

Pakistan Meteorological Department

Drought Bulletin of Pakistan



April-June 2017

National Drought Monitoring Centre

Pakistan Meteorological Department

Sector H-8/2, Islamabad – 44000, P.O.Box#1214,

Phone # +92-51-9250598, Fax # +92-51-9250368

Website: www.pmd.gov.pk, Email: dirndmc@gmail.com

Drought Bulletin

April – June, 2017

S.No.	Contents	Page No.
1.	Introduction	3
2.	Historical Background	5
3.	Rainfall Distribution(April –June) 2017	5
	<ul style="list-style-type: none"> • Rainfall andTemperature 	7
4.	Drought products;	9
	<ul style="list-style-type: none"> i. Standardized Precipitation Index analysis 	9
	<ul style="list-style-type: none"> ii. Cumulative Precipitation Anomaly 	9
	<ul style="list-style-type: none"> iii. Soil Moisture Analysis 	11
	<ul style="list-style-type: none"> iv. Water level of Reservoirs 	12
5.	Agriculture	12
5.1	<ul style="list-style-type: none"> • Crop Condition:April-2017 	12
5.2	<ul style="list-style-type: none"> • Crop Condition:May-2017 	13
5.3	<ul style="list-style-type: none"> • Crop Condition: June: 2017 	14
6.	District wise impact of drought	15
7.	Government reactions to drought	15
8.	Recommendations	16
9.	Acknowledgement	16
10.	References	16

This bulletin is regularly published on Quarterly basis under the guidance of Mr. Hazrat Mir, Chief Meteorologist, National Drought Monitoring Centre(NDMC), Islamabad.

Editor: Dr. Azmat Hayat Khan, Director, NDMC, Islamabad

Sub-Editor: Mr. Shahzada Adnan, Meteorologist, NDMC, Islamabad

Quarterly Drought Bulletin

April – June, 2017

By

National Drought/Environment Monitoring & Early Warning Centre,
Pakistan Meteorological Department,
Islamabad

1. Introduction

Pakistan has a long latitudinal extent and the rainfall variability during different seasons is considerably high. The climate of the country in its lower southern half is arid and hyper-arid while the northern half of country lies between semi arid to very humid. Some regions of the country in each seasons, remain drastically dry and area always vulnerable to drought. If subsequent seasons fail to generate significant precipitation, the drought conditions then are sure to take the vulnerable regions in the grip. All the provinces of Pakistan have a history of facing major droughts in the past.

Drought differs from other natural disaster (e.g. flood, tropical cyclones, tornadoes and earthquakes etc) in the sense that the effects of drought often accumulate slowly over a considerable period of time and may linger for years even after the termination of the event. Because of this drought is often referred to as a “Creeping Phenomena”. Drought impacts are less obvious and are spread over large geographical areas than are the damages that results from other natural hazards. Consequently drought affects more people than any other environmental hazard.

Unfortunately, no organizations dealing with the drought issues exist in Pakistan and the responses to drought for the distressed economic and social sector, whenever such situation arose, were taken on emergency and on adhoc basis. It is thus inevitable need of the time and Pakistan Meteorological Department (PMD) took an initiative to establish National Drought/Environment monitoring and Early Warning Centre (NDMC) in 2004-05 after the worst drought during 1999-2001 in Pakistan. The main objective is to monitor drought situation in the country and issue advisory before time. Its national centre is in Islamabad while four Regional Drought Monitoring Centers (RDMC’s) are in Lahore, Karachi, Peshawar and Quetta. These four RDMC’s cover those region which comes under their jurisdiction. These centers serve as a hub for the monitoring,

collection, consolidation and analysis of drought related data from all the possible sources in the country. In order to strength the network, 50 Automatic weather stations (AWS) have been installed in different regions particularly the drought prone areas of the country. The data of eleven meteorological parameters (air temperature, humidity, wind speed, wind direction, dew point, sea level pressure, station level pressure, solar radiations, soil moisture at standard depths(5,10,20,50,100)cm and snow level are transmitted through satellite and GPRS technology after 3 hours. So, it has now become easy to access the data of remote areas of the country. NDMC has installed 335 Ordinary Rainguages have been installed at districts level in four provinces as shown in figure-1

