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Annals of Biological Research, 2012, 3 (4):1947-1952
(http://scholarsresearchlibrary.com/archive.html)

Annals of Biological Research
Scholars Research Library
ISSN 0976-1233
CODEN (USA): ABRNBW

Challenges facing nomads with drought in Southern Iran

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ABSTRACT

This research was anticipated that would be exploratory, aiming to derive the component structure of management strategies of drought in Nomads. In quantitative phase of the study, a questionnaire was developed. Prior to the application of exploratory component analysis, two checks of internal reliability and validity were undertaken. In order to measure the reliability, Cronbach Alpaha coefficient was calculated 0.89. Face and content validity of the instrument were established, refined using an expert panel. The total populations of Nomads in Jiroft Township located in southern of Kerman Province according to summer quarters were 2764 families, of whom 92 families were selected using stratified sampling with proportional to size (n=92). Totally 83 families were surveyed. Time delimitation of the study was the late of 2007 until 2010. Finally the component structure of management strategies of drought in the Nomads explained via exploratory factor analysis. In the first stage four components could explain 69 percent of the variation in the data scores. These components are: Risk Management of Water, Crisis Management, The Last Attempt to Survive and Nutrition Management of Livestock. In the second stage only one latent variable was extracted as drought management.

Keyword: Drought, Sustainability, Nomads, Exploratory Component Analysis.

INTRODUCTION

According to UNDP [1] in the Islamic Republic of Iran, the negative effects of severe drought that affected the country from 1999 through 2002 were magnified by non-climate factors. In Iran, southern and southeastern of the country are more sensitive to drought both in intensity and frequency [2] and [3]. Nomads in Kerman province have been faced one of the most serious droughts of the last fifteen years (table 1).

The present study aims to explain the drought management strategies in Nomads. The term drought management implies that human intervention can reduce vulnerability and impacts. Nevertheless past attempts to manage drought and its impacts thorough a reactive, crisis management approach have been ineffective, poorly coordinated, and untimely in both developed and developing countries [13] and [14]. The impact of drought largely depends on societal vulnerability and adaptive capacity at the time and place where drought occurs. This implies that chronically drought-impacted societies need to put drought near the centre of their sustainable development priorities [15] and [16]. Now the basis question is what are the main strategies of drought management in Nomads? A transition from

crisis management measures in drought conditions is necessary and we will need to review and implement new approaches in the face of drought [17], [18], [19], [20], [21]. In this research the instrument was constructed based on the semi quantitative-qualitative approach. As well as in comparison with other rural societies, nomads in south east of Iran have some special attributes from the social and economic aspects named as nomad s syndromes.

Table 1.Classification the effects of drought on Nomads (Iran)

Sectors	Impact	Some implications
Pasture and range land	-Reduced production of forage in range land -Development of sabulous and desert areas -Reduced utilization of rangeland and forest byproducts -Changes in vegetation composition of range lands -Reduced productivity of range lands -Reduced regeneration of desert species -Produce poor-quality forage	-Increased hay prices/high fodder prices -Increased hay feeding -Unavailability of fodder for livestock -Desertification -Increased dust storms -Livestock poisoning due to grazing toxic forage
Livestock	-High livestock mortality rate -Lack of livestock pregnancy and abortion occurred -Weight loss in livestock -Loss from dairy and livestock products -Side losses: increased fodder costs, water supply and parasitic diseases	-Income loss for pastoral Nomads -Average sale weight reduction -Increased malnutrition and famine -Increased debt -No money to treat livestock
Agricultural Crops	-Abandoned lands in wasteland -Garden dried	-Loss of income from farming activities
Environment and Desert	-Loss of biodiversity -Sand influx -Damage to shrubs by livestock -loss of forests -Increased desertification -Increased ground water mining	-Loss of resilience -Increased wind and soil erosion -Saline-water intrusion

Adapted from: [4-12].

MATERIALS AND METHODS

This research is quantitative in its nature and applied in kind which was anticipated that would be exploratory, aiming to drive the component structure of drought management strategies. Validity of the research instrument was confirmed by the research group and a Chronbach Coefficient was calculated 0.89. The total populations of Nomads in Jiroft Township were 2764 families of whom, 92 families were selected using stratified sampling with proportional to size. Prior conducted Factor Analysis, missing values were substituted with the linear trend at point. The Kaiser-Mayer-Olkin measure of sampling adequacy index was 0.668 and Bartlett s test of sphericity significantly was smaller than 0.0001, demonstrating that the identity matrix instrument was reliable and confirming the usefulness of factor analysis.

