

Livelihood Vulnerability to Drought and its Impacts on Socio-Economic Conditions of Farming Families in District Nushki: Balochistan

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Abstract

Drought is a slow onset devastating natural disaster which has affected thousands of humans in the province of Balochistan. Nushki – one of the least developed districts of the province – has been suffering from the tumor of drought for the last two decades where a high proportion of the populace is depended on water related livelihood – agriculture and livestock. This study aims to analyze livelihood vulnerability to drought and its impacts on socio-economic conditions of farming families in the Nushki district of Balochistan. The study is quantitative in nature where a total of 187 household heads of farming families—the land owners/laborers, were interviewed through structured questionnaire. The study finds out that livelihood patterns, increased dependency on rain-fed agriculture, demographic, socio-economic, and water related infrastructure are most commonly observed vulnerability factors of livelihood during drought among agriculture related humans. The study also reveals that these vulnerability factors highly influence the socio-economic sectors including income, health, food, nutrition, education and gender perspective. The study recommends pragmatic solution to cope with the current and predicted socio-economic impacts of drought.

Key words: livelihood, vulnerability, drought, socio-economic, farming families

Introduction

Drought is a creeping but devastating natural disaster which has affected billions of human beings in the history of human kind. Acute climate extremes and variability has caused vulnerabilities of nations to water related disasters in Asian countries that are mainly illustrated both by temporal and spatial distribution of water resources (APN, 2004). Drought has several natural and human made causative factors. It has been identified and accepted as a killer

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natural threat whose emergence is mysterious. There are different definitions of the term “Drought” but for the aim of this research, drought is a time of very dry weather of a large duration to develop wide destruction of livestock, water crisis, crop loss and economic possessions (Grainger, 2013). Drought is the extended period of dry weather to cause widespread crop failure, death of livestock, water crises and personal hardship. (Sichingabua,1995). Scarcity of water has most negative impacts, ruin various economic activities, most significantly regions having dry weather (Saadati, et al. 2009). When the scarcity of water takes place, it converts fertile regions into desertification. The most effected sectors of drought are those of water related for example agriculture, livestock, industry, water supply to urban areas and tourism. (Nosrati, and Kazemi, 2011).

Agriculture sector is claimed to be the highest target of drought spells all over the world. Drought conditions mostly result in desertification of useful land for agriculture which ultimately converts fertile and useful land into barren land-unable to be cultivated by farmers. The rigorousness of drought impacts can be analyzed through various monitoring mechanisms including agricultural, meteorological and hydrological monitors (Barry and Chorley, 1987).

Drought has affected life of billions all over the world in recent and remote past. Australia, Africa, America, Asia and different parts of Europe could not save themselves from the devastations of severe spells of drought. A study conducted by Smith (1992) reveals that shortage of water resulted loss of 16.9 billion to the economy of Texas State of USA. Additionally, it resulted in almost 166,895 people unemployment in California state. Highly influenced sector was agriculture which resulted loss of jobs of around 106,000 people. As compared to 2010, the California and Texas states had a loss of 91 percent revenue in cotton farming while 32 percent losses in the production of livestock.

Overwhelming droughts have sketched in African in general and in the history of Southern Zambia. These conditions have strong impacts on weakest groups bringing additional suffering to their already wretched conditions, even to the extent that they have to dispose of their meager assets (Livestock), including in many instances, mortgaging or selling their land (Scoones, et al., 1996). Australia was severely affected by drought during 2002-2003. The overall devastations of drought were experienced in agriculture sector. Drought resulted in almost 20 percent decline in the overall revenue. Although agriculture has a small share in the GDP of Australia, even than 1.6 percent GDP loss was observed due to severe drought spell. It resulted in decreased opportunities of employment, and deteriorating trade balance in the country. (Bernard, 1970)

