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Assessment of Droughts in Afghanistan

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ABSTRACT

Drought is one of the important phenomena all around the world, which has negative effect on the economy of a country. Asian countries have faced to droughts, and Afghanistan is affected by drought more than other south Asian countries.

This study focusses on drought impact that is caused vulnerable of farmers. About 3.9 million hectares grain field, 1.3 million hectares are rainfed lands. Arable lands provide food and fiber for the population, especially in rural areas. Severe droughts in recent years has had a lot of impacts on farmers' because their income based on agricultural yield. Both irrigated and rainfed lands are affected by drought. Farmers with rainfed agriculture suffered more than farmers with irrigated agriculture due to low precipitation. During the severe droughts they lost almost all their yields and livestock.

Government should determine the high-risk zones and provide a policy to meet all their need. Beside the government, NGOs also can train farmers about how they can prepare themselves for the future droughts. For example, purification of drinking water, harvesting rainwater, introducing new crops etc.

Keyword: Droughts, Climate change, Climatic Hazards, precipitation

1. Introduction

Drought is an environmental disaster which can occur in all climatic zones with high and low rainfall. Drought is considered as the inadequate precipitation in a long period of time such as a season or a year. There are some significant factors which play role inthe occurrence of droughts, such as temperature; high winds; low humidity; timing and characteristics of rains. Distribution of rainy days during seasons of crop growth, intensity and duration of rain, and onset and termination of rain are the characteristics of rain[1]. In recent years droughts are occurring with higher severity level and the distance between extreme events has became shorter in certain areas [2]. Droughts reduce the water quality and water supply of surface and groundwater. As a result, there will be crop failure, low productivity, loss of riparian habitat and destroying of economic and social activities[3]. Studying of droughts are important in planning and management of the water resources [2]. Today climate change is one of the major threats for the earth and its consequence is not just the change in the average weather but an increase of extreme events. Droughts are also the extreme events which develop slowly but have the longest duration and the least ability of prediction among natural hazards [2]. Droughts rank first among all natural hazards in terms of the number of affected people severity, duration, total areal extent, and long-term impact [4]. It is difficult to have a universal definition of drought and there should be a difference between conceptual and operational definitions [5]. In conceptual definition, drought is defined as a long and dry period, while operational definitions consider the onset, intensity, and termination of the drought period. Operational definitions can help to analyze the frequency, intensity, and duration of droughts. There are many definitions for drought. Some of them are:

(1) Drought is a sustained and extended deficiency in precipitation[6].

(2) Drought means the naturally occurring phenomenon that exists when precipitation has

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been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production system[7].

(3) Drought is the percentage of years when crops fail from the lack of moisture [8].

(4) According to the encyclopedia of climate and weather " drought is an extended period – a season, a year, or several years of insufficient rainfall relative to the statistical multi-year mean for a region [9].

(5) Drought is the smallest value of daily streamflow [10].

(6) Drought as a sustained period of time without significant rainfall." Consequently, drought definitions are different based on variables we use to describe the drought[11].

There are four types of drought [5];

(1) Meteorological drought which is the deficiency of rainfall in the affected area. Precipitation data can use for meteorological drought[12].

(2) The hydrological drought which is the insufficient amount of water in the surface resource of water. We can use streamflow data to analyze this kind of drought [13].

(3) Agricultural period. Operational definitions can help to analyze the frequency, intensity, and duration of droughts[7].

(4) Socioeconomic drought is when there are no enough water resources to meet water demand and the demand for an economic good which is related to water is increased. Besides these four types of drought, we can add groundwater drought too [14]. Groundwater drought means the decrease in groundwater recharge, level, and discharge. It may occur for a time period of months or years [15].

Drought is pervasive to all continents of the world. According to the Global Drought Information System, short-term global droughts remained relatively constant across the world in August 2013 affecting 44 million people while drought conditions, which eased in North America, Africa and Europe, remained intensive in Australia, constant in South America, and intensified in Asia. The global drought mapped by the University College of London shows 258 million people affected globally by exceptional drought in last 36 months (fig 1)[16].

