

Drought perceptions and coping strategies of drought-prone rural households: a case study of Nushki District, Balochistan

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ABSTRACT

Background: Drought affects every sector of life and repetitive droughts in Balochistan have severally affected livelihoods of people particularly of rural households.

Objectives: The objectives of this study were to explore the perceptions of drought and households' coping strategies in rural areas Nushki District of Balochistan province.

Methods: For this cross-sectional study, the primary data were collected through a semi-structured questionnaire from 198 respondents at four union councils of Nushki District. Respondents were selected through simple random sampling. Descriptive statistics were used for quantitative data analysis, whereas for analyzing qualitative data, content analysis technique was used.

Results: The findings of this study show that lack of rainfall and drying of karezes and water sources were important perceptions of respondents for the incidence of drought. No or less rainfall was perceived to be the arrival of drought in the study area. Furthermore, selling of household assets, low food consumption, seeking alternate sources of income, out migration from the drought prone area were the prominent drought coping strategies of households at local level. Contrary to the literature, diversification in cropping pattern and planting practices were not adopted as coping strategies by rural households at Nushki District.

Conclusions: Nushki District is one of the most affected and drought prone area where occurrence of drought is regular. Mismanagement of water, migration from the rain-fed areas and lack of skills were serious issues. Therefore, government organizations and NGOs should conduct skill development programs for the rural households and farmers should be encouraged to grow drought resistant crops.

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1. INTRODUCTION

Every year drought affects millions of people worldwide (Wilhite, 2000), which threatens the situation of food security (UNDP, 2004). Drought ranks first among all the natural hazards as far as the number of people directly affected are concerned. It is a creeping phenomenon and the differences in hydro-meteorological variables and socio-economic factors in different regions of the world make it difficult to define and understand drought (Wilhite, 2000). Though specific definitions of drought may change by region and sector, usually it is less than the average rainfall over a prolonged period of time, resulting in the water shortage for some activity, group or environmental sector. In general, droughts are classified as

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either a meteorological drought, hydrological drought, agricultural drought or socio-economic drought based on the climate, hydrology, requirements of agricultural water and socio-economic well-being (Wilhite, 2000; Wilhite & Glantz, 1987).

The climate of Pakistan is arid and hyper-arid in the lower southern half. Several areas remain very dry and remain always vulnerable to drought. Because of its hyper-arid climate, Balochistan province suffers often from drought. The persistent drought, especially in Balochistan, has completely crushed the food security situation. During 1998-2004, Balochistan faced one of the worst droughts of its history. Harsh drought periods shaken the livelihoods, caused human losses, crop failure, forced many people to migrate and killed a vast number of livestock. The drought had extremely hit the low rainfall areas of Balochistan. The livelihoods of the people of the areas were constantly demolished, and they continued selling their animals at low costs. A number of them were left with no choices but to migrate. All of this has severely affected peoples' livelihood in drought-affected territories and represented a danger to the social fabric (Anjum et al., 2010). Over 1.5 million people were affected and around 2 million animals killed due to drought in Balochistan (Anjum et al., 2012).

Droughts occurred in Balochistan previously several times with overwhelming results. Due to the absence of appropriate mitigation measures for drought, it affects society extremely. Balochistan is among the most drought-prone areas of Pakistan where harsh drought events have been recorded in 1967-1969, 1971, 1973-1975, 1994, 1998-2002, and 2009-2015 (UNDP, 2015). Despite its repetitive occurrence and seriously affecting communities in Balochistan, few studies have been conducted to evaluate the droughts and household coping strategies. However, less importance has been given to public perceptions about drought. Most of the knowledge and local practices are not directly accessible to researchers as objective variables. It is only accessible when the affected communities make livelihood decisions during the times of drought and their perceptions of the drought situation. Therefore, perception of the affected communities on drought occurrence and its effects is expected to be different from the perceptions of national governments and international relief agencies which mostly depend on official climatic data and formal situation reports. As both the local communities and government and international organizations generate different perceptions about a drought situation, it is vital to understand the affected communities' perceptions of drought for drought planning (Knutson et al., 1998).