Like other drought prone countries of the world, Pakistan, too, has been experiencing severe drought episodes. In every ten years, the recurrence of this slow disaster is at least 2 to 3 years in every Ten years. Those nations of the world are highly vulnerable to the negative impacts of extreme weather events that produce and consume poorly (Smith, 1992). Studies reveal that there is dangerous growth in recurrence of heat waves indicate the forth-coming harshness of drought and desertification in Pakistan (Burton and Visvader, 1974). Pakistan has been drought prone in the history. Severe spells of drought damaged several sectors of economy in almost all areas of the country. The province of Punjab experienced horrible drought spells in 1899, 1920 and 1935. Similar droughts spread destructions in the province of Sindh in 1871, 1881, 1899, 1931 and 1951. The Khyber Pashtoonkhwa (KPK) province experienced extreme droughts in 1905 and 1951. While at national level, the most destructive drought spell was of 1999-2002 which influenced almost all parts of the country. During this period, inconsistency was found in the rainfall and water flow in rivers decreased to extreme level (Ahmed et al. 2003).

Studies have recorded that two provinces of Pakistan—Balochistan and Sindh – are highly susceptible to and have experienced most serious conditions of drought in the recent years (APN, 2004). Balochistan has been considered as most prone to drought conditions. The mention worth dry spells of Balochistan are 1967-1969, 1971, 1973-1975 and 1994. The drought spells that commenced in 1998 to 2002 and later from 2009 to 2015 have recorded highly increased loss to the socio economic sectors of populace (Ahmed et al, 2015). While from 2016 to December 2018 inconsistent or no rains haven observed. The rainfall was very low and underground water table decreased to 1200 feet in some areas. In such conditions the most influenced segment of local population was agriculture and livestock which directly and indirectly affected livelihood of farm related labor and population. The recent spells of drought have been termed as “the most terrible drought spells ever” in the province. This spell of drought restrained the economic development rate to 2.6 percent, according to ministry of finance. The drought spell of 2000-2002 resulted almost 25 billion Rupees loss to national revenue (PDMA, 2013). The socio-economic conditions of at least 23 districts of Balochistan were affected by dry spells (Shafiq and Kakar, 2007). However, other statistics and representatives of provincial offices claim that the number of effected has increased due to consecutive spells of drought.

Overview of studies show that the most devastating spell of drought in the province was observed during 1998-2006. After the intensive and long period of drought (1998-2006), the province has suffered from a number of other dry

spells of varying degrees which as badly affected the socio economic activities in general and agriculture and livestock dependent population in particular (PDMA, 2012). Shafiq and Kakar, (2007) also found that the most of the areas of the province of Balochistan faced mild to moderate effects of drought in its socio-economic fields. Among all other districts of the province, Nushki remained severely affected by the devastating spell of 1998-2006 drought (UNDP, 2015). Drought periods did not end in 2006, but it continued with intervals of small and large spells till date. The year 2018 has not experience a single rain in the district. The social and economic sectors of the district are severely suffering from drought impacts.

Literature Review

Understanding related concepts of drought

According to different point of views it is concluded that drought is curse which affects multi economic sectors. The difference between the conceptual and operational drought is that, Operational means the beginning, harshness and end of scarcity of water while, conceptual means long and dry duration (Yevjevich, 1967). By livelihood we understand “to make living or earn income, support the family or source of income and job”. The term livelihood basically is concerned with the strategies of humans to develop and implement survival. This term was introduced by civil society, governments and other organizations in order to help marginalized groups of people who face threatening situation in making living, or whose sources of income has been damaged. Livelihood consists of the capacities, assets and activities of people that are needed to means of living. In this research study, the effects of drought on various components of livelihood are deeply studied.

The term “drought” is generally used to refer to deficits in water supply, but it can also refer to meteorological (precipitation), hydrological (stream flow), or agricultural (crop yield) deficits compared to a long term average. Droughts are recognized as an environmental disaster and have attracted the attention of environmentalists, ecologists, hydrologists, meteorologists, geologists and agricultural scientists. Droughts occur in virtually all climatic zones, such as high as well as low rainfall areas and are mostly related to the reduction in the amount of precipitation received over an extended period of time, such as a season or a year. Temperatures; high winds; low relative humidity; timing and characteristics of rains, including distribution of rainy days during crop growing seasons, intensity and duration of rain, and onset and termination, play a significant role in the occurrence of droughts. In contrast to aridity, which is a permanent feature of climate and is restricted to low rainfall areas (Wilhite, 1992). A drought is a temporary aberration often there is confusion between a

heat wave and a drought (Chang and Wallace, 1987), however, the two terms are different.