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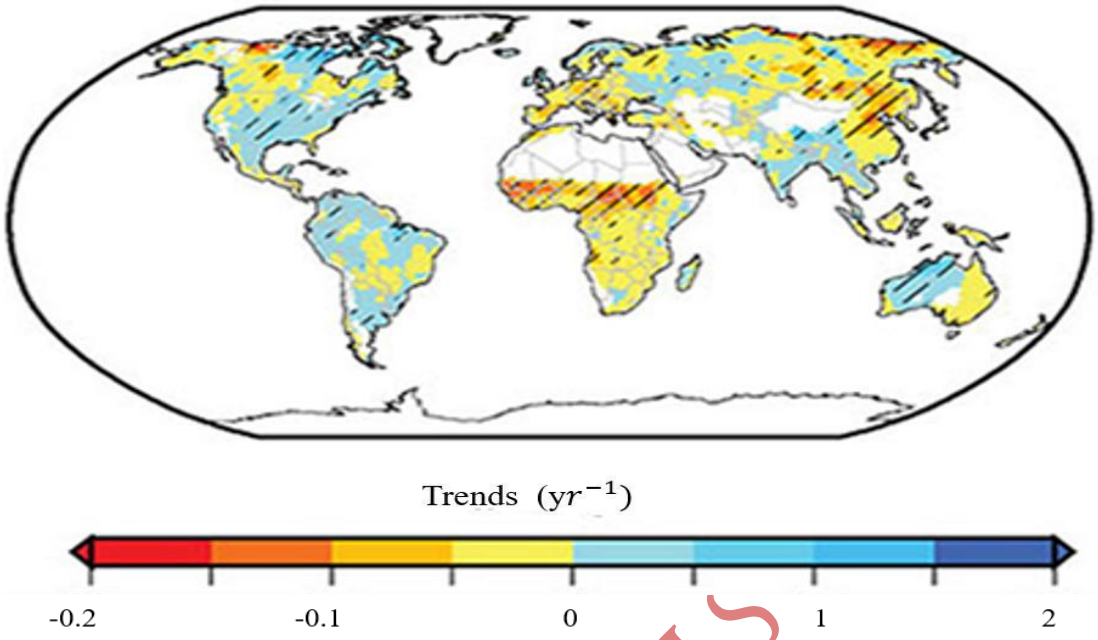

Figure 1 Global drought trends past 50 years Red areas have experienced increasing levels of drought while blue areas have become less prone to dry condition

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2. Droughuts in Afghanistan

There is a long history of droughts in Asia which has had negative impacts on the Least Development Countries [17]. South Asia has experienced severe droughts from 2000 onwards which is the most

drought-prone region in the world. It is predicted that many parts of Asia will experience severe droughts by 2020.

Afghanistan is one of the South Asian countries also has had droughts at least once in every three years period in the last five decades(Tareq, 2012), and has experienced all meteorological, agricultural, hydrological, and socio-economic types of droughts frequently[18][19]. Overexploitation of water resources, high evapotranspiration, inadequate precipitation are the causes of water scarcity during the droughts [20]. Localized and wide range droughts occur recurrently in Afghanistan. According to Aias Development Bank (ADB), localized droughts occur every three or five years and wide range droughts mostly occur every nine to eleven years. Mostly South and Central parts of the country are suffered more from July to September. From 1995 onwards Afghanistan began to experience unusual droughts and it continued until heavy snow in the 2002-2003 winter season [21]. Drought and war are two important drivers of internal displacement of people who are living in extremely poor conditions [17].