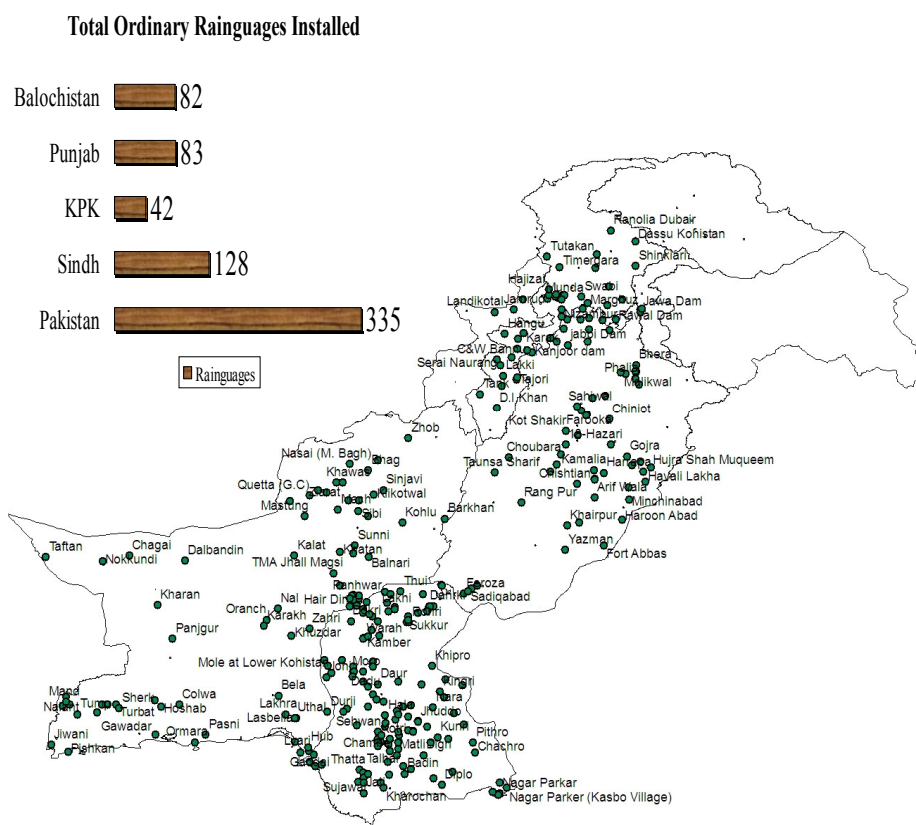


Figure-1 Rain-gauges Network of Pakistan by NDMC

NDMC also monitoring the water level situation of small dams in Barani areas of the country. NDMC using different indices like Standardized Precipitation Index (SPI), Normalized difference Vegetation Index (NDVI), Cumulative Precipitation Anomaly (CPA), Rainfall Anomaly Index (RAI), Percent of normal, Probability of occurrence, Percentage departure and soil moisture analysis etc to monitor drought. NDMC issues fortnightly drought bulletin of the country.

Negotiations are underway with NGO's and National Disaster Management Authority (NDMA) for utilization of drought advisories / bulletin to end users.

2. Historical Background.

The Indian sub-continent is predominantly characterized by a tropical monsoon climate and entire regime is distinguished mainly by the differences in rainfall both in quantity and distribution. The most important feature is the regional and temporal alteration of atmospheric flow patterns associated with monsoon. There are two rainfall systems operating in the region (a) Southwest or Summer monsoon and (b) Northeast or the Winter monsoon.

Fortunately Pakistan also falls in this region which receive heavy amount of rainfall in summer due to SW monsoon and in winter due to western disturbances. The summer monsoon accounts for 70 to 80% of the annual rainfall over major parts of South Asia (IMD, 2009). In Pakistan, summer monsoon accounts 60 to 70% of the annual rainfall during July to September (Chaudhry, 1992). There is a large variability in the monsoon rainfall on both space and time scales.

Droughts in Pakistan region are mainly due to various kinds of failures of rains from southwest monsoon. Also there seems to be some association between El Nino and La Nina events and weak monsoons. Pakistan frequently experiences several droughts. The Punjab province experienced the worst droughts in 1899, 1920 and 1935. Khyber Pakhtunkhwa (KPK) experienced the worst droughts in 1902 and 1951, while Sindh had its worst droughts in 1871, 1881,1899,1931,1947 and 1999. Over a more than hundred year period between 1871-1988, 11 out of 21 drought years were El Nino years. The El Nino phase of the Southern Oscillations (ENSO) has a direct impact on drought in Pakistan as it poses mainly negative impact on summer monsoon.

Due to climate change, wet and dry cycles some years we receive more rains in wet spell and in dry spell we receive less rain. Due to less rain we have drought and heavy rain we have floods (flash flood, urban flood, coastal flood and river flood).

3. Rainfall Distribution (April–June) 2017

During the second quarter of the year (April-June) 2017, Slightly below normal (-19.96%) precipitation was observed over Pakistan. During the quarter high temporal and spatial variability precipitation was observed. Normally May and June are the hottest months in the country and northern areas and south western parts received very less amount of rainfall. However, some convection rainfall lessened the moisture stress in the country along with some gusty winds. The evaporation rate remained very high during this quarter. But during this quarter, amount of rainfall was below normal as predicted by the Pakistan Meteorological department in seasonal forecast.

During April 2017, well-below normal(-100.0 %) rainfall received in Sindh, (-93.0%) in Balochistan, (-42.5%) in Gilgit-Baltistan/Kashmir and below normal (-41.6%) in KP. During May 2017, rainfall was below normal in Gilgit-Baltistan/Kashmir (-74.7%), in Sindh (-61.7%) in KP (-43.4%), Balochistan (-14.5%) and Punjab (-11.7%). During June 2017, amount of rainfall was well above normal in Sindh (197.2 %), Balochistan (112.4%), and 54.40% in Punjab whereas it was below normal in Gilgit-Baltistan/Kashmir (-48.2%). The figure shows the percentage area weighed departure rainfall occurred during (April-June) 2017. Viewing the rainfall distribution on province basis, over Sindh and KP Punjab, it was highly above-normal (53.0%) and (41.2%) respectively, over Balochistan (19.8%), while It was well below normal over GB-Kashmir (-121.5) and Punjab(-43.9%) as shown in figure-2