Profile of the study area

The study area in this research study was Nushki district which is located between 65°07'42"-66°18'45" East Longitudes and 29°01'51"-29°52'37" North Latitudes. Geographically, Nushki district is comprised of 5,797 square Kilo-Meters which is further divided into ten UCs (union councils). Nushki town is the headquarter of district. The district is located in the north of province. Its borders are allied with Afghanistan in the north, Quetta in the east, Kharan and Kalat in the south and Chaghi district in the west. Eastern and southern parts of the district consist of hilly areas while the rest of the district area is plain land. The climate of District Nushki varies from extreme hot in summer to severe cold in winter. The rainfall is irregular and low (GOB, 2011).

The Population of district Nushki is 178,796 (according to Census Report of Pakistan, 2017). The livelihoods of people in Nushki are highly dependent on agriculture and livestock. The main crops are wheat and barley in the Rabi season and sorghum, maize, mung bean, mash bean, onion, potato, melons, chilies, vegetables and fodders in the Kharif season. The major fruits are grapes and pomegranate. The livelihood of 70 percent of people completely dependent on agriculture. The district and adjacent areas are experiencing complete drought or irregular rains (Yousuf and Nasir, 2016). A significant shortage of rains have been found in the district and its sounding areas for the last two decades which has resulted in high scale disruption in the socio economic activities of residents in general and farm related people in particular. The precipitation and rain data shows that a notable difference of -4.33 on average has been found in rains between two periods of fifteen years i.e. 1976-1990 and 1991-2005 in Zone C of Pakistan which also include Nushki District. (Salma, 2012).

Drought livelihood vulnerabilities and socio economic effects

Consecutive spells of drought in the province has increased the vulnerability of water dependent population to intense level. To gauge the vulnerability of farming families to drought, a variety of models were reviewed in the current study. Drought vulnerability has been determined in a variety of ways.

It goes without saying droughts can be harmful to the environment. But droughts also have serious consequences for people's livelihoods, affecting everything from agriculture and water supply to transportation and health. Nearly 40 percent of the world—1.3 billion people—rely on agriculture as its

main source of income. So if severe droughts lead water shortages in an area dependent on agriculture, it puts the health and wellbeing not only of animals and crops at risk, but of the farmers and communities that depend on them too. To get a sense of the scale of this threat in the U.S. alone, in 2012, the US Department of Agriculture declared a natural disaster in 2,245 counties because of severe droughts. That's a lot of people and a lot of communities living with drought.

Ground water resources in Balochistan province of Pakistan are highly exploited due to successive drought spells. There are two main basins in the province (Pishin Lora and Nari) but beyond the development potential of the two basins, the ground water is highly exploited. The increasing over drafting of water from the two catchment areas is threatening—in long term to dry up the aquifers. (Kahlowan and Majeed, 2002). Like other drought affected parts of the nation, in Nushki, the situation is worse or even more than worse. The lack of sources of livelihood and food security caused by drought and climate stuns have compelled families in the district to sell household assets and land in exchange for food, take loans, take children out of schools and/or get involved in such practices that are exploitative for environment as a whole. Drought conditions have result in a variety of undesirable psychological problems among people (Bourque et al., 2006) (Gerrity and Flynn, 1997). The same cases psychological cases were observed in the Nushki district. A large number of people frustrated, isolated, mal-adjusted and depressed people are found in the district whole relate these conditions to the poorest sources of income due to droughts.