The goal of factor analysis is to reduce “the dimensionality of the original space and to give an interpretation to the new space, spanned by a reduced number of new dimensions which are supposed to underlie the old ones” [22], [23]. This consisted of principal component analysis (PCA) and orthogonal rotation (Varimax) performed with the 16 actual items. Factor rotation is a process of manipulating or adjusting the factor axes to achieve a simpler and pragmatically more meaningful factor solution Hair et al, 2006 in [24]. Communalities after extraction should probably be above 0.5. In this study, the factor-loading criterion level of 0.5 was used [25] and [26] to identify the structure of relationships among the variables.

RESULTS AND DISCUSSION

1-First Order Component Analysis

A four-component solution from the 16 items resulted in the loading of 16 items across the 4 components with at least three indicators. Extracted components were: 1, 2, 3 and 4. Finally these components together explained about 69 percent (68.906%) of the variation in the data scores (table 2 and table 3).

Table 2: Principal Component Analysis (PCA)- Rotation Sums of Squared Loadings

F	Eigenvalues	% of variance	Cumulative % of variance
1	3.417	21.355	21.355
3	2.882	18.014	39.369
3	2.502	15.637	55.006
4	2.224	13.900	68.906

KMO measure of sampling adequacy: 0.668
Batlett □s Test of Sphericity: 749.879, df: 120, Sig:0.0001

Table 3. Component loading of scale items: Rotated Component Matrix[a]

Item	1	2	3	4	Communalities Extraction
Q 1	-.053	.011	.066	.824	.687
Q2	-.085	-.007	-.858	.068	.748
Q3	.029	.229	-.782	.051	.668
Q4	.171	.409	-.073	.754	.770
Q5	.180	.420	-.304	.662	.739
Q6	.326	-.461	.465	.296	.623
Q7	.107	.743	.081	.424	.750
Q8	.593	-.075	.268	.472	.652
Q9	.844	.285	.203	.017	.835
Q10	.864	.163	.183	-.008	.807
Q11	.570	.132	.633	.014	.742
Q12	.262	.741	-.099	.122	.643
Q13	.096	.879	-.111	.089	.802
Q14	.614	.004	-.038	.077	.385
Q15	.061	.508	.501	.082	.520
Q16	.795	.100	-.079	.071	.654
Sum	**5**	**4**	**4**	**3**	-

[a]*Extraction Method: Principal Component Analysis. / Varimax*

2-Component Interpretation of the Findings (latent variables)

In the exploratory component analysis for a substantive interpretation of the components, only significant loadings were considered. In table 4, extracted components were named based on the nature of the related items.

Table 4. Naming explained components based on the nature of loaded items- First order factor analysis

No	Item	Component
8	Desiltation (dredging) and repair the Qanat	**Risk Management of Water**
9	Storing springs □ water in summer pastures through the construction of small pools	
10	Construction of water storage in the migration route along with the installation of stock pond	
14	Treatment of sick livestock by a veterinarian	
16	Construction of dam for storing rain water and provide adequate drinking water for livestock during drought	
7	using of gas cylinders for cooking and heating	**Crisis Management**
12	Mobile water supply to the tribes (human and livestock) in Inaccessible areas	
13	Distribution of the fixed tanks to store water among nomads households	
15	Reduced the number of sheep and cattle and instead, keep goats and more resistant livestock during drought	
2	(Hedging) Cutting trees □ branches as livestock forage due to drought and hay shortage	**The Last Attempt to Survive**
3	The use of straw as livestock □s fodder during drought	
6	Hanar (Due to water shortage, livestock is forced to drink water once every two days)	
11	Rake up livestock wells in winter pastures	
1	Separate the pregnant, lactating and growing livestock from dried livestock during drought	**Management of Live**
4	Rationing of range □s forage for livestock	
5	Aftermath (livestock graze the residues of wheat and barley farms)	

3-Second order component analysis of items identified in the previous stage

After the first order component analysis, average score of each latent variable, used in the second stage. As shown in table 5, only one component was extracted. This latent variable could explain about 48 percent (47.733%) of the variation in the four items extracted in the previous stage. The measure of sampling adequacy was 0.576, along with a significant P-value <.00001.