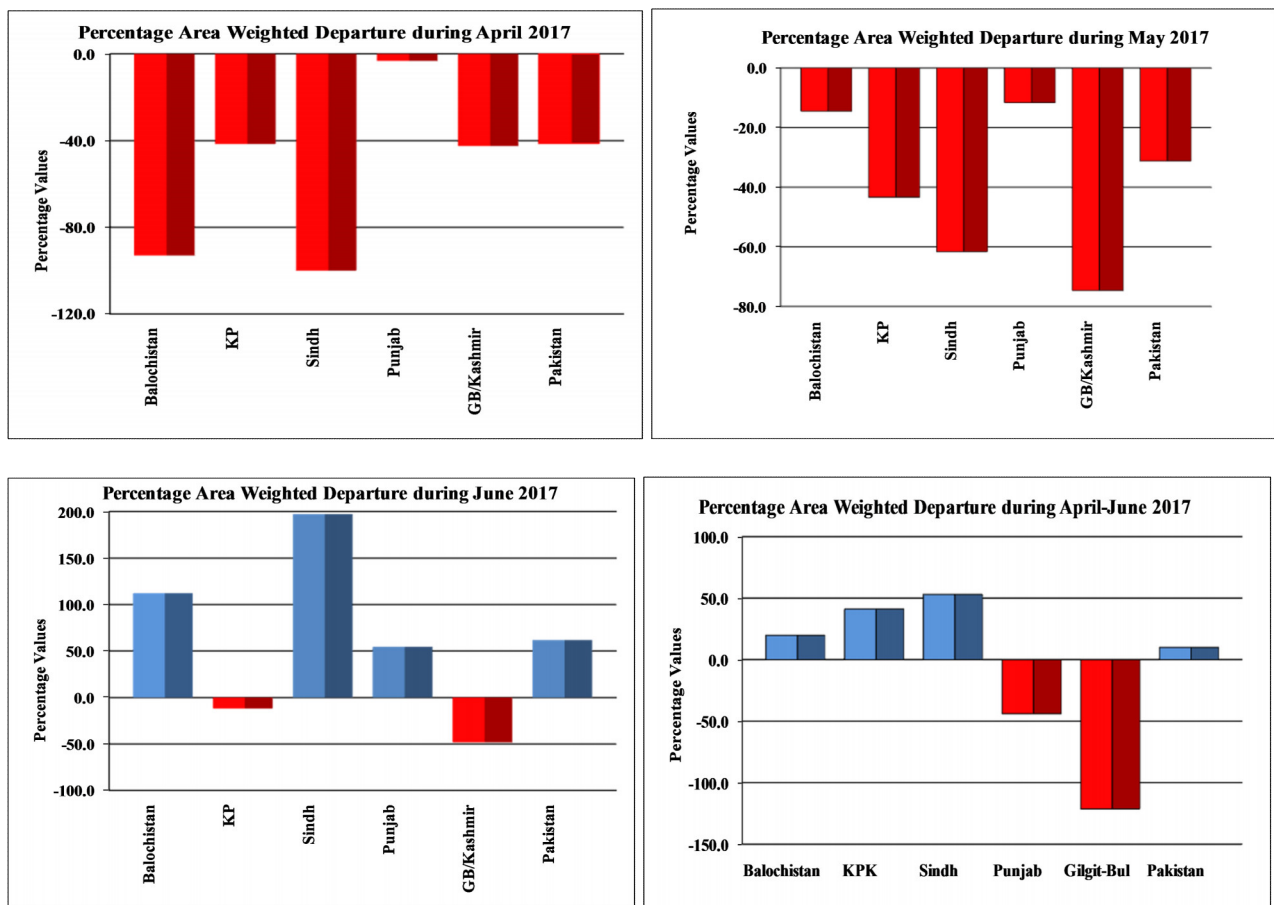


Figure-2 percentage departure of rainfall during (April-June) 2017

Despite some cooling of the tropical Pacific Ocean surface waters, ENSO indicators remain neutral and well shy of La Niña thresholds. In contrast, a strong negative Indian Ocean Dipole (IOD) event continues, with ocean temperature well above average in the eastern Indian Ocean and below average near Africa All climate models indicate more cooling of the tropical Pacific Ocean is

likely, but only two of eight models exceed La Niña thresholds for an extended period. A La Niña Watch (indicating a 50% chance of La Niña in 2017) remains, but if La Niña does develop it would most likely be weak. The monthly and seasonal analysis on regional and country basis are as shown below in figure-3.