Objective of the study

The main objective of the study is to analyze livelihood vulnerability factors to drought and the socio-economic impacts on farmers and laborers in district Nushki, Balochistan. While the specific objectives include;

- To study the livelihood vulnerability factors of farming families to drought in district Nushki
- To analyze the socio-economic impacts of drought on the livelihood of farming families.
- To recommend operation and policy oriented recommendations.

Methodology

The study was descriptive on the basis of purpose while quantitative on the basis of data sources. Descriptive design of study was helpful to analyze the opinions, perceptions and tendencies of farming families in drought conditions.

The descriptive study design was selected due to the reason that it is most suitable in describing the characteristics of target population in line with various drought spells since 1997. Secondary information was retrieved from a large number of book, research journals, government reports, NGOs reports and internet websites. While primary data was mustered from household heads (187) farmers and agriculture laborers through structured questionnaire combined with observation as tools for data collection. The universe of the study was district Nushki. A total of 5 union councils were selected through cluster sampling in the first phase of sampling while later in second phase list of villages was developed to select 4 villages from each union council through systematic sampling. Thus a total of 20 villages were sampled. In the last phase of sampling, 9 respondents (farmers / agriculture laborers) were selected through accidental sapling method. The collected primary data was analyzed through computer software SSPS in order to draw solid results and reach conclusion.

Results and Discussion

According to results of the study, a large population in the district relies on livestock and agriculture (self and labor) for their livelihood. They are associated with none irrigated agriculture (tube-wells, *Karez* and rain-fed) and livestock to ensure their livelihood being the owner or agriculture labor (tenants). The agriculture laborers work on daily wages in the fields of rural areas. While, 28% of people have government services and other commercial activities along with agriculture while the rest of people solely depend on agriculture. It was observed that due to drought conditions mostly number of livestock reduced to minimum number along with other requirements of livelihood such as, income, use of water for domestic and negatively affected. Addition to it, the same deteriorating situation is generally observed throughout the globe and particularly in the province from secondary data. However, it is certain from the data that most of the residents of district Nushki are dependent on water related livelihood activities.

Type of agriculture (if primary occupation is agriculture)

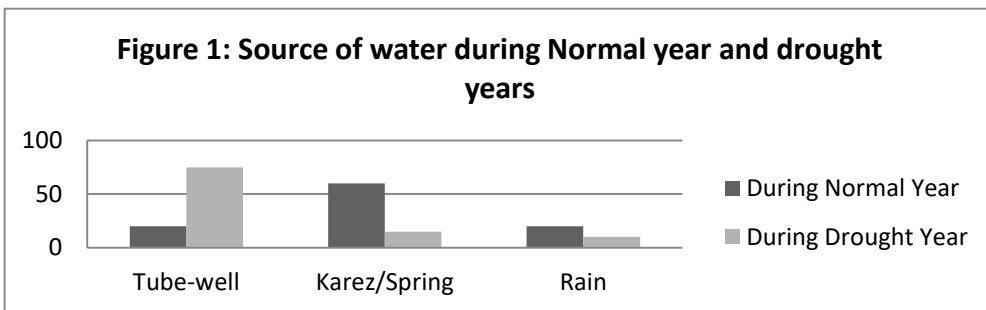
Reportedly, people who are associated with agriculture as their main source of income rely upon annual crops for example wheat and barley in the Rabi season and onion, potato, melons, chilies and vegetables. However, since the underground water-table has been declining due to drought, therefore, the productivity of these crops has decreased. Besides, large parts of two Union Councils of district (namely *Dak* & *Anambostan*) converted into deserts because of unavailability of rain water. The underground water of the stated Union Councils is sour (unable to be used for agriculture). Furthermore, Union

Council of **Kashangi** used to be famous for its Orchards such as Apple and Peach. After the severe spell of 1997-2006 drought, the orchards completely dried-up. Now field data witnesses that a lower percent of people in Nushki district rely on irrigated orchards such as grapes and pomegranate.

Source of water.

