

Pakistan Meteorological Department

Drought Bulletin of Pakistan



April-June 2014

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, 2014

S.No.	Contents	Page No.
1.	Introduction	3
2.	Historical Background	5
3.	Rainfall Distribution(April –June) 2014	5
	<ul style="list-style-type: none"> • Rainfall Spell 	7
	<ul style="list-style-type: none"> • Temperature 	8
4.	Drought products;	8
	<ul style="list-style-type: none"> i. Standardized Precipitation Index analysis 	8
	<ul style="list-style-type: none"> ii. Cumulative Precipitation Anomaly 	9
	<ul style="list-style-type: none"> iii. Soil Moisture Analysis 	10
	<ul style="list-style-type: none"> iv. Water level of Reservoirs 	11
5.	Agriculture	12
5.1	<ul style="list-style-type: none"> • Crop Condition:April-2014 	12
5.2	<ul style="list-style-type: none"> • Crop Condition:May-2014 	13
5.3	<ul style="list-style-type: none"> • Crop Condition: June: 2014 	14
6.	District wise impact of drought	16
7.	Government reactions to drought	16
8.	Recommendations	17
9.	Acknowledgement	17
10.	References	17

Quarterly Drought Bulletin

April – June, 2014

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 Raingages have been installed at districts level in four provinces as shown in 1

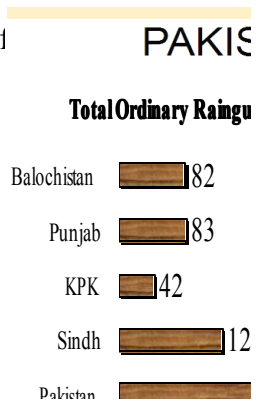


Figure-1 Rain-gauges Network of Pakistan by NDMC

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) 2014

During the second quarter of the year (April-June) 2014, Above-normal (40 %) 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 well above

normal as predicted by the Pakistan Meteorological department in seasonal forecast. During April 2014, -17 % below normal rainfall received in Sindh, in Gilgit-Baltistan/Kashmir was well below normal (-88%) and in Balochistan above normal (14.67%) and Punjab it was well above normal (57.85%). During May 2014, rainfall was below normal in Sindh (-18%), Gilgit-Baltistan/Kashmir (-42.47%) while in Balochistan and Punjab it was well above normal(167.59%) and (119.36%)respectively . During June2014, amount of rainfall was well below normal in Sindh (-99.77%), KP (-51.54%) and Punjab (-50.64%) while in Kashmir and GB it was (-32.93%). The figure shows the percentage area weighed departure rainfall occurred during (April-June) 2014. Viewing the rainfall distribution on province basis, over Sindh and GB-Kashmir, it was highly below-normal (-135%) and (-163.3%) respectively, over Khyber-PK (-39%), while It was well above normal over Punjab (126.6%) and Balochistan (143.1%) as shown in figure-2