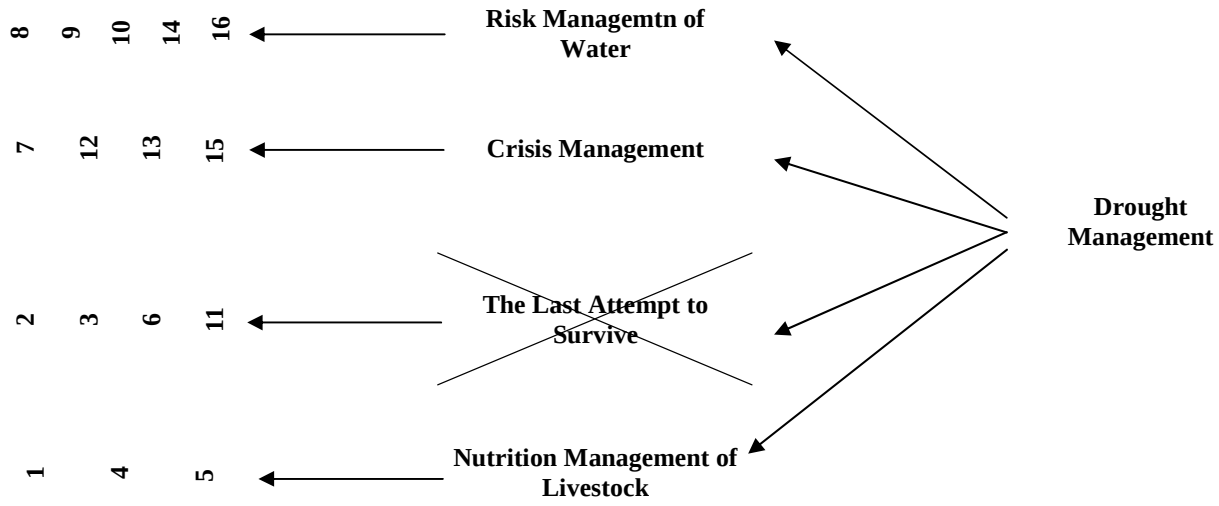
Table 5. Component loading of scale items

No	Item	1	Communalities Extraction
1	**Risk Management of Water**	.704	.496
2	**Crisis Management**	.732	.536
~~3~~	~~**The Last Attempt to Survive**~~	.520	~~.271~~
4	**Nutrition Management of Livestock**	.779	.607

KMO measure of sampling adequacy: 0.576
Batlett s Test of Sphericity: 48.353, df: 6, Sig:0.0001
Eigenvalue: 1.909, Cumulative % of variance: 47.733

The third number (the last attempt to survive) removed from the analysis because it has a communality extraction less than 0.5.

This latent variable named as drought management on the base of explained items. Below the final refinery model resulted from the first and second exploratory component analysis, has been shown.



Refinery Model of Drought Management- First and Second Exploratory Component Analysis

In relation to water and range management Nelson et al [27] indicated that interactions between government and resource users in local communities need to be supported by regionally distributed scientific support capable of integrating local knowledge and informing the livelihood outcomes of critical importance to both rural communities and policy advisers. Results of research conducted by Marchildon et al [28] and Berkes et al [29] showed that institution-building may be of value in helping the residents adapt to predicted climate changes in the future as well as anticipate some of the barriers to effective institutional adaptation.

CONCLUSION

The aim of this study was to investigate component structure of drought management strategies in Nomads, which were clustered into four latent variables in the first stage. These components respectively based on the nature of their constituent items, were named as risk management of water, crisis management, the last attempt to survive and nutrition management of livestock. These components as latent variables could explain 69 percent of variation in data scores. In the next stage, only one component was extracted. This latent variable was named as drought management. In other words, drought management in nomadic society of Jiroft (located in southeast of Iran), drought management requires attention to following components: Risk management of water, crisis management and nutrition management of livestock.

Acknowledgements
The authors are thankful to Nomad s organization of Republic Islamic of Iran for providing the necessary facilities for the preparation of the research.

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