Severe drought in 1999-2001, affected almost all parts of Afghanistan, except those parts which had located in the big river valleys. About half of population affected, directly and indirectly. 3 to 4 million people affected severely and 8 to 12 million people threatened by famine. About 300000 people migrated to Iran and Pakistan and more than 400000 people moved to other places inside the country. But those who remained in drought-hit areas faced too many problems such as, insufficient water supply and food which caused famine and diseases. They remained in their areas because of lack of financial capacities, Transport facilities and lack of social capacities to go and work in other villages or cities of Afghanistan. In Southern

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Afghanistan about 200,000 people displaced internally, especially huge number of Nomad people had to leave their normal grazing lands. Due to this drought Helmand river dried for the first time and all reservoirs lost their water. The drought of 1999-2001 caused loss of livestock and wheat stock in southern part of Afghanistan which resulted in consuming of dried mulberry and chickling peas by people. Chickling pea is used usually as fodder for animals and its consumption by human can disable the body of consumer. In southern Afghanistan Rainfed wheat yields decreased about 40% below than average and this created seed shortage for farmers, because they consumed the wheat as food for household and there was nothing to grow for next cultivation. About 50-57% of each farmers orchard (apple, pomegranate, almonds, apricot and grapes) was damaged because of inadequate rainfall. Livestock sickness and loss of weight were another effect of drought which caused many farmers sell their animals almost at one quarter of their original price [22].

Due to long term droughts in Afghanistan Sistan wetland which is located in the border between Afghanistan and Iran and has an international value is compeletly dried up. Drought, civil war and mismanagement of water resources are the main cuases of deterioration of Karezes(a kind of groundwater resource) and shallow weels in Kandahar and and other southern provinces which are the main source of drinking water for people. About two third of Karezes and shalow weels compeletly dried during last three decades and caused the decrease in clean drinking water. Lack of safe and clean water for drinking created water borne diseases like disentry and diarrhea in these areas [23].

The continouse droughts of 2008-2011 also in Afghanistan affected 2.6 million people in 14 out of 34 provinces of the country[24]. Long term droughts and over use of water have decreased the water resources of Afghanistan which is the major natural resource in the country.

In Afghanistan, droughts have multiple impacts on different sectors such as Agriculture, herding, water sector, food security and health sector [25]. In last decades the social, environmental and economic impacts of droughts have increased dramatically.

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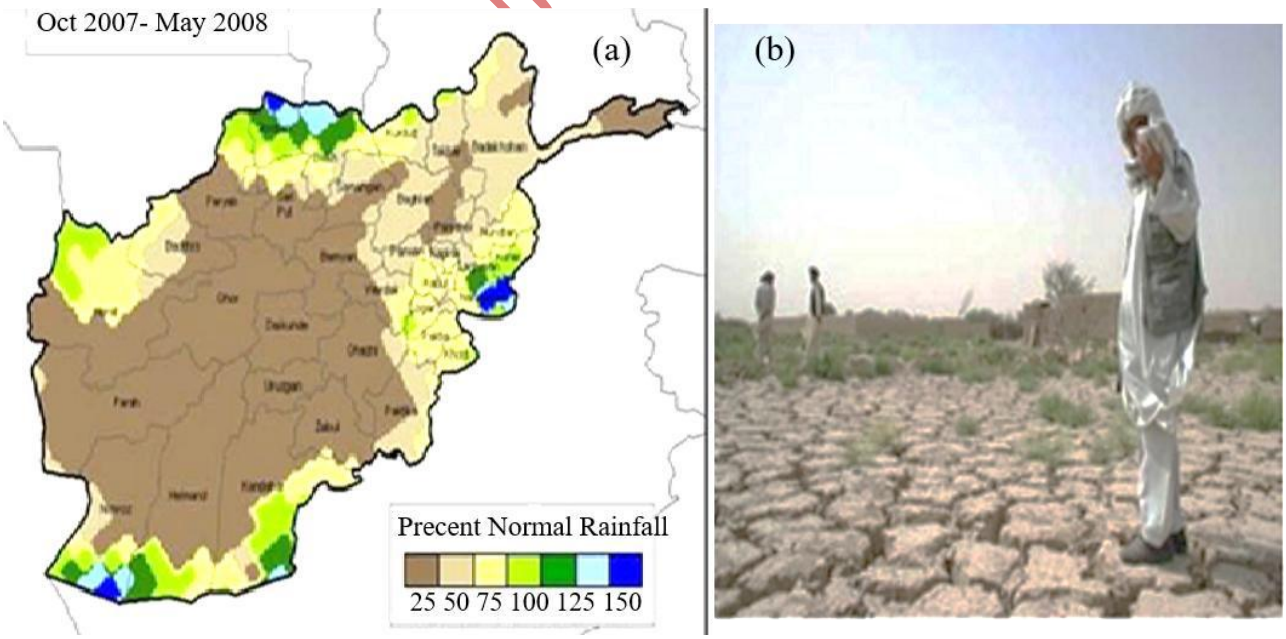