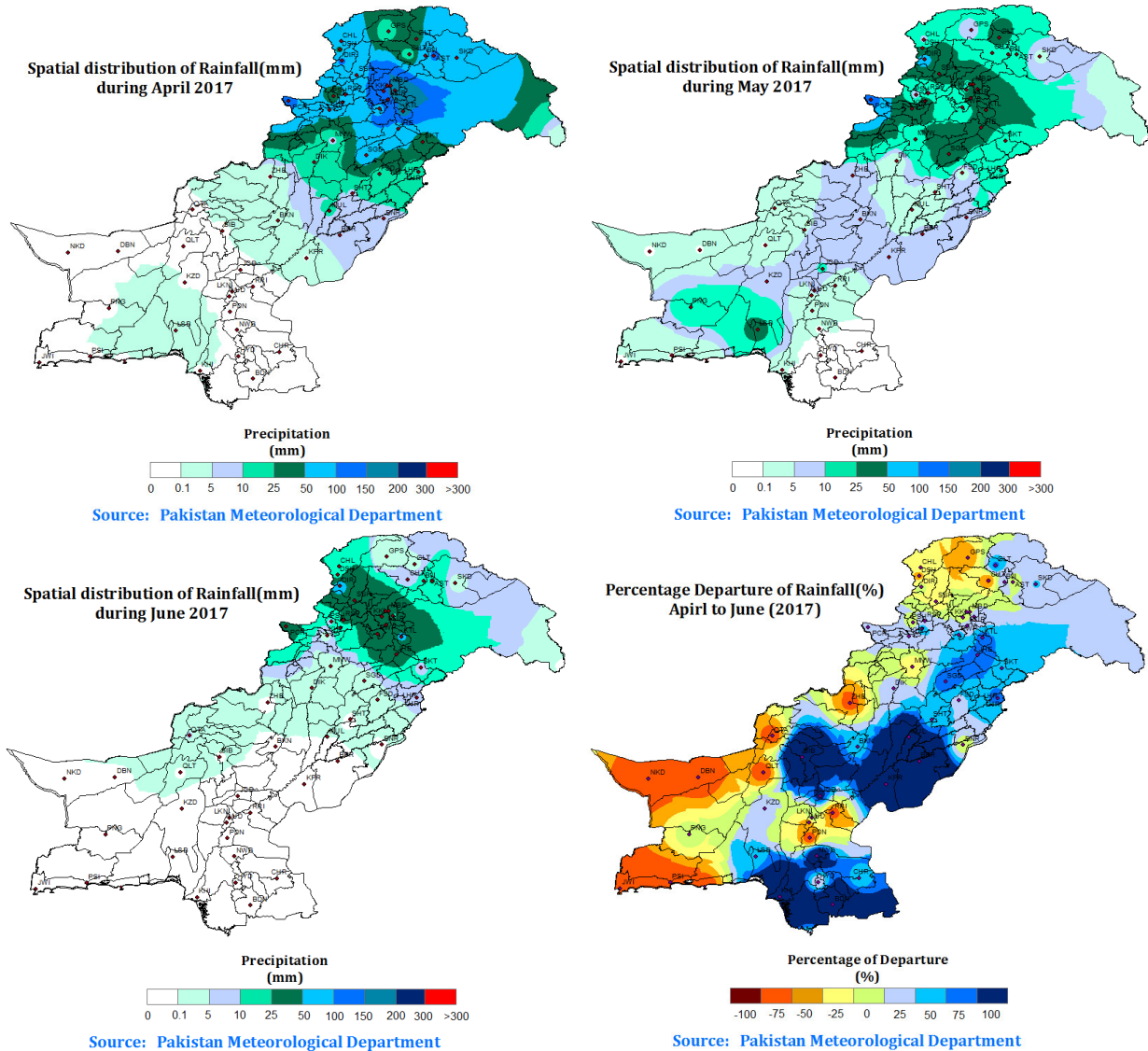


Figure-3 spatial distribution of rainfall during (April-June) 2017 of Pakistan

- **Rainfall and Temperature**

April 2017: Water is the most important climatic factor that is very vital for the existence of plants. Punjab, KP, GB and AJ&K received three rainfall spells during 1-4, 9-11 and 17-20 April. Sindh and Balochistan received light rain showers. In general Punjab received around 20 mm of rainfall. The rainfall was on highside in Murree and other northern parts of the province. It gradually

tapered towards south with Sargodha receiving 21 mm, Multan 22 mm and D.G Khan 25 mm. The rainfall in the plains of KP was around 100 mm. The mountainous ranges of Malam Jabba received rain of 371 mm, Parachinar 264 mm, Kalam 346 mm, Dir 237 mm, Saidu Sharif 186 mm, Chitral 150 mm, Mirkhani 125 mm, Balakot 111 mm, Drosh 102 mm, Lower Dir 101 mm. In Balochistan only Zhob received rainfall of 46 mm and Barkhan 42 mm. Sindh remained almost dry. Maximum and minimum temperatures remained normal during April.

May 2017: In May winds reverse their direction with weak monsoon currents from Bay of Bengal and currents strengthen in July. Punjab, KP, GB and AJ&K received four rainfall spells during 3-5, 10-12, 22-25 and 30-31 May. Sindh and Balochistan received light rain showers on 3-5 May. The rainfall was on highside in Murree and other northern parts of the province. It gradually tapered towards south with Sialkot receiving 53 mm, Gujranwala 43 mm, Lahore 32 mm, Sargodha 30 mm, Chakwal 28 mm, Jehlum 26 mm, D.G Khan 15 mm and Multan 5 mm. The rainfall in the plains of KP was around 50 mm. The mountainous ranges of Malam Jabba received rain of 46 mm, Parachinar 265 mm, Kalam 90 mm, Dir 88 mm, Saidu Sharif 42 mm, Chitral 27 mm, Mirkhani 38 mm, Balakot 56 mm, Drosh 41 mm, Lower Dir 22 mm. In Balochistan Lasbela received rainfall of 31 mm, Barkhan 16 mm and Quetta 11 mm. In Sindh Padidan received rainfall of 23 mm, Dadu 18 mm and Shaheed Benazirabad 17 mm. Maximum and minimum temperatures remained normal during May

June 2017: Punjab, KP, GB and AJ&K received four rainfall spells during May and five during June. Sindh and Balochistan received 1 light rainfall in May and June each. The rainfall was on highside in Murree and other northern parts of the province. Murree received a rainfall of 245 mm and Jhelum 169 mm. The rainfall tapered towards the south with Sialkot receiving 157 mm, Sargodha 150 mm, M.B Din 149 mm, Lahore 149 mm, Chakwal 142 mm, Noorpur Thal 122 mm, Islamabad 112 mm, Gujranwala 107 mm. The Southern parts of Punjab received less than 100 mm of rain. The mountainous ranges of Parachinar received rain of 527 mm, Balakot 235 mm, Malam Jabba 208 mm, Dir 159 mm, Kakul 157 mm, Kalam 131 mm and rest of KP received less than 100 mm. In Balochistan, Sibbi received rainfall of 71 mm, Barkhan 66 mm and Lasbela 30 mm. In Sindh, Rohri received rainfall of 26 mm, Padidan 23 mm and Shaheed Benazirabad 17 mm

Drought products

i. Standardized Precipitation Index (SPI)

The Standardized Precipitation Index (SPI) was developed for the purpose of defining and monitoring drought (McKee *et al.*, 1993). The SPI calculation for any location is based on a series of accumulated precipitation for a fixed time scale of interest (i.e. 1, 3, 6, 9, 12, months). Positive SPI values indicate greater than median precipitation, and negative values indicate less than median precipitation. Because the SPI is normalized, wetter and drier climates can be represented in the same way, and wet periods can also be monitored using the SPI. Here we are including one month and seasonal maps show the drought conditions of the monsoon season in the country.