From the beginning, the main source of water used to be rainy flowing, spring (Karaz) and to somewhat ground water. But after the consecutive drought spells, the scenario has completely changed the situation on the basis of availability of water. Now people mostly rely on excessive utilization of ground water. Two Union Councils have remained vulnerable because of the quality of underground water for agriculture purpose, the said UCs **Dak** and **Anambostan** are adjacent areas to Afghanistan. On the other hand, water has been reduced to minimum level in the rest of areas as depicted in the following graphs.

Source of water during Normal year and drought years



(Source: Field Survey) (Data in Percentage)

According to data the main source of water during Normal years mostly rely upon Springs and rains while most of the springs were dried up in drought years. Only few springs (Karez) still exist only in two Union Councils namely **Ahmed Wall** and **Mall** with minimum level of water flow from them. Moreover, the rest of the union councils depend on tube wells and flowing rainy water only.

Livelihood vulnerabilities to drought

An operational definition of the “Vulnerability” has been provided by IPCC (Intergovernmental Panel on Climate Change) where it is stressed upon strategies to decrease the effects of “Adaptive Capacity, Sensitivity and Exposure” (IPCC, 2001). The same was measure by Dressa et al (2008) in following formula:

$$V = (AC) - (S + E)$$

The above formula was analyzed by the team of researchers on farmers in Ethiopia to study vulnerability to climate change by implying adaptive capacity (AC), sensitivity (S) and exposure (E). In adaptive capacity, various indicators of socio-economic field were used which included literacy rate, wealth, technology, infrastructure and social institutions. While bio-physical indicators such as frequency of droughts, potential for irrigation and variations in temperature and precipitation were used as sensitivity (S) and exposure (Exposure) indicators.

When checked livelihood vulnerability of farming families/laborers to drought in district Nushki, it indicated that since it is semi-arid and one of the least developed district of the province, therefore, the populace is highly vulnerable to drought. Same results were indicated in studies conducted by Dressa et al (2008) in Ethiopia and Fontaine et al (2009) in the State of Washington. However, the formula adapted by Fontaine et al (2009) was different from that used by Dressa et al. The formula used by Fontaine et al contained same elements and was as follows:

$$V = (E + S)/AC$$

By using above formula to measure drought vulnerability, Fontaine et al (2009) severity and frequency of drought means to quantify exposure (E). additionally, they checked the sensitivity of drought via its duration, magnitude and spatial severity. While the adaptive capacities were measured by the marginal skills of farmers. The same model was applied in district Nushki to measure livelihood vulnerabilities of farmers to drought and the results indicated that the vulnerability of rain-fed and dry land dependent farmers / laborers is higher to drought as compared to other sectors. The **Dak** and **Anam-Bostan** union councils of Nushki were drier as compared to other UCs, therefore, the vulnerability factors of geography and water related infrastructure were higher as compared to other UCs of the district.

Vulnerability has also been assessed through Chronic Vulnerability Index (CVI) to assess the vulnerability level by applying the following equation (Burg, 2008): The formula illustrates that results of vulnerability are not only exposure to risk factor but also socio-economic process that cause reduction in the capacity of people to deal with the risk factors.

$$\text{Vulnerability} = \text{Exposure to Risk} + \text{Inability to Cope}$$

In this very study conducted in rural areas of Nushki, the “coping” indicator included livestock assets per capita, staple crop production per capita, cash crop prevalence, road accessibility, pasture/browse availability, access to safe drinking water (percent of population). While “exposure to risk” included risk

of drought, risk to diseases and change in crop production. The findings indicate that vulnerability of famers/agriculture laborers is higher in the district.

In a study conducted by Webb and Harinarayan (1999), relationship between malnutrition and vulnerability was assess by following equation:

$$\text{Vulnerability} = \text{Hazard} - \text{Coping}$$

In the same way relationship of drought vulnerability and socio-economic conditions was assessed and it was found that experience, community culture, practices, demographic traits, unemployment rate, agriculture income, access to water, quality of water, access to information and conventional methods of cropping increased the socio-economic vulnerability of farmers and laborers. Few studies (Winser, 2001) & (Winser, 2004) have illustrated the relationship between vulnerability, hazard, and risk as follows:

$$\text{Vulnerability} = \text{Hazard} - \text{Risk}$$

Some think that capacity is the most significant factor to decrease the severe impacts of disaster (drought). Davis (2004) added capacity to the above formula by stressing the key role of capacity in increasing or decreasing vulnerability factors in general and in case of this very study drought to be assumed.