From region to region the drought perceptions vary among the people due to the interplay between a natural hazard and different human factors (Kiem, 2013). For a better understanding of public adaptive behavior regarding drought, it is of incredible significance to understanding their perceptions in the context of drought (Singh et al., 2014). Without an understanding of public perceptions, any mitigation or adaptation strategies would probably be ineffective (Alam et al., 2017). Because perception is a vital prerequisite, and in this way, it is important to understand the public perception regarding drought (Nguyen et al., 2016; Tripathi & Mishra, 2017). For early warning and relief programs, it is important to understand the households' behavior in response to a natural disaster as it would have important implications. Due to the identification of various stages in coping strategies through which households pass, may provide, the key to early warning of impending disasters (Corbett, 1988). Knowledge derived from household coping strategies is a useful policy tool for future planning (Meze-Hausken, 2000). Every agro-ecological zone is distinctive in terms of its geography and socio-economic characteristics, hence making these strategies distinct to every region or community (Mertz et al., 2009).

The availability of scientific information about public perceptions on drought can help to bridge any knowledge gaps between rural populations and policymakers (Teschfahunegn et al., 2016). However, limited research has been carried out in Balochistan to study public perceptions of drought and household coping strategies in rural areas (Ashraf & Routray, 2013). In Pakistan, many researchers focus their research on drought mitigation (Ahmad et al., 2004), and drought management (Sheikh, 2002). While few of them have focused on assessing the impacts of drought on agriculture (Anjum et al., 2010), effects of drought on

livestock (Shafiq & Kakar, 2007), on rangeland productivity (Mirza et al., 2009), vulnerability and severity of drought (Anjum et al., 2012), and drought risk assessment (UNDP, 2015). However, there is a shortage of studies, particularly, in the context of Balochistan, which have explored the households' perceptions of drought and their coping strategies towards this natural hazard. Nushki District is one of the highly drought-affected areas, with no exception to Nushki District. Therefore, the main objectives of the study are to explore the public perceptions about drought and coping strategies of drought-prone rural households. Furthermore, to suggest the ways through which improvements can be made for handling the adverse impacts of drought.

2. METHODS

2.1 Study design

A case study design has been used for this cross-sectional study. By applying a mixed-methods strategy, both quantitative and qualitative approaches have been used for the collection and analysis of the data.

2.2 Setting

Balochistan consists of an arid weather pattern and a semi-arid land profile (Baloch & Tanek, 2008). The majority of the population is rural in Balochistan and principal activities for livelihood are agriculture and livestock production (Mustafa & Qazi, 2007; Nawaz-ul-Huda et al., 2011; Rodríguez & Mayer, 1995). Due to poor socio-economic conditions and largely reliant on agriculture, rural households are most vulnerable to drought.

Nushki District is selected as the study area for this research (Fig. 1). Nushki is a district of Balochistan and located at the western end of the country's border with Afghanistan. Its geographical location lies between 65°07'42"- 66°18'45" East longitudes and 29°01'51"-29°52'37"North latitudes (Government of Balochistan, 2011). The district falls in the Desert sub-region of the Dry Western Plateau agro-ecological zone of Pakistan characterized by low and erratic rainfall (Qazi, 2004). On the north of the district is the desert region which stretches into Helmand in Afghanistan called *Registan* or *Raig*. The district is bounded on the east by the Sarlath hill range and District Mastung; Kalat and Kharan district on the south and on the west by Chagai district (Figure 1). Hills comprise the eastern and southern areas of the district. It has an area of 5,797 square kilometers (Government of Balochistan, 2011). Agriculture and livestock rearing is the mainstay of the district's economy. Permanent vegetation is rare and is to be found in the beds of perennial streams. Annual rainfall of 124 mm occurs mostly in the winter as the region falls outside of the monsoon range. Huge dust storms originating from Dasht-e-Lut region in Iran often engulf the area due to which damage of crops can happen as well as disturbing daily life (Jamali, 2006).

2.3 Participants

The inhabitants of Nushki District at the households' level were chosen to be participants for this study. Household is the most appropriate units of analysis because important economic, social and political decisions are made at this level in Nushki District, and in Balochistan generally. Households' heads were preferred to be interviewed face to face, however, in some cases, other responsible representatives of the households were interviewed.

2.4 Data types and sources

Primary data was collected from 198 respondents through a semi-structured questionnaire survey as it is one of the effective instruments of data collection. Actually, this study is a part of extensive research carried out on drought in the study area. The questionnaire was developed using key components from previous literature of the study. For better understanding, the questionnaire was translated into local languages i.e., Balochi & Brahui.