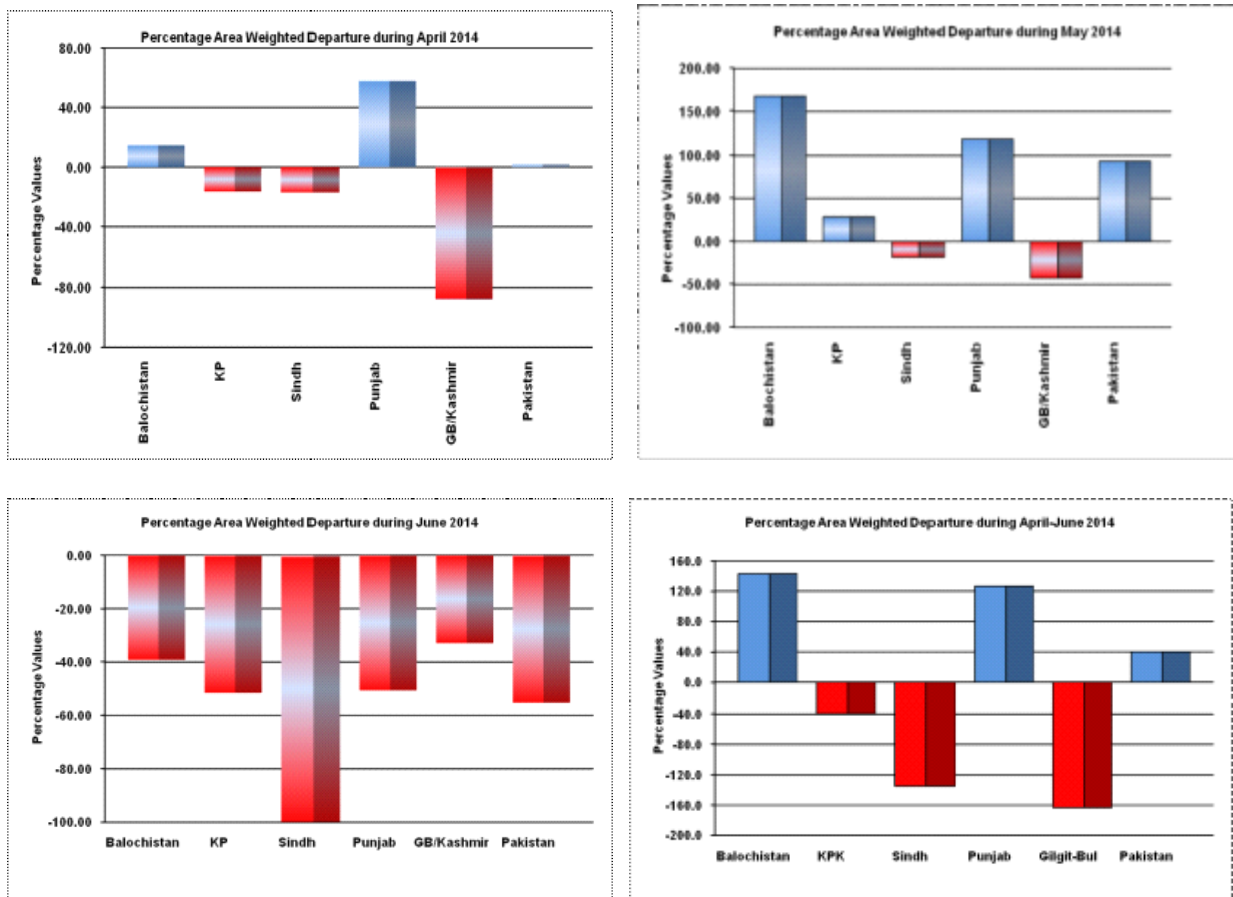


Figure-2 percentage departure of rainfall during (April-June) 2014

ENSO-neutral conditions prevailed in May 2014, following the dissipation of La Niña in April. Sea surface temperatures (SSTs) are currently near average across most of the equatorial Pacific

Ocean, and above-average in the far eastern Pacific. The monthly and seasonal analyses on regional and country basis are as shown below in figure-3.