Figure 2 (a) Percent Rainfall in Afghanistan, (b) Effect of Drought in northern Afghanistan

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3. Coping with drought

There are many ways which farmers use to cope with drought. Farmers in Afghanistan also practiced many of them according to their adaptive capacities.

Less production and the high price of food force the small farmers to sell their land, household goods, and their animals at a low price to provide food to their family [26]. Some people begin to eat some wild plants, trees leaves, tubers which cannot be used normally [27]. For example, using chickling peas during the drought in Southern Afghanistan due to famine which is harmful for health [22].

Farmers have different adaptive strategies to cope with droughts impacts. They try to reduce the severity of drought risks at household levels by using two techniques. First, they try to do some agricultural practices to compensate their production loss, such as re-cultivating of crops and application of water irrigation to increase the production (Brammer, 1987) or they can shift the crop patterns which is resistant to drought [28] [22]. Second, sometimes just agricultural practices are not enough because of high prices of food and lower yields. Farmers need cash to provide other basic needs, so they have to practice some non-agricultural practices, such as selling their land, livestock, and their household goods or do some off-farm jobs to get additional money [17].

There are some enabling factors which enhance the adaptive capacities and help to cope better with negative impacts of drought. Because of these factors, all members of a community are not equally vulnerable to drought. For example, at village level friends, relatives, neighbors and other people can help affected people by providing cash, loan, food and clothes (Paul, 1995). Beyond this, other relatives and friends who live outside the community can have an important role in helping victims by providing financial and other supports. The government also has a key role to reduce the impacts of drought by providing of off-farm jobs and financial assistance such as the distribution of free food, clothes, cash, medicine and other basic needs. NGOs also may help the drought victims to reduce the vulnerability. Consequently, the vulnerability will be reduced if all stakeholders act together in same time. Otherwise, victims will be in a hard situation and higher vulnerability. Especially, the government support is very important to halt famine and enhance the adaptive capacity of victims. People also have their own adaptive strategies such as food preservation techniques (drying of meat, fruits, and vegetables) and storing of surface and rainwater in large manmade reservoirs [17]. Government of Afghanistan tried to have some financial assistance to the farmers during the droughts such as distributing of free food for households and seeds, but these were usually inadequate and for a short time. According to IWMI survey (2004) in Kandahar and Helmand provinces, during the drought of 1991-2001, NGOs provided relief to drought victims and tried to reduce the impacts of drought, but many people couldn't get the NGOs relief assistance. As a result, people and livestock had to leave their area and migrated to other areas. In these provinces most people are farmers with irrigated and rainfed lands. Their main income is selling their agricultural production. During the drought because of water scarcity and lack of precipitation they paid more attention on livestock and animal husbandry and small number of them, especially in rainfed areas did mixed activities (farming, animal husbandry and off-farm activities).

Farmers traditionally know how to adjust their crops with the climate. But, sometimes over the use of High Yielding Variety (HYV) seeds may consume more water. Also, these seeds are losing their immunity and become more sensitive to diseases and climate variation. So, there is a need for more researches on drought-resistant crops to solve this problem. Some Least Developed Countries such as Bangladesh started planting of food tree crops which are less sensitive to drought. These trees able to absorb water and nutrients from the deep soil and do less transpiration to mitigate the adverse effects of drought. Because of economic effects of drought on income generating crops, in some place's farmers convert their farm crops to tree crops such as fast-growing species to get timber, fuel wood, and fruits [17].