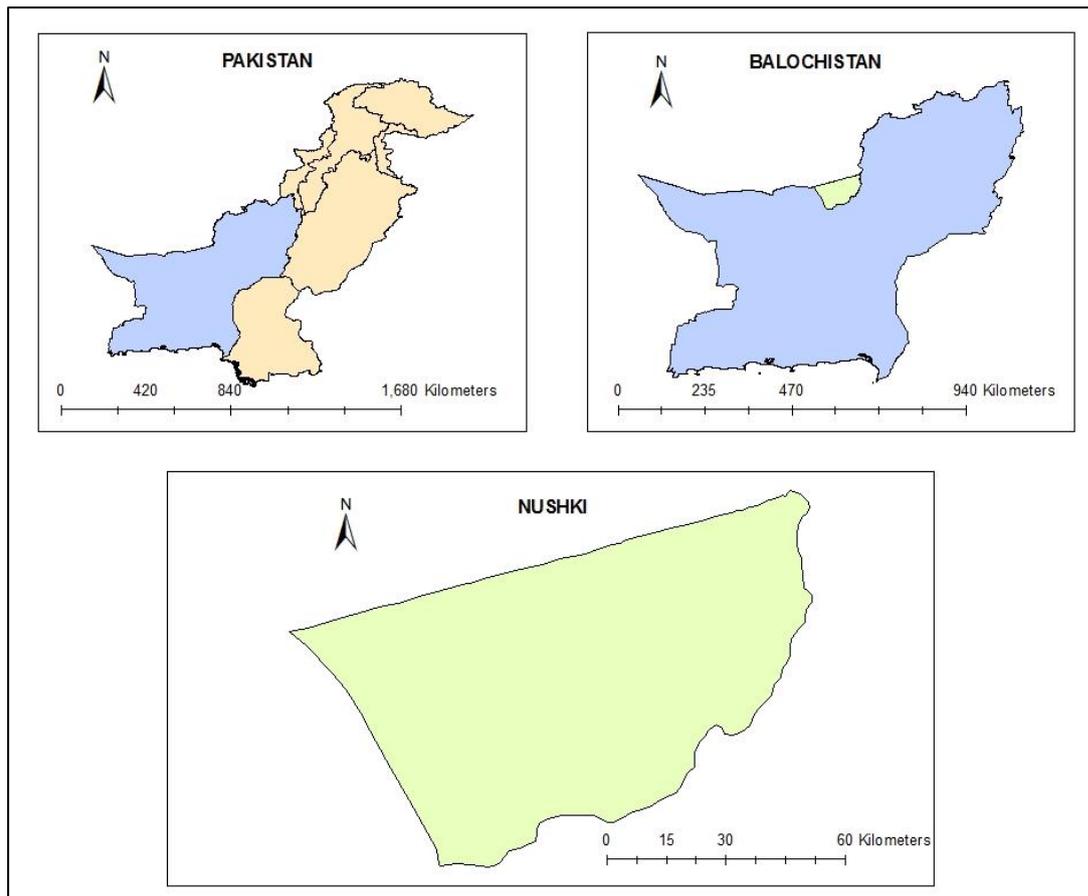


Fig. 1 The map showing location of Nushki District, Balochistan Province

2.5 Sample design

Households were the primary units of analysis for the questionnaire survey in this study. The study area is characterized by a thin and scattered population. Nushki District consists of ten (10) union councils. A union council is the grass root level political unit in the district. Four (04) most affected union councils, as reported by (UNDP, 2015) were selected for the household survey. The selected union councils that are affected from drought include union council Ahmed Wal, Anam Bostan, Daak and Kishingi.

The sample size was derived on the basis of the population size (number of households) in the selected union councils. The sample size (Equation 1) was calculated following the formula of sample size calculation by Yamane (1967).

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where,

- n= is the sample size
- N= Population size
- e= The level of precision.

From the above-mentioned formula, we got the sample size i.e., 198.

An individual household is considered as a primary sampling unit. Because in most studies of coping strategies in Asia and Africa, the household is taken as the unit of analysis. As it is expected that decisions about consumption, production, and investment are taken mostly at the household level (Corbett, 1988). This is also true in the case of Balochistan where important decisions are made at the household level.

