Around 300,000 people fled to Iran and Pakistan and more than 400,000 moved to safe places within the country. -During the drought, livestock was sold almost at one quarter of their original price due to sickness and loss of weight.	- Relief donations from NGOs. -Changing cropping patterns (high delta apple crops were replaced by pomegranates) -Doing causal labor -Sales of safe assets -sale of livestock and their products
<b>Kenya / Isiolo District [19]</b>	Water availability in drought-prone Isiolo	In the year 2000, prolonged drought saw the loss of about 50 percent of the cattle. The grazing and water resources in Isiolo have been stressed. This situation triggered a series of conflicts over grazing lands and access to water.	The major recommendation: -Rehabilitation non-operational water sources -encouraging more rainwater harvesting initiatives.

Pastoral nomads in Kerman province have been faced one of the most serious droughts of the last fifteen years. According to Saboki [20], one of the nomad tribes of Kerman which is located in northern of the province, Lard Meidan [15] the another tribes which is located in southern of the province, Provincial Nomads office of Kerman [21] and District Noamads office of Kahnouj Township [22], located in southern of province, the economic, social, and environmental costs and losses associated with drought increased dramatically. These multiple impacts rose from multiple periods of consecutive years with below normal precipitation in the most recent period being between 1995-2007, which includes:

Unavailability of drinking water for human and livestock; reduced productivity of range lands; livestock emaciation and sickness; loss from dairy and livestock production; damage to animal species; high cost of lease or purchase additional grazing or pasture; high cost of purchase winter feed; reduced economic feasibility of keeping livestock; sale livestock to the lowest price; unavailability of food and malnutrition; loss of human life and employment; shifted from generative jobs to working as labor and other activities such as informal economy; increased poverty; increased mental and psychological stress; decreased social safety and increased conflicts; health and physical problems as an important result of increased workload on women/carrying water by women and girls from far away; increased in school dropout rates-for example in Nargesan district (located in south of Kerman province), Nomad s school with 110 students closed due to migration and the low number of students; increased permanent and seasonal immigration to villages and towns; Injured the tribe and family social structure (less power in decision making).

## 2. Materials and Methods

In quantitative phase of research, a questionnaire was developed. Face and content validity of the instrument were established, refined and confirmed using an expert panel. A pilot study was conducted with 21 Nomadic families in four townships (Iranshahr-Zabol-Jiroft-Anbarabad) to determine the reliability of the questionnaire through which, 82-96 percent was obtained. The total population of Nomads in the study area was 4606 Nomad families, of whom 173 families were selected using stratified sampling with proportional assignment. Time delimitation of the study was the late of 2007 until 2010. In qualitative phase of research, open and semi structured interviews were employed.

## 3. Results

### 3.1. Household Characteristics

Findings showed that average age of the head of households was 50 years old and 45% of them were between 46-65 years old. As well as 21% were between 25-35 years old. Family size of the households is shown in table 3. As shown, 64 families (40%) had 4 to 6 people and 56 families (35%) had between 4-9 people (table 3).

Size of Family (No. of people)	1-3	4-6	7-9	10-12	14-15
Frequency (No. of Family)	30	64	56	7	2
Sum	159				
No response	14				
Mode	5 People				

Literacy status of the head of household indicated that the majority of them (nearly 63%) were illiterate and 3.66% of them had high school diploma (table 4).

Literacy rate	Illiterate	Reading / Writing	Elementary School	Secondary Education	High School Diploma	Total	No Response
Frequency	103	22	14	19	6	164	9
V. Percent	62.80	13.41	8.53	11.58	3.66	100	-

### 3.2. Drought impacts on natural ecosystem from the perspective of Nomads (n=173)

Priority setting is done based on coefficient of variation (table 5). Participants were asked to rank each of the questions on the basis of drought impacts. The average scores indicated that drought impacts in all cases has been considerable. Priority setting showed that destruction of some native rangeland plant and species, livestock die because of a lack of fodder and water, abortion, livestock mange during drought and loss of livestock pregnancy, have been devoted most priority on itself respectively.