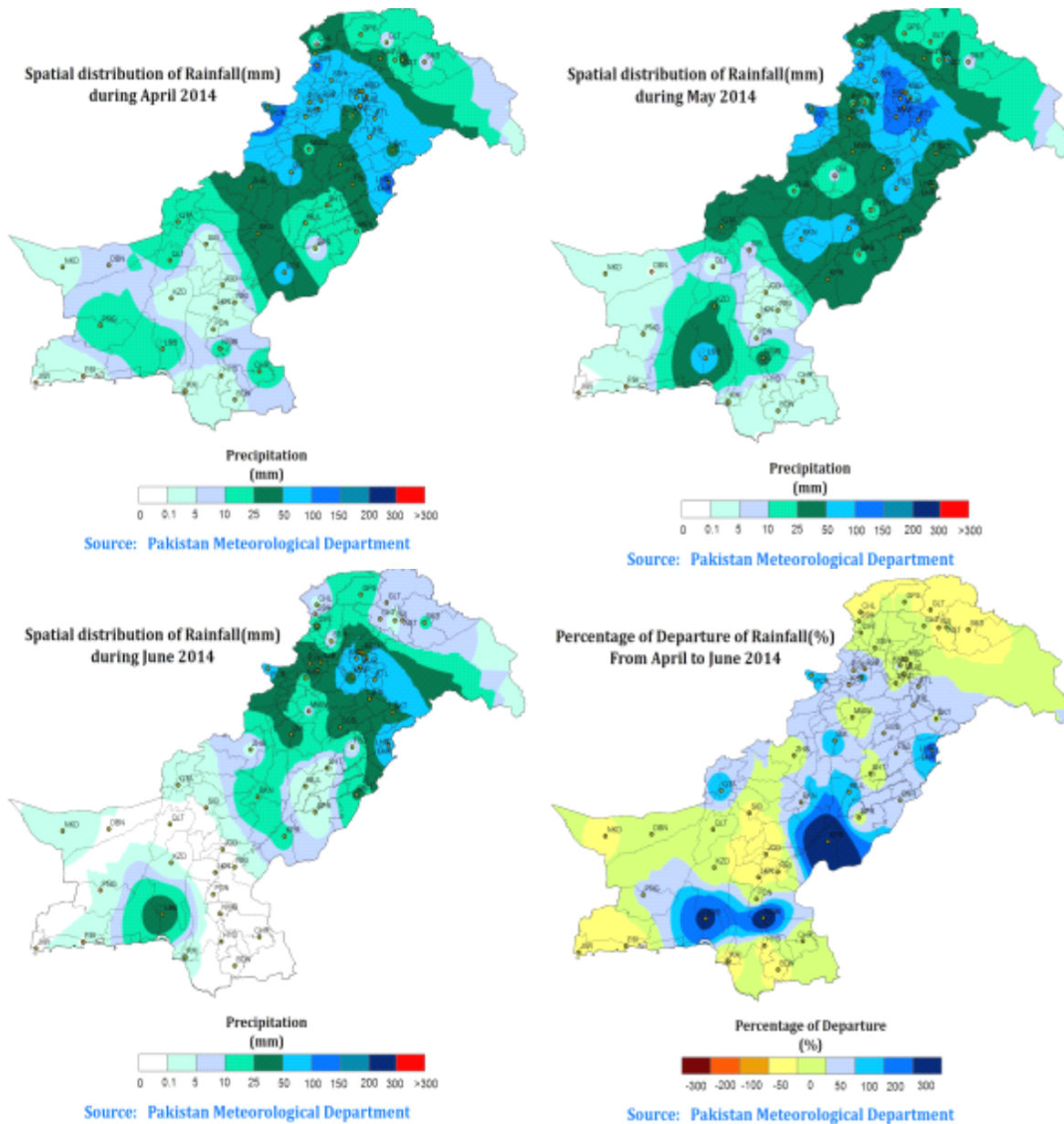


Figure-3 spatial distribution of rainfall during (April-June) 2014 of Pakistan

- **Rainfall spell**

Rainfall in April and May delayed wheat harvest process in Northern parts of Punjab and KP respectively almost three weeks. Maximum and minimum temperatures in 2nd half of the month remained 4-5 degree lower than last year due to wide spread rain spells. Temperature decrease and

Rainfall delayed the sowing of Kharif crops in some areas, but increased relative humidity in agriculture areas will be beneficent for Kharif crops

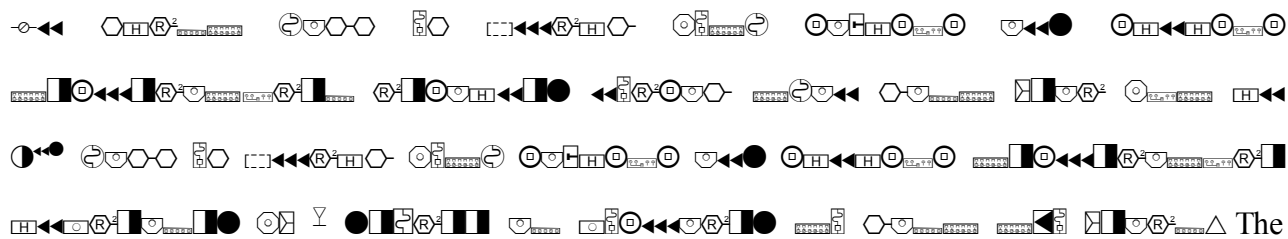
April 2014: Water is the most important climatic factor that is very vital for the existence of plants. In April wide spread rain spells were observed. Rainfall remained higher than last year except Sindh and Balochistan.