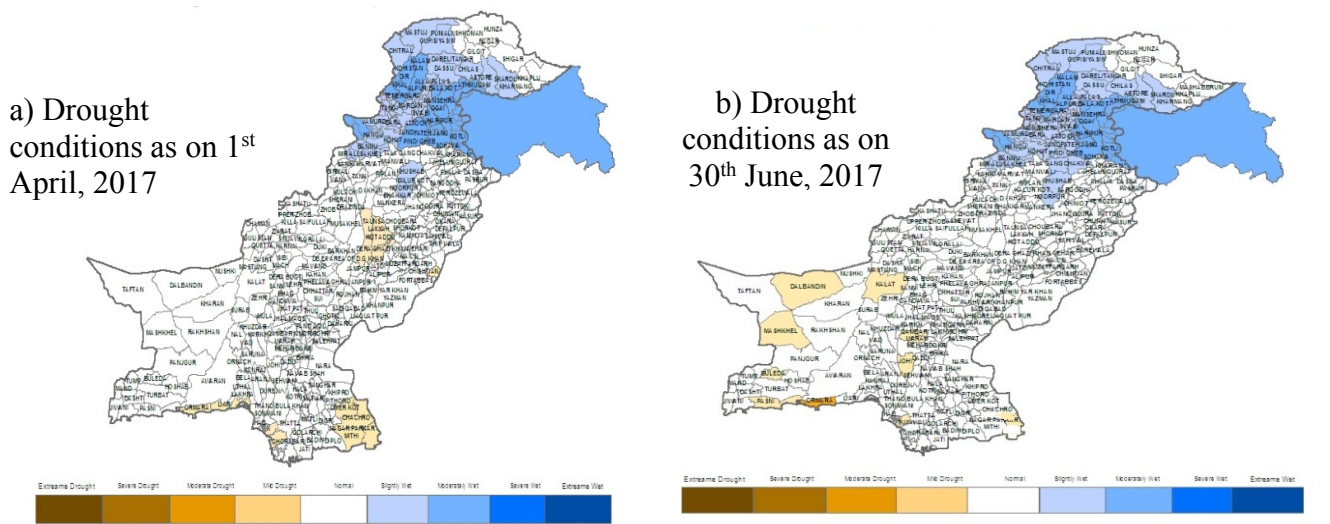


Figure-4 Drought conditions of Pakistan

Due to deficient rainfall, mild to moderate drought conditions emerged in lower Sindh, southern Punjab and coastal areas of Balochistan. Moreover, appreciable amounts of rainfall has been recorded over agricultural plains of the country that demands availability of more supplementary irrigation water for Rabi crops which are at grain formation stage and therefore the water requirement is satisfactory

ii. Cumulative Precipitation Anomaly (CPA)

Westerly rain bearing systems will remain active over Pakistan with the decreasing frequency of occurrence as compared to the peak winter months. The northern parts of the country will be mainly influenced by these weather systems and frequency of precipitation days would be greater in these areas as compared to other parts of the country. Some precipitation associated with thunderstorm/ hailstorm is also expected due to local weather developments in the northern parts.

During April to June 2017, it was observed that Cumulative Precipitation Anomaly was positive in southern west Balochistan, southern Sindh and upper KP regions. Even the day time temperature and evapotranspiration were higher as compare to the previous quarter yet the conditions are satisfactory and no moisture stress has observed especially lower and central regions of the country. While the barani areas of KPK,GB-Kashmir, Potohar regions and some parts of southwestern coast of Balochistan were under moisture stress.