Proportionate stratified sampling technique was used to select samples from the target population, where the union council was stratum and households as final units. Each union council was considered as a separate population stratum and a stratified random sampling method was applied. In this method, independent random samples were taken within each stratum. As the four strata (union councils) differed in size, a formula for proportional allocation of sample sizes was applied to derive statistically representative samples for each independent stratum (Table 1).

Table 1. Sample size calculation

Names of Union Councils	Households (n)	Proportion (n)
Ahmed Wal	1350	48
Anam Bostan	1250	44
Daak	1533	54
Kishingi	1484	52
Total	5617	198

Source: authors' calculations

2.6 Data analysis methods

This study basically involved primary data to be analyzed. Both quantitative and qualitative approaches were used to analyze the collected data from respondents. In the case of quantitative analysis, primarily, the data were entered and tabulated in Microsoft Excel worksheets. As part of descriptive analysis, tables and graphs were generated to demonstrate the findings of the study. The qualitative data collected from respondents and key informants (KIs) interviews were analyzed through content analysis technique. This is a qualitative data analysis technique that is used to categorize, classify, summarize or tabulate the verbal or behavioral data collected through open-ended interviews. In addition to this, the maps of Nushki District and selected union councils (UCs) were generated through ArcGIS: a tool of geographic information system (GIS).

3. RESULTS

3.1 Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents are given in Table 2. The overall average household size of the sampled population was eight 8. Study results indicated that 31.8% respondents had no education. While 26.8%, 18.2%, and 23.2% respondents had completed their primary education, high school, and college or higher education, respectively. The majority of the respondents depended on agriculture for their livelihood. A significant number of respondents were involved in livestock rearing and mixed activities. Mixed activities here mean the respondents having the occupation of agriculture, livestock and non-agricultural activities.

3.2 General perception of drought and its causes

Respondents were asked in their local language about their perceptions of drought as how they perceive drought. Drought has different meanings to respondents. Respondents perceived the lack of rainfall and drying of *Karezes* and water sources as important signs for the incidence of drought. According to study results, 88% respondents believe that they are facing a drought condition if there is less or no rain over the season resulting in water scarcity. This means for the majority, no or less rainfall is considered as drought. Thus, for people in Nushki District, if there is no or less rainfall then it is drought. The drying of water sources was ranked second (48%) in importance following rainfall. Similarly, they considered poor health of livestock (32%) and crop failures (32%) also important indicators for the occurrence of drought. A considerable proportion of respondents (28%) perceive a decline in livestock prices as a sign of drought.

Besides this, a few respondents (8%) have also perceived drought as a loss of livestock. Figure 3 shows the general perception of drought at household level. One of the respondents shared his perception of drought in the following words.

“What is a drought? It is the warning and punishment of God to us. We have forgotten our Lord and left behind his commandments, particularly many of us do not pay Zakat. God sends drought. I truly believe that God will finish droughts once we correct our deeds.” (Respondent no. 111, age 57, Union Council Kishingi)

Table 2. Socio-economic characteristics of the respondents

Socio-demographic characteristics	f	%
<i>Age (in years)</i>		
≤ 40	33	16.6
41-50	85	43
51-60	39	19.7
> 60	41	20.7
<i>Educational status</i>		
No education	63	31.8
Primary & high school	89	45
College and higher	46	23.2
<i>Occupational structure</i>		
Farmer	63	32
Livestock rearing	30	15
Trade/Transport	24	12
Labour/wage	29	15
Government job	18	9
Mixed activities	34	17