May 2014: In May winds reverse their direction with weak monsoon currents from Bay of Bengal and currents strengthen in July. This year in May rainfall was much higher than last two years in agriculture plane in two widespread rainfalls spells 7-14 and 17-19 May 2014.

Rainfall on some stations was, Faisalabad 69 mm, Islamabad 104mm, Jhang 33 mm, Mandi-Bahau-Din 79 mm, Multan 67 mm, okara 45 mm, Sargodha 39 mm, Dadu 53 mm, Shaheed Benazirabad 32 mm, Balakot 127 mm, Cherat 76 mm, Kakul151 mm, Parachinar 162 mm, Pattan 131 mm.

June 2014: In June one spell of rainfall was observed in last week of the month which was much lesser than last year. In July, normal monsoon rains are expected in Punjab, KP and Northern areas while Sindh and Balochistan will remain below normal.

• **Temperature**



The temperature remained below normal during May in most parts of the country. Day temperature also remained on higher side during June 2014.

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.

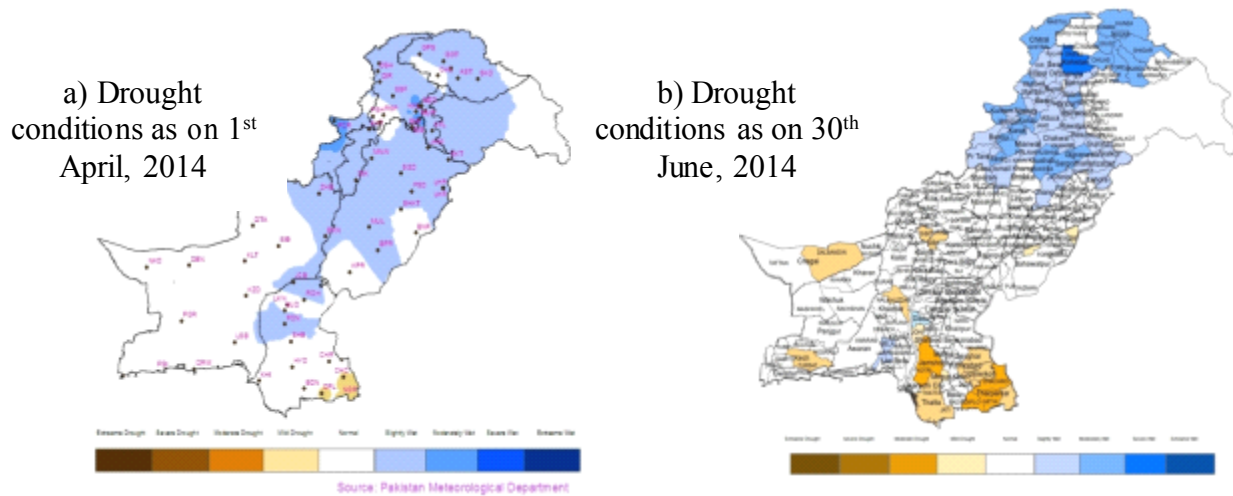


Figure-4 Drought conditions of Pakistan

Due to deficient rainfall, mild drought conditions emerged in Brunei areas of lower KPK, adjoining Punjab, Tharparkar district and southwest 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 2014, it was observed that Cumulative Precipitation Anomaly was positive in southern and central parts except some of the barani areas, extreme north and south western parts of Balochistan. 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.