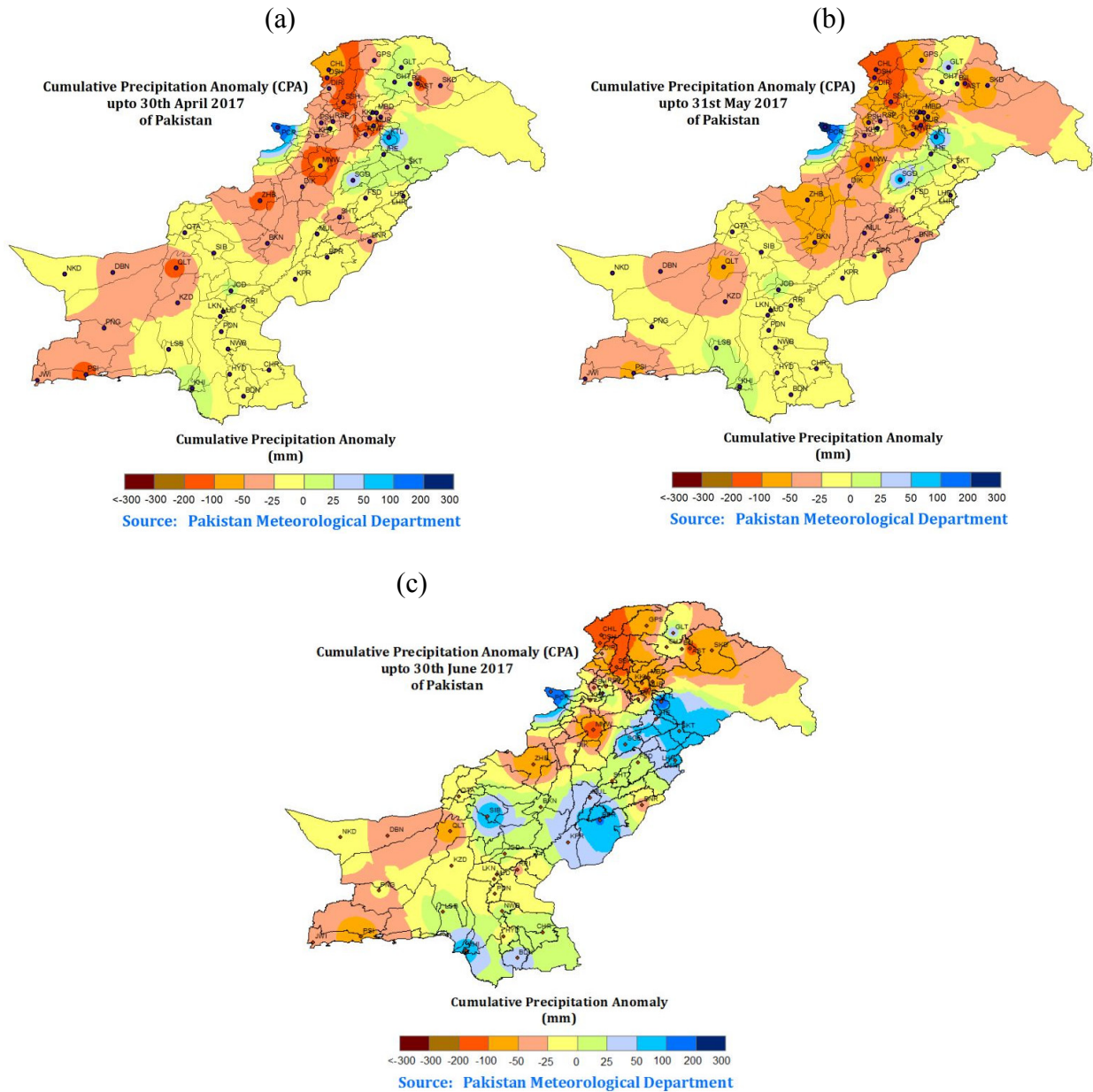


Figure-5 Cumulative precipitation anomaly during (April-June) 2017 of Pakistan

iii. Soil Moisture Anomaly (SMA)

Due to the above normal rainfall during April-June in the country, no significant moisture stress was observed in the country. However central and western regions of Balochistan have shown some stress due to low amount of rainfall in these areas as shown in figure-6. Soil moisture conditions in north eastern Punjab were slightly under stress. It was predicted that rainfall will be above normal in April-June 2017 due to which soil moisture stress may be lessen especially in the southern parts of the country. It was also predicted that the coming monsoon rainfall 2017 may help to over come this moisture stress in the country.