Source: Primary data, 2016

3.3 General perception of drought and its causes

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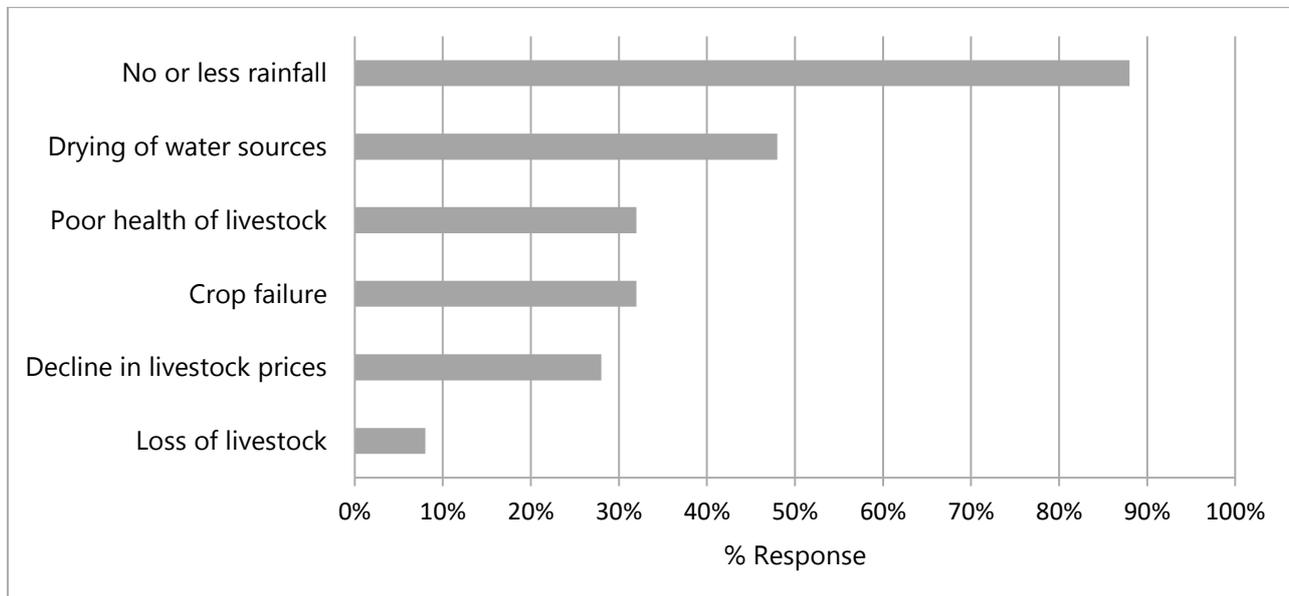


Fig. 2 General perceptions of drought and its causes

3.4 Drought Coping Strategies at local levels

According to Appell et al. (2004) not only climatic factors but also there are other factors that affect the ability of people to respond to drought, their histories of coping with drought being one of the main factors. However, these coping strategies are not adopted in a random or haphazard way (Corbett, 1988). In this study, the findings revealed that several coping strategies were adopted by respondents at the local level. As indicated by their social and financial abilities, households responded to drought variously and endeavored to deal with it while keeping in view their resources. The results of the important strategies are as follows;

3.3.1 Disposal of assets

Disposal of assets such as the sale of livestock and other assets are the most common strategies to deal with drought conditions. The findings demonstrated that of 198 respondents, only 7% have sold their land. This ratio is low. In rain-fed areas livestock remains the main asset of respondents. Livestock owners engaged in the forced sale of animals for obtaining food and cash. This is supported by the evidence that sheep and goats were sold at highly unfavorable prices. For many, selling livestock was very hard but they had no other option. A few sold their tractors, domestic items, and other productive and non-productive assets in order to safeguard their livestock. They tried to avoid the sale of their animals even when they did not have enough pasture and water. In union council Daak, an elderly respondent shared his story as;

“He had goats at home for household needs. During the drought, there came a situation when there was no grass and pastures through which we could feed them. It’s very emotional and let me share with you that we shared our own bread with the animals as an effort to save them from starvation”. (Respondent no. 31, age 72, Union Council Daak)

Some of the respondents shared their selling of livestock due to tight financial conditions.

"I sold some of my livestock as I had no money to buy fodder for them and at the same time buy food for my family"(Respondent no. 17, age 43, Union Council Ahmed Wal)

3.3.2 Reduction in food consumption

A common drought coping strategy in Nushki District appeared to be a reduction in food intake. Adults in many households work till noontime without any food taken except for a cup of black tea. Households are managing by changing their dietary patterns and decreasing caloric consumption which has influenced the general nutritious status of the people. Many households have started selling milk and milk products that they used to generally reserve for their own consumption. Thus, a reduction in food consumption has been adopted as a drought coping reduction in the study area.

3.3.3 Seeking alternate sources of income

The results of this study indicate that under drought conditions, 28% respondents adopted the alternate sources of income as their coping strategy. From the interviews of key informants and stakeholders, it can be concluded that changes are occurring in people's livelihood due to drought in Nushki District. While some work as daily wages labors in the area, many male adults work as labor across the border in Iran. Many of them work and settled around tube-wells as farm labor. For some illegal smuggling of goods across the borders with Afghanistan and Iran is the only option of livelihood.