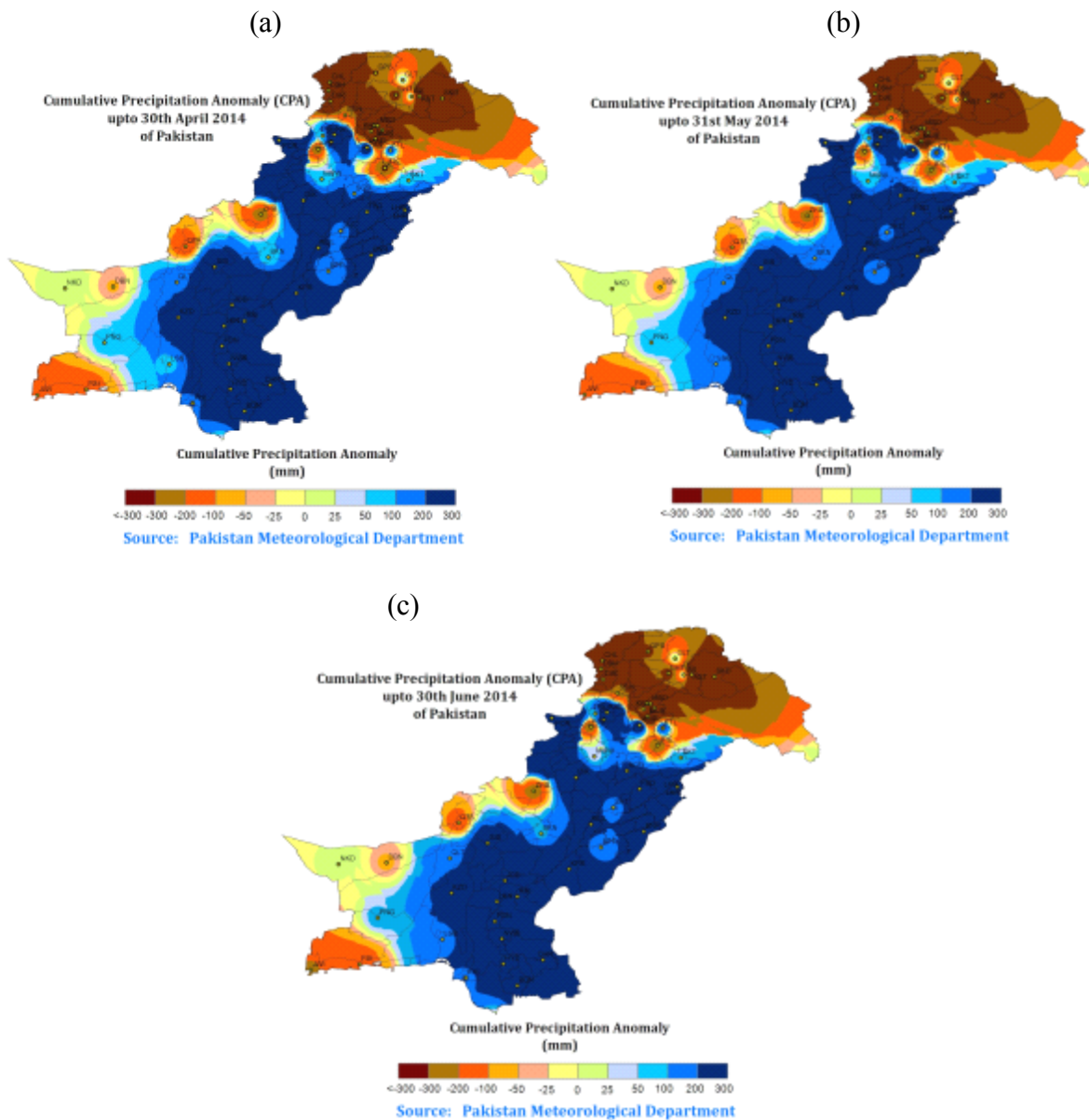


Figure-5 Cumulative precipitation anomaly during (April-June) 2014 of Pakistan

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 Potwar region and south and southwest Balochistan shown some stress due to low amount of rainfall in these areas as shown in figure-6. Soil moisture conditions in north eastern Punjab including barani areas of the country were slightly under stress. It was predicted that rainfall will be above normal in April-June 2014 due to which soil moisture

stress may be lessened especially in the rainfed areas of the country. It was also predicted that the coming monsoon rainfall 2014 may help to overcome this moisture stress in the country.