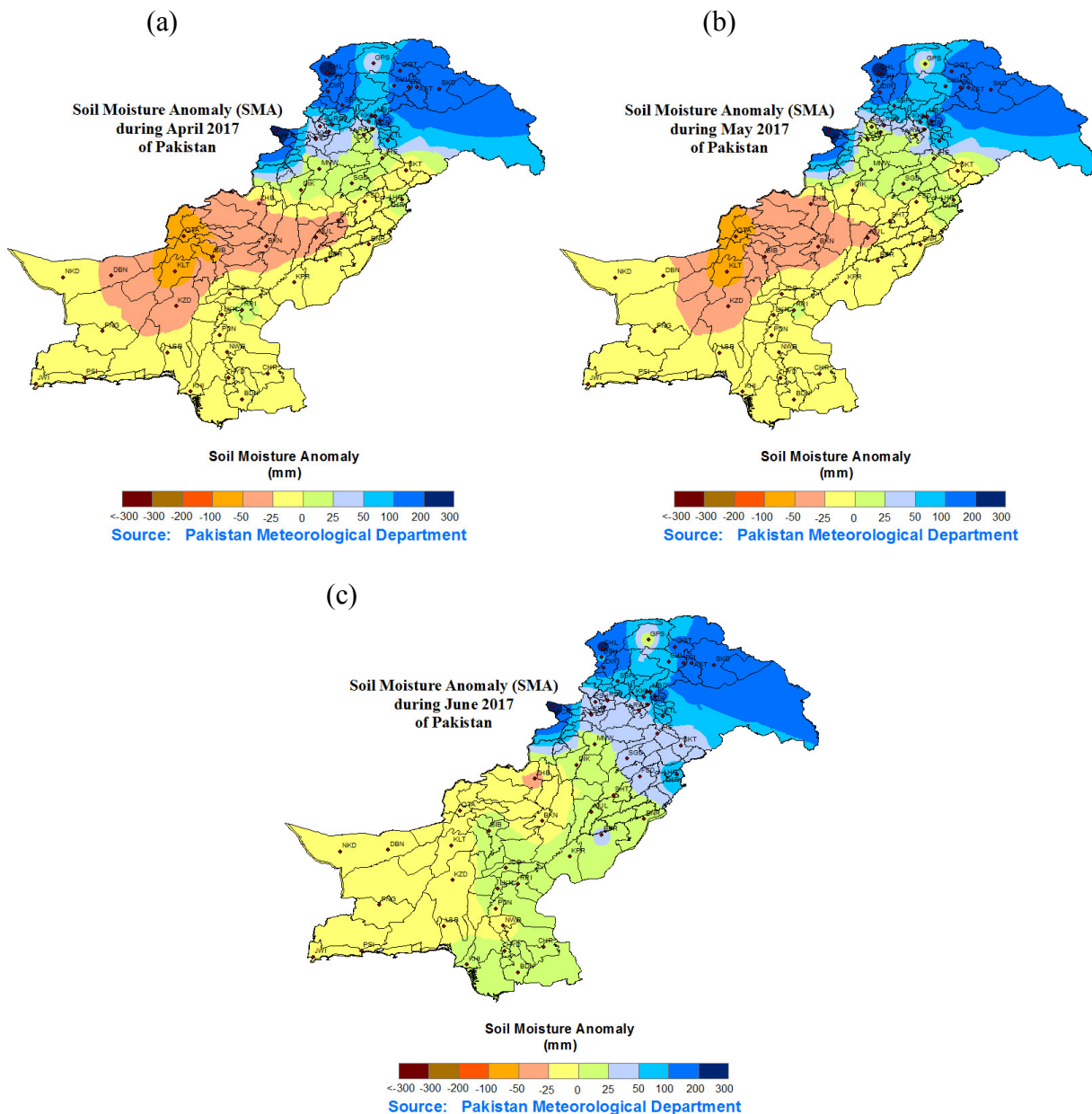


Figure-6 soil moisture anomaly during (April-June) 2017 of Pakistan

iv. Water Level of Reservoirs

Pakistan has two main reservoirs of water in the form of dam i.e. Tarbela and Mangla. The dead level of Tarbela is 1378feet while maximum conservation level is 1550feet while Mangla has dead level of 1040feet and maximum conservation level of 1242 feet. Due to pre-monsoon rains, along with the snow melting play an important role to water level of dams. In addition, small dams in various parts of the country were also filled to their capacity that would help boost agriculture and improve socio-economic activities in the country. Percentage of average water level during April to June 2017 was calculated for both dams are shown below in figure -7;

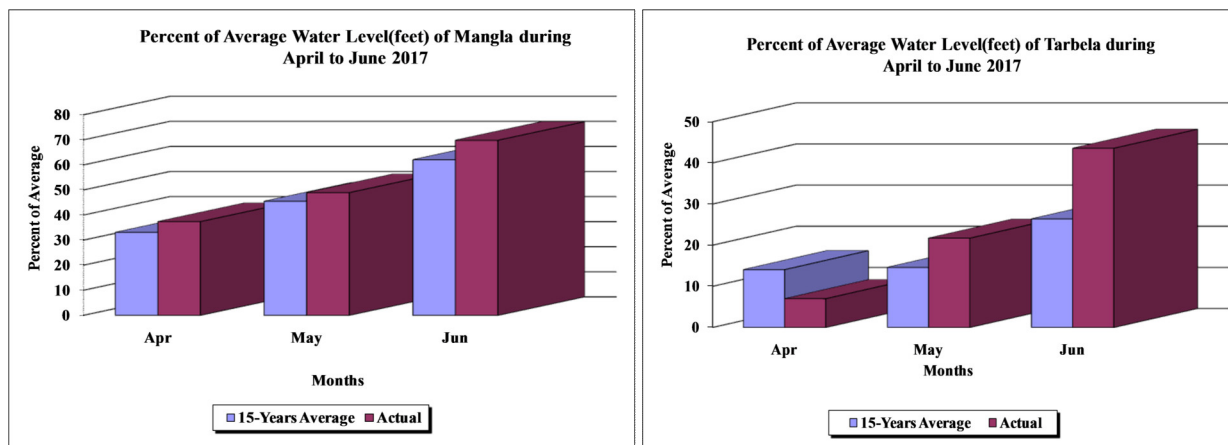


Figure-7 percent of water level of Tarbela and Mangla during (April-June) 2017

4. Agriculture

Agriculture is main livelihood of about 70% population of the country. Due to direct relationship between agriculture and water scarcity/drought, drought mapping data is of vital importance. Efforts are being made to inform farmers of drought information in a timely fashion for better utilization of data.

5.1 Crop Condition:April-2017

The rabi season at the end of April, was half way through in Punjab, Upper Sindh, Balochistan and Southern KP. Hopefully the harvesting would be over in most parts of these areas by mid-May. The harvesting in Peshawar valley and northern areas generally extends upto June and beyond.

- Wheat Crop

Crops in Potohar region suffered from medium drought due to fewer rains in early part of the season and have reached harvesting stage. In Potohar, manual harvesting is common procedure and only threshing is carried out by threshers on barter system or rent. This year Government has decided not to increase the support price. In last four years the price had been increased impacting the prices of the commodity. The purpose of this was to keep a balance between the wheat producing farmers and the users. The maximum temperatures during last fortnight of March in upper parts of Punjab and KP poised at less than 20°C and in southern parts at less than 29°C. These temperatures are highly favorable for filling of grains and increasing productivity of the crop

- **Maize crop**

Two crops of Maize are grown in Pakistan viz. autumn crop during June to August and spring crop during February to March. Spring maize was at silking stage during April in major growing districts of Punjab. These districts includes Sahiwal, Okara, Pak pattan, Chiniot, Sialkot and Kasur. The crop is gaining popularity in adjoining districts of Khanewal, Vehari, Multan and Jhang. The abundant rainfall during early period proved highly beneficial for the crop. The crop will be harvested in June.

5.2 Crop Situation: May, 2017

The spring maize crop is at cobbing stage after completing tasseling and silking stages and would be harvested in early June. The February-March sown sugarcane crop is at suckering stage and the September sown crop is at prime stage of rapid growth. Early sown cotton in Punjab and Sindh is at flowering stage. However major sowing of the cotton area was carried during April-May in Sindh. The large areas of cotton were sown during May and the operation will continue further during early June. The major activity of the Rabi season during early May was harvesting of wheat crop.

- **Spring Maize Crop**

Spring maize crop is mainly grown in Punjab. There are two cropping seasons of maize crop viz. autumn and spring. The crop is irrigated in Central Punjab and generally sown under upland system in other areas. Spring maize is generally confined to Central Punjab/Pind Dadan Khan Tehsil of Jhelum on the right bank of the river. This crop is sown in February-March and harvested up-to June. The main growing districts include Okara, Pakpattan, Sahiwal, Faisalabad, Chiniot,

Kasur, Jhelum and others. The crop completed tasseling and silking stages in April-Early May. The crop was at grain filling and maturity stage toward the end of May. Crop is at grain formation stage and will be harvested in early June.