"I use to be owner of a large flock (sheep and goats), but due to the drought I lost the flock, and now I am working as a labour in Nushki town"(Respondent no. 131, age 37, Union Council Ahmed Wal)

"Before the flood, our main source of livelihood was farming but drought worsened our financial conditions. Due to lack of rainfall I could not manage to provide water to our farms; so I left home to work at a tube well on wage"(Respondent no. 99, age 45, Union Council Anam Bostan)

3.3.4 Migration

Migration has only occurred in those areas where agriculture depends on rain and there is no irrigation-based agriculture. Union councils (UC) of Daak and Anam bostan are rain-fed areas. It is important to note those who have other sources of income are more resilient as compared to the ones whose only source of income is agriculture or livestock. As for them, drought means a total failure of livelihood and if other strategies are failed their only option is migration. According to study results, 20% of respondent households' family members have migrated as a result of drought. The deputy director livestock department shared his views on the impacts of drought on the migration of seasonal pastoralists.

Migration is lower if we compare it to the drought of 1998-2004. The basic reason is the installation of the high number of tube wells. However, transhumant pastoralists are not returning and they have migrated from the area. They used to take their animals to the far away Kachhi plains in winter and return in spring but not now. Due to drought in 2013, approximately 25% of the transhumant pastoralists have not returned to Nushki and are wandering in search of water and pasture (Deputy Director, Livestock Department, Nushki District).

The occurrence of droughts brought changes in people's livelihood sources. People got engaged in different activities and left agriculture due to a significant decrease in rainfall. Many people from

the district are working in neighboring country Iran. Some shifted to the other areas of Balochistan province in search of alternative sources of income (Agriculture Officer, Nushki District).

The key informants from the Livestock department also reported that the local government has taken drought mitigation measures and had conducted a baseline survey. The government has also constructed open ponds that are locally called *Nawars*. Furthermore, they have conducted a baseline survey of drought-affected areas and organized veterinary mobile camps in the area as a specific strategy for drought risk management.

Furthermore, from the interviews with key stakeholders of the agriculture department it is concluded that lack of precipitation is not the only factor related to drought in the area. Besides this, poor management of water resources is a very serious issue that worsens the impacts of drought in the study area. The official added as;

In Nushki District, it is the mismanagement of water which makes the area more vulnerable to drought. The exploitation of groundwater and no mitigation measures related to drought are also serious concerns. There are no mitigation measures and no early warning system in the area in relation to drought. Among other factors, desertification and uprooting of bushes and forests are important ones. (Agriculture Officer, Nushki District).

4. DISCUSSION

The findings of this study showed that lack of and less rainfall was perceived as important signs for the incidence of drought. In addition, there is a strong perception among respondents regarding the reasons for no rainfall. They link it with religious beliefs due to the teachings of religion related to the weather phenomena. Respondents were of the view that it's God's punishment that there is no rainfall and consequently it causes drought. Several studies (Nyanga et al., 2011; Slegers, 2008) while exploring the perceptions of drought have also reported a link of religious teachings with the occurrence of drought. In our study, few respondents perceived drought as punishment from God and it is God's will, when should rain. The same findings have been reported by other studies. (Ashraf & Routray, 2013; Jarawura, 2014; Tambo & Abdoulaye, 2013).

A key component of the coping strategies is how households manage their assets during the drought. A common response is to dispose of assets. These assets include small livestock (goats and sheep), cattle, personal possessions such as jewelry etc., agricultural tools and land (Corbett, 1988). It is interesting to note that very few (7%) people had sold their land as a drought coping strategy in Nushki District. The reason for this low ratio of selling land is that in the study area the majority of agricultural lands are jointly owned by the extended family. In addition to that, another reason for low selling of land is the fact that land distribution is mostly based on tribal or sub-tribal bases. Therefore, it is not easy to sell a piece of land. According to Qureshi and Akhtar (2004), in Balochistan selling of livestock and their products were the most reliable drought coping method during the 1998-2004 drought. The findings of our study also support those of Jamali (2006) who reported that disposal of productive and non-productive assets was an important component of drought coping strategies in Nushki district.