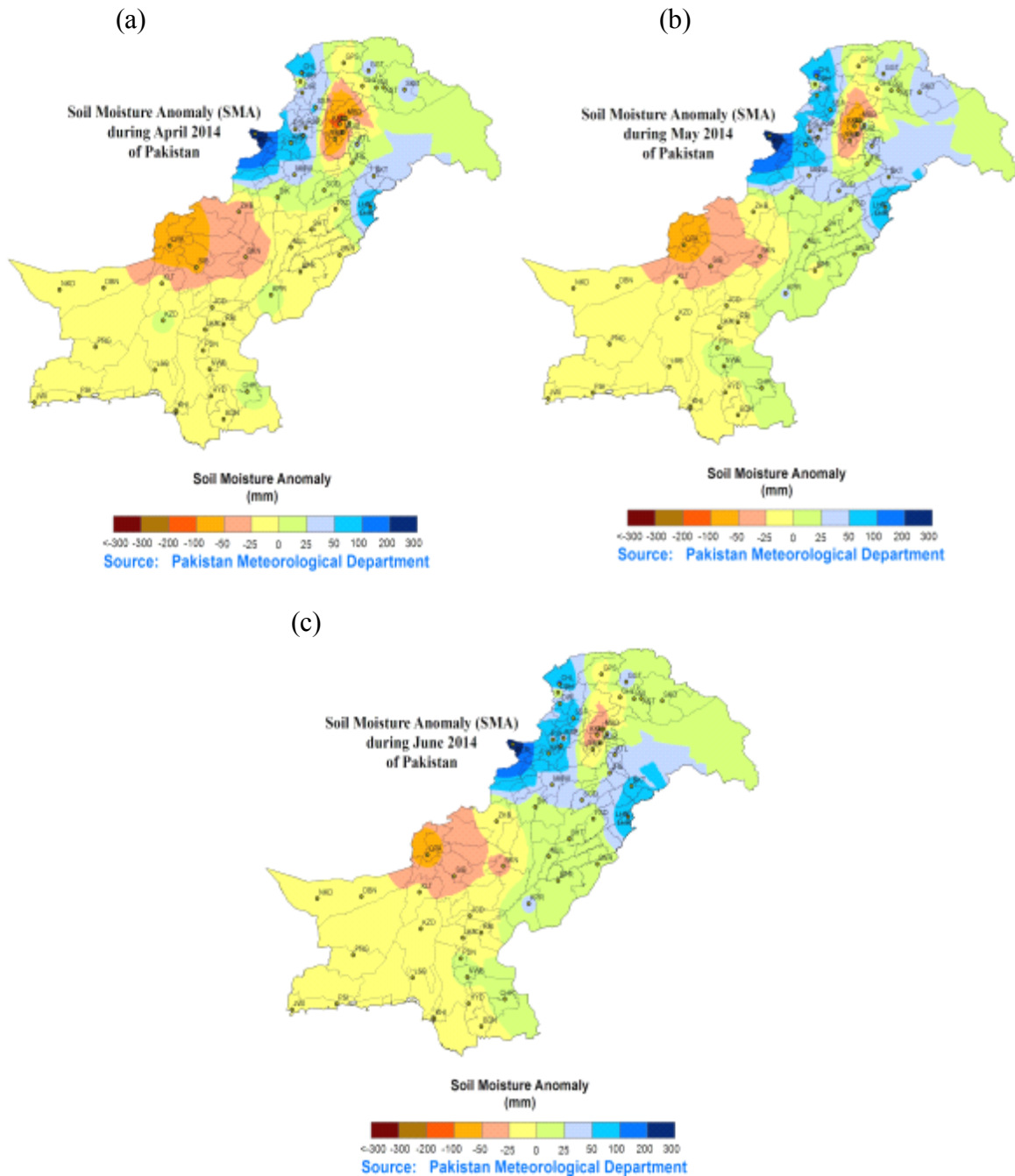


Figure-6 soil moisture anomaly during (April-June) 2014 of Pakistan

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 2014 was calculated for both dams are shown below in figure -7;