- **Cotton Crop**

The optimal sowing time for cotton in Sindh is from April to Mid-May while in Punjab, it is from May to mid of June. The field information indicate that about 8-10 percent of the cotton crop is sown early during the months of February and March in both these provinces. However the farmers draw out the sowing timelines on either side, both early and late to match the thinly spread irrigation water supply. The sowing of early cotton starts in February in Punjab. This situation has been corroborated to combat the attack of cotton leaf curl virus. The main crop is sown in March-May in Sindh and May-June in Punjab.

- **Sugarcane Crop**

In Sindh 75 percent of sugarcane crop area (2015-16) was sown in September while the rest of the area was sown during February and March 2017. In most parts of Punjab and KP sugarcane was sown during February and March, 2017. Crop is at healthy growth stage in most parts of the countries due to sufficient water availability.

- **Rice Crop**

The rice crop is still at nursery stage in most parts of the country. By end of May Basmati rice in North eastern region of Punjab was at nursery plantation stage and are required to be sown after 20th May by a legislation aiming at breaking life cycle of rice borer by eliminating the host plants.

5.3 Crop Situation: June, 2017

The growth of Kharif season crops i.e sugarcane and cotton are progressing during the month of June. Sugarcane crop is at early growth stage. The cotton crop is at boll formation stage in Sindh and in some limited areas of Punjab, where crop was sown during February & March. The Cotton crop in major areas of Punjab is however at flowering stage.

Farmers in Khanewal and Vehari substituted part of the area by planting spring maize crop and in Muzaffargarh, the short duration Mungbean crop was sown in areas stretching along the River Chenab to assure resilience in any likelihood of flooding

Kharif Crops

- **Maize Crop**

Spring maize crop is mainly grown in Punjab. There are two cropping seasons of maize viz. autumn and spring. The crop is irrigated in Central Punjab and generally sown under upland system in other areas. The main growing districts include Okara, Pakpattan, Sahiwal, Faisalabad, Chiniot, Kasur and Jhelum. This crop is sown in February-March and harvested by June.

Harvesting of spring maize in Sahiwal division took pace during June and almost completed except the late sown maize during April, which will be harvested in first decade of July.

- **Cotton Crop**

Cotton crop is a perennial plant with an indeterminate growth habit which has no distinct stage between vegetative and its reproductive stage. This characteristic makes cotton picking a multi-stage picking phenomenon. It has a very dynamic growth response to environment and anagement. Site-specific management strategies need to be taken into consideration to optimize yields. Furthermore, management strategies should be flexible to allow for changing environmental conditions. Cotton has one of complex insect pest and disease problem in main growing areas of Punjab and Sindh. Most common are CLCV, bollworms, dusky cotton bug, whitefly thrips, armyworm, jassids and others.

Cotton in Sindh is promising this year and has reached the blooming stage. A few Ginning actories have started operation by mid of June based on small scale cotton picking. It is expected that cotton production will be on higher side, if crop acreage and crop growth is not affected by rains/river floods later in the season.

5 District wise impact of drought

Due to wetter than normal season, no serious negative impacts of drought have been reported from any part of the country. However there is mild to moderate drought reported in some of the southern parts of Sindh, Punjab and coastal regions of Balochistan.

6 Government reactions to drought

Due to above normal rainfall, drought conditions subside in most parts of the country however some of the barani areas of lower KPK, adjoining Punjab, southwest Balochistan and Souteastern parts of Sindh(Tharparkar region) are under mild drought. Moreover, light to moderate rainfall has been recorded over agricultural plains of the country that fulfill the water requirement of the crop to some extent. However availability of more supplementary irrigation water for Rabi crops may be carried out during grain formation stage as water requirement may be high.

The water availability in major reservoirs is sufficient due to above normal snowfall in the catchments areas, water situation in the dams will improved with the increase of temperature. It is therefore advised to all stakeholders for an immediate water management strategy to avoid negative impacts of deficit rainfall on agriculture sector. NDMC continued its monitoring activities and drought monitor was regularly updated on fortnightly basis at PMD website <http://www.pmd.gov.pk/ndmc/index.htm>.

7 Recommendations

Natural disaster could not be stopped. Each disaster gives us a lesson to do better planning, management and taking some precautionary measures to minimize its impacts in future. Following are some recommendations to cope with the floods and droughts in Pakistan

- Pakistan dam's water storage capacity is much less than the neighbouring countries like India. Therefore it is the need of the hour to built large and small dames in catchments areas especially the rainfall water during monsoon period.
- Manage the floods and storage the water
- The stored water will protect food security especially fulfill the water requirements of crops during drought period in the country.
- The water will also be helpful in generating hydropower electricity which is essential requirement of country and reduce the unemployment in the country.

8 Acknowledgement

National drought monitoring centre, Pakistan Meteorological Department, Islamabad acknowledges SUPARCO and district office agricultural departments for sharing the information.

9 References:

1. Chaudhry, Q.Z.1992: Analysis and Seasonal prediction of Pakistan Summer Monsoon Rainfall, Ph.D. Thesis, Univ. of Philippines, Quezon City, Philippines.
2. Edwards, D.C.; and T. B. McKee. 1997. Characteristics of 20th century drought in the United States at multiple time scales. Climatology Report Number 97-2, Colorado State University, Fort Collins, Colorado.
3. FAO report available on web at www.fao.org/news/story/en/item/89752/icode/

4. McKee, T.B.; N.J. Doesken; and J. Kleist. 1993. The relationship of drought frequency and duration to time scales. Preprints, 8th Conference on Applied Climatology, pp. 179–184. January 17–22, Anaheim, California.
5. <http://www.suparco.gov.pk/pages/pak-scms.asp>