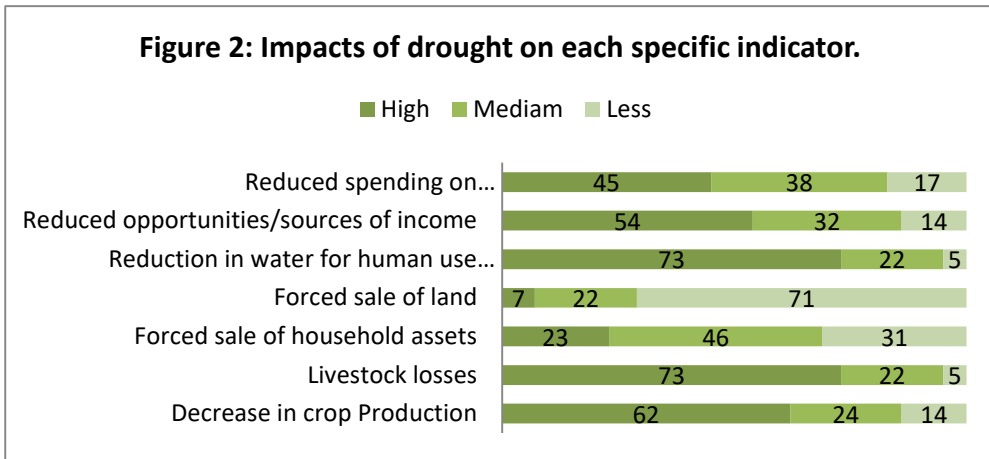
$$\frac{\text{Vulnerability} \times \text{Hazard}}{\text{Capacity}} = \text{Disaster}$$

Different models of vulnerabilities were tested and observed that the vulnerability of people dependent on water as a major source of income (agriculture and livestock) is higher in Nushki. Socio, economic, geographical and environmental factors increased the vulnerability of local population and increased the risk of drought as a natural hazard which ultimately caused severe socio economic damages for populace in the study area.

Impacts of Drought on Livelihood of Farm related Human Resource

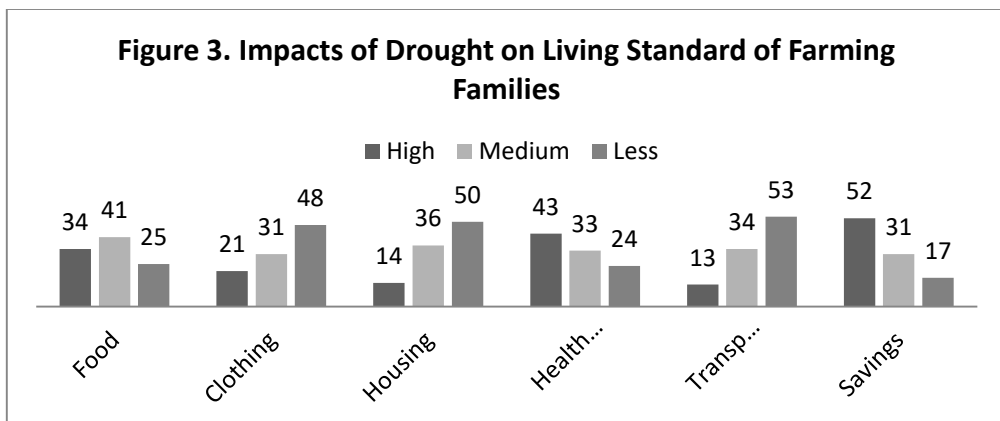
(Source field survey) (Data in percentage)

The data reveals that the most of respondents 62% believe that reduction in



corps production is high while the 24% and 14% believe the reduction in production is medium and less during drought year respectively. Besides, the impacts of drought on livestock are very high 73% while the forced sale of household assets is very low 23%. Addition to it, sale of land during drought year is very low 7%, the lands are converted into desert but people do not prefer to sale their land because of prevailing traditions they perceive it ill. On the other use of water for domestic is very high 73% so on drought affect badly opportunities of source of income/livelihood 54% and reduce the spending's on marriages and on other cultural ceremonials.