Children and women are more vulnerable to droughts. Women mostly provide juicy foods and take more fresh water to reduce the effects of water scarcity and diseases [17]. In rural parts of Afghanistan just men are responsible for income, during the drought and failing of their crops some heads of family migrate to other cities or neighboring countries to find job. Women and children remained alone in their area. Women also beside of doing domestic chores tried to do some handicrafts to provide money which is too less. From other ward, due to water scarcity women

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and children which are responsible for providing of water must go several kilometers far to bring fresh water. These reasons make them more prone to diseases and more vulnerable to droughts [22].

The government may develop some drought awareness to local government, communities and households to cope easily with drought. NGOs also can provide some training programs for women and youths about how they can store, recycle and pure the water. They can train how farmers can harvest the rainwater traditionally and use it. Capacity building of local people can help them to reduce their vulnerability [17].

4. Link of climate change and drought

Afghanistan will be confronted by a range of new and increased climatic hazards. The most likely adverse impacts of climate change in Afghanistan are drought related, including associated dynamics of desertification and land degradation. Drought is likely to be regarded as the norm by 2030, rather than as a temporary or cyclical event.

Meanwhile, prolonged political instability in Afghanistan took its toll on scientific research of the impact of climate change on the country's glaciers and mountains. As a result, scientists mainly used available tools to substitute ground-based research in the country, such as high-resolution imagery collected from satellites, periodic water level [29].

While the climatic risk of rainfall-related drought has increased over the past thirty years across most of the country, the main areas of concern in terms of negative impacts on food security are concentrated in the north and parts of the Central Highlands. These are areas where the dominant livelihoods rainfed farming and pastoralism are highly dependent on rainfall, and where the observed decline in spring rainfall therefore has a direct impact on households' ability to produce food and earn income. This shows that, severe droughts of Afghanistan during the past 30 years directly are related to climate change [30].

5. Drought scenarios till 2100

5.1-Changes in Temperature

According to Global Emissions Scenarios, it is predicted that there will be an increase in temperature of between 2 and 6.2 by 2090 in all regions of Afghanistan. Springs and summers will become hotter in the north and centrals parts of Afghanistan. There will be an increase in frequency of days and nights which are hot in current climate during the summer season.

Up to 2030s, the mean annual temperature is projected to increase by 1.4 to 4.0°C by the 2060s, compared to 1970-1999 averages.

By 2090, the range of projections by the 2090s under any one emissions scenario is around 1.5 to 2.5°C. The range of potential annual temperature increases is noticeably influenced by global emission scenarios.

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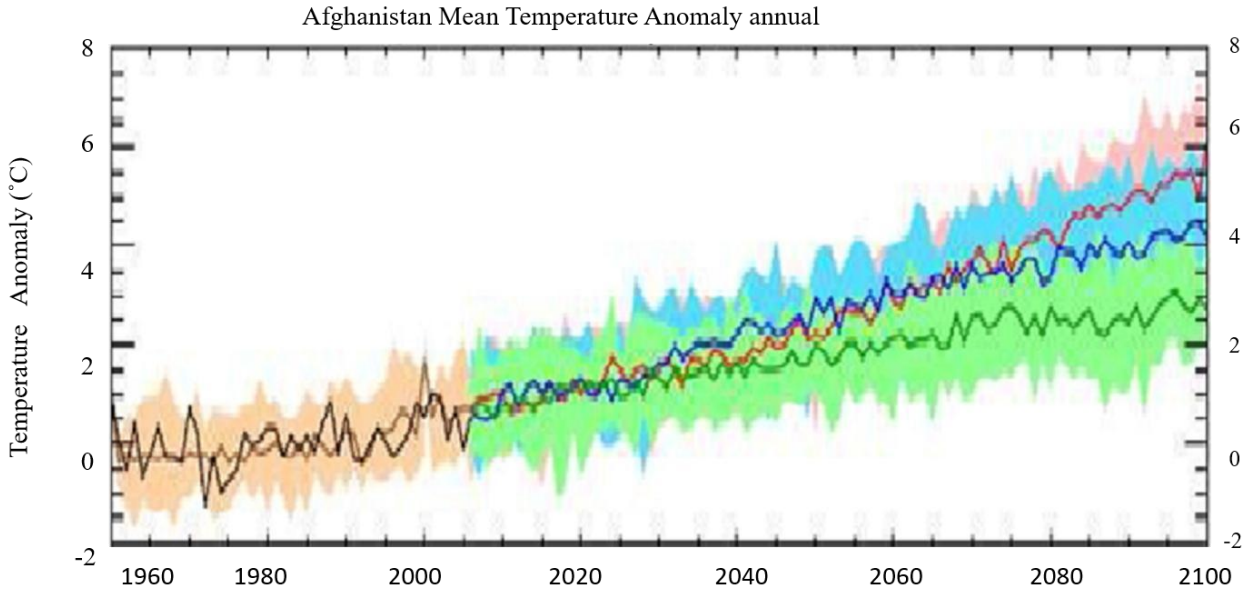