Item	Frequency	Mean	S. D	C.V	Priority	Don't know	No response
Livestock die because of drought	172	4.5174	.79084	.175	2	-	1
Destroyed some native species of plants in range land	172	4.2733	.71801	.168	1	-	1
Entered Livestock to other □s pastures due to urgency and lack of forage	170	4.0294	1.05711	.262	6	-	3
Increased sand storms and dust	172	3.9826	1.27263	.319	10	-	1
Some pastures remain useless due to water shortage or lack of water	170	3.9059	1.05048	.269	8	-	3
Drinking water discoloration and pollution for livestock	166	3.8855	1.31385	.338	12	1	6
Livestock poisoning due to grazing toxic forage, forage with poor quality or drinking contaminated water	169	3.8639	1.19490	.309	9	3	1
Create stain on livestock liver	169	4.0533	1.07049	.264	7	3	1
Livestock mange during drought	170	4.1294	1.00635	.243	4	1	2
Loss of livestock pregnancy	170	4.1000	1.06948	.261	5	2	1
Increased abortion in livestock	169	4.2249	.90454	.214	3	2	2
Reduced of meat quality	169	3.6923	1.43095	.387	13	3	1
Deformation of livestock hoof due to Long walking on the sand	167	3.9641	1.27010	.320	11	2	4

(0=zero 1=too little 2=little 3=moderate 4=much 5=too much)

Drought conditions can make grazing lands and hay fields hazardous for livestock, since lack of water causes increased concentrations of nitrates and prussic acid. Even if the animals are not directly affected, these chemicals contaminate their meat and milk. If livestock cannot graze, they eventually become infertile, and their milk will dry up. Their physical condition will deteriorate, until finally they become so weak that they may die. The farmer's only options are to sell the stock at a low price, or to buy feed, which is expensive [23]. Indeed the ability of pastoral communities to survive through periods of drought has been highly dependent on their capacity to spread their risk. According to the results, grazing rate of livestock in other □s rangelands has been highly increased during drought. Moreover the main economic asset of the nomadic pastoralists in Sothern of Kerman Province was livestock (table 6).

goat & sheep	goat	Sheep	goat & sheep & cattle	goat & sheep & camel
91	22	15	15	13
<b>Other forms</b>	<b>Valid</b>	<b>No response</b>	<b>Sum</b>	
7	163	10	173	

Nomad households were asked to determine the main source of income during the drought. Answers to this open ended question indicated that pastoral nomadic, and working as wage labor were the main sources of income during the recent drought. In a general conclusion can be stated that the tribes are not compatible with the drought. Only 9 nomad □s households were used from drought insurance and 162 nomad □s households not insured their livestock. In another open ended question, nomads households were asked to determine what was the most important problem that they faced during the recent drought? The answer to this question based on the most comments is shown in the following table (table 7).

Results showed that severe shortage of fodder, even the lack of grazing, and inaccessibility to adequate and safe water for livestock and human were the most important issues with the highest frequency.

Item	F	Priority
There is not enough fodder and range land for livestock	85	1
Inaccessibility to adequate and safe water for livestock and Haman	76	2
Livestock die	15	3
Poverty and misery	15	3
Loss of income and financial assets	10	4
Unavailability of food and malnutrition	10	4
Lack of education, experience and information; lack of planning to cope with drought	10	4
Reduced economic feasibility of keeping livestock and Nomads style of life	9	5
Inadequate and poor infrastructure facilities (electricity, road, school and health)	8	6
Loss of employment	7	7
Outbreaks animals disease	4	8
Inaccessibility to Veterinary	3	9
Lack of support from government and related institutions	3	9
Sum	255	-

Drought is not a new phenomenon to the pastoral nomads. This study highlighted the general problems faced by pastoral peoples especially via the ecosystem aspect. As a result of poor linkages with the rest of the economy (due mainly to inadequate infrastructures and institutions), these tribal communities have been unable to realize the financial benefits from this important resource. Thus there were not adapted to drought and the overall carrying capacity of the tribal communities in this region has been reduced.

#### **4. Discussion and Conclusion**

Pastoral nomads were very vulnerable in face of the drought. Findings showed that drought has had notable effects on nomadic style of livelihood. Moreover examining the indirect impact is a dimension that cannot be neglected. Today two fundamental challenges are: Water supply and forage. I would like to leave open my discussion and conclusion with the following statements on behalf the tireless nomads of Iran: **«In drought, both human and livestock will be lost. People are bored»**

Researchers say: It is hard to define drought because it has a different meaning in different areas of the world. As you know there are climates with variable characteristics all around the world and, as you can imagine drought does not mean the same for all of them. The say: Drought is a term used to refer to a prolonged shortage of rainfall. They are challenging with each other, constantly. They are challenging on the methods, techniques and words. They are competing with each other on the quantitative measure of concepts as I, throughout this article; but I going forward, one step ahead. This is what they told me and I learned something new about drought: **«The drought is going back in all fields of economic, political and cultural. » and: «With the drought, glory and esteem is lost; Like a bird that has broken its wing »**

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