Impacts of Drought on Living Standard of Farming Families

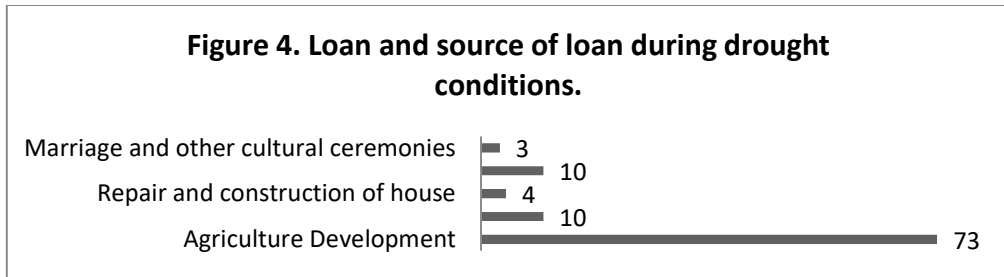


(Source field survey) (Data in percentage)

Impacts of drought on the living standard of people on the above mentioned sectors vary, but the effects of drought are negative on the living standard of farming families. On food these are 34%, clothing 21%, housing 14%, Health

43%, Transportation 13%, and on savings 52% as High. Rather than the data observation reveals that the farming families do not give priority to the said sectors besides savings.

Loan and source of loan during drought conditions.



(Source Field Survey) (Data in percentage)

Severe and consecutive spells of drought in the district forced farmers and laborers to take loans and keep the wheel of life going on, despite, so many troubles. Field data shows that people took loans from two major sources as the main source of loan was banks (93%) while the remaining 7% source of loan is informal money lenders and relatives. Respondents were also investigated about the reasons for taking loans where reportedly most of the loan was taken for agricultural development (73%) while on the other sector utilization of loan was concerned with livestock rearing, family expenses, repair and construction of houses and cultural events such as marriages etc.

Conclusion

Throughout the globe spell of drought is very common and its impacts are devastating on every section of society. Every region of Pakistan and Balochistan has faced severe drought spells. Evidently, the 1998-2006 spell of drought was the most devastating which affected the social, economic and environmental sectors very harshly. District Nushki has been badly affected by the drought spells since 1996.

Drought impacts are severe on water related activities. District Nushki is one of the most severely affected districts in the recent episode of drought. A large population of the district is dependent on agriculture and livestock as source of livelihood. The socio economic impacts of drought are very harsh, people have no other option rather than agriculture. This study finds that water resources were abundant prior to drought in district; however, drought not only reduced these resources but also had lasting socio-economic negative impacts on people. The intensity of drought impacts are observed in terms of decline in crop productivity, loss of livestock, food insecurity and malnutrition; and to somewhat forced sale of household assets and land; reduction in water for

human use such as for drinking, reduction of sources and opportunities for income, and decline in health due to spread of diseases, lack of clean drinking water and malnutrition.

The paper concludes that drought preparedness and mitigation has never been taken serious at any level. The only efforts taken for drought affected people are relief activities by government and non-governmental organizations. It is recommended that preparedness, mitigation related activities along with relief operations need to be carried out through well-coordinated efforts. This study observed a serious gape in research related to drought hazards and it's imperative to conduct in-depth studies on this phenomenon to address the disastrous long-term socio-economic impacts of drought. Information provided in this paper is beneficial for planners, officials, administrators, and non-governmental organizations to improve responses to future incidents of drought and held to reduce the adverse socio-economic impacts of droughts.

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