The occurrence of droughts has limited the consumption of food items particularly meat and milk from their own livestock, and natural products from their own land in the study area. The evidence of malnutrition in children can be related to the severe decline in the consumption of milk and milk products. As the livestock owners are compelled to sell their animals at low prices and had to migrate to settled areas, therefore, their livelihood suffered and the required nutrition could not be provided especially to children and women which resulted in malnourishment. The findings confirmed the reduction in the consumption of nutritional products. The findings of our study are similar with those of Jamali (2006). Who

if of the view that reduction in food intake happens to be a common drought coping strategy in Balochistan. In addition to that (Jamali, 2006) who also reported that households ate fewer meals in a day and their meals comprised cheaper food items. During the 2014 food insecurity analysis, Nushki District was classified as highly food insecure where the situation was worsening (WFP, 2014). According World Food Programme food security phase classification 2015, the situation in Nushki District was expected to worsen and due to its acute food insecurity, it needed immediate response (WFP, 2015).

Many household respondents stated about selling milk and dairy products which they consume for their own if not for drought. Many have reduced their food intake and dietary patterns. Nutritious products use has been reduced. This reduction in food consumption has affected the general nutritious status of people in the area. Similar to the findings of current study, the rationing of food consumption is commonly observed from Asian studies of coping strategies. This immediate reduction in consumption levels is also a response that has been noted in many of the African case studies (Corbett, 1988).

Searching for non-agricultural income is an important drought coping strategy in dryland areas (Meze-Hausken, 2000). In Nushki, people had to look for alternative ways of generating income due to the failure of agriculture and livestock which used to be their traditional sources of livelihood in the area. Because of drought on-farm activities have been lessened. This has influenced livelihood arrangements in the area and people are engaged in casual work or working in tube-well irrigated areas as farm labor.

Households are observed to hold on to key productive assets for as long as possible and migration is the terminal stage of coping strategies when people have no other option (Corbett, 1988). On the other hand, migration of the entire family indicates the total failure of coping strategies and the most undesirable option available for the household. Though undesirable, migration has been a significant strategy in Nushki district.

The findings of the current study confirmed the migration of households as a drought coping strategy. The previous studies have also reported the migration phenomenon. For instance, if we compare it to the drought of 1998-2004 in Nushki, the occurrence of migration is low because in 2000 hundreds of households migrated due to worsening drought conditions in Nushki district (Jamali, 2006). As per Oxfam (2001) report, in union councils of Anam Bostan, Daak and Kishingi, which were worst affected areas of Nushki district, nearly 50% of households left their homes. A reason can be the increasing number of tube wells in the area which were few in the previous drought.

Lastly, change in cropping patterns and planting practices, as important coping strategies described in the previous literature on drought by (Adger et al., 2003; Ashraf & Routray, 2013; Corbett, 1988) was not practiced in Nushki district. The reason behind this may be the acute shortage of water for even to irrigate the existing crops.

5. CONCLUSIONS

Drought has been a recurrent phenomenon in Balochistan province. Nushki District is one of the most affected and drought-prone areas where the occurrence of drought is regular. For drought planning, it is vital to understand the affected communities' perceptions of drought and coping strategies. This case study tried to focus on public perception about drought and coping strategies of households regarding drought. Study results reveal that no or less rainfall is perceived as the arrival of drought. Mismanagement of water is a serious issue in the study area which is making the area more vulnerable to drought. Migration occurred only in rain-fed areas of Anam Bostan and Daak union councils. Due to their reliance on rain-fed agriculture, they are most vulnerable to drought. Due to their lack of skills out of livestock rearing, people cannot perform other skills so they are more vulnerable.

Policy implications

The findings of this study have several policy implications. The government should adopt a multidimensional approach for mitigating the adverse impacts of droughts. Those who have a permanent source of income other than agriculture and livestock are more resilient to drought. On the contrary, for those with agriculture as a primary source of livelihood, it is extremely important that government organizations (GOs) and non-governmental organizations (NGOs) should conduct skill development programs for the rural households and create employment opportunities which can provide them alternate sources of income and consequently limit their relocation. Further, farmers should be encouraged to grow drought-resistant crops. In addition to this, both GOs and NGOs can collaborate to improve the level of drought education of rural communities and implement public awareness campaigns about drought and water usage for effective drought preparedness. Furthermore, Community Based Disaster Risk Management (CBDRM) should be integrated into the drought management. It can be further improved through the establishment of Disaster Risk Management Committees (DRMCs) at the union council and ward level. Through DRMCs, the early warning information can be efficiently communicated to the rural communities to effectively respond when droughts occur.

DECLARATIONS

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