Figure 3 change in temperature to 2100 under 3 emission scenarios (vs. 1970-99 average)

5.2- Changes in Precipitation

In the short term, average rainfall is projected to show a small increase, although by little more than about 10-20mm. Mean annual rainfall changes in the 2090s show conditions are generally drier (-40 mm high, -20 mm medium, -10 mm low) over much of Afghanistan. Much of the drying is due to decreases in spring rainfall (MAM). Winters are expected to be significantly drier in the South. Projections of mean annual rainfall from different models are broadly consistent in indicating decreases.

The water resources also will decrease, so farmers who are doing rainfed agriculture, they will not be able to do their farming. They may choose an off-farm job or migrate to the cities. Farmers who have paddy rice, they may change their rice to other crops or choose another type of rice which need less water. Farmers may have some artificial lakes which harvest rainwater during rainy seasons and use dripping irrigation system.

5.3- Climatic Hazards

It is projected that droughts in Afghanistan will occur recurrently and droughts will be more severe than current climate. Floods due to untimely rainfall and a general increase in temperature are of secondary importance.

However, their impacts may by amplified due to more rapid spring snow melt as a result of higher temperatures, combined with the downstream effects of land degradation, loss of vegetative cover and Land mismanagement. Nearly all of Afghanistan's 34 provinces have been hit with one or more natural disasters, including flooding, landslides, drought, and extreme heat and freezing weather [31].

The occurrence of snowmelt-related drought caused by reduced winter snowfall in parts of the Hindu Kush Mountains seems to have primarily affected Kabul and surrounding regions. These densely populated areas, which produce much of the country's vegetables, fruits and cereals are heavily dependent on irrigation from the Kabul River and its tributaries, which are partly fed by snowmelt from the Hindu Kush [29]

There are many ways that government should avoid from the drought. And the best way is water band constriction to collect all water in winter seasons.

Farmers should be trained to improve irrigation scheduling of different crops and restrict irrigations to critical growth stages of the crop to mitigate the effects of dry spell and ensure reasonably good yields [11].

Conclusion

Among all the problems that Afghanistan has faced in last three decades, one of them is regular occurrence of droughts. Afghanistan has experienced severe droughts

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in the past and will experience more droughts in the future too. In Afghanistan livelihood of about 80% of people is dependent on agriculture and animal husbandry.

Farmers have also their own traditional strategies to cope with adverse effects of drought. They may sell their land, livestock and other financial savings such as gold, jewelries, farming machineries, sewing machine and other things. They may migrate to other areas, do some off-farm jobs, shift their crop patterns or use some other drought resistant seeds to compensate their lost and run their livelihood, provide food for their family and stay survive. But practice of these coping strategies is dependent on their coping capacities, it means their livelihood assets. Adaptive capacities are different, so the level of vulnerability to drought is not equal among the people in a community. Mostly, just practicing traditional adaptive strategies are not enough to reduce or mitigate the negative effects of drought, so the government and other non-government organizations can play an important role to mitigate and provide relief for farmers. At national level there should be an action plan to manage the drought for a long term, because droughts are recurrent events in Afghanistan. Short term strategies cannot meet all the necessities and make the farmers more and more vulnerable to droughts. Farmers are the main producers in Afghanistan, so when they suffer, economy of the country will suffer.

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