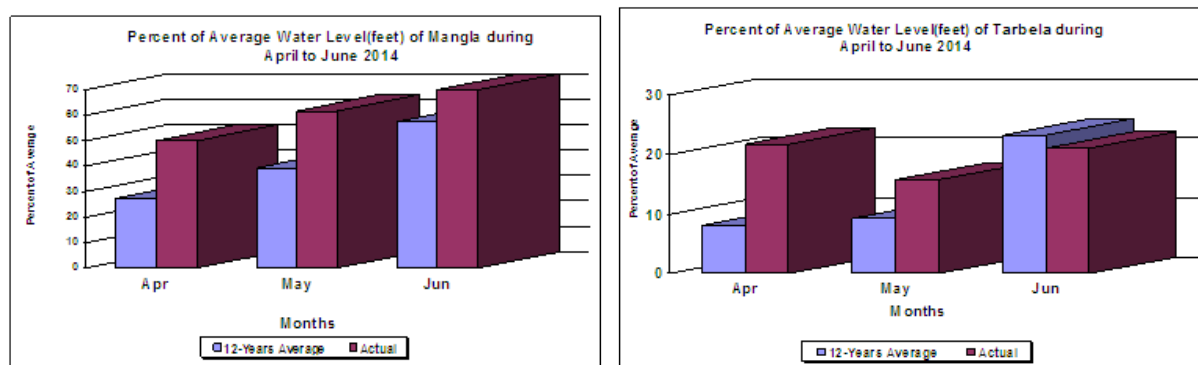


Figure-7 percent of water level of Tarbela and Mangla during (April-June) 2014

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-2014

The harvesting of wheat crop started over large wheat growing areas of the country. It was observed that about 90 percent of wheat crop, in lower Sindh was harvested by early April. About 30 to 40 percent wheat harvesting has been completed in Upper Sindh, Punjab, Southern KP and Balochistan. The destitute farmers in these areas are facing hardship in harvest of wheat crop as clouds are continuously playing hide and seek and wheat cannot be harvested in a smooth operation, because of potential threat of rains. This has delayed harvest operations by about 15 days. The threshing operations have also not been actively started as it requires temperature to cross over forty plus degree Celsius, to dry up the wheat straw to be chopped.

The harvest operations in Peshawar valley and adjoining eastern districts will start during May and will be completed in about 5 weeks. The wheat crop in the Northern KP beyond Peshawar and in GB is grown on a limited scale and harvest operations in these areas will be completed in June.

- **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.

- **Maize crop**

Most of autumn potato harvested area comes under spring maize in Punjab during the month of February. Spring maize is at grain formation stage in major growing districts of Punjab. Satellite data also showed the active growth of the crop already benefited from rains during the months of March and April.

Spring maize productivity in Okara, Sahiwal, Pakpattan and Kasur has been increasing significantly since 2003-04 due to improvement and adoption of hybrid maize technology and enhanced role of the agro industry. Currently, spring maize is contributing more than 2.5 million tons annually to the total maize production in Pakistan.

5.2 Crop Situation: May, 2014

The major wheat harvesting operation in the main growing areas of Sindh, Balochistan, Punjab and KP was over in May. However some limited harvesting is still continuing in the northern KP, AJK and GB. There were extensive rains during May, it affected the wheat harvest operation causing discomfort to growers and affecting quality and causing some damages.

- **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. It is expected that harvesting will start in the first week of June and will be completed by 20th June, 2014. Most of autumn potato harvested area in Punjab comes under spring maize during the month of February. Spring maize has reached harvesting stage in major growing districts of Punjab by end of May.

- **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.

Most of the sowing operation will be completed in June in both the Provinces. The cotton sowing situation is better than last year as the water supply in main cotton growing areas is more than previous year. Cotton sowing is mostly completed in Sindh due to water availability. In Punjab, sowing operation will be completed by the mid of June, 2014. last year, Bt Cotton low quality seed has affected the crop yield. Ministry of National Food Security and Research has taken steps to ensure the quality of approved Bt cotton varieties and finalize plant breeder act.

- **Sugarcane Crop**

In Sindh 75 percent of sugarcane crop area (2014-15) was sown in September while the rest of the area was sown during February and March 2014. In most parts of Punjab and KP sugarcane was sown during February and March, 2014. Crop is at healthy growth stage in most parts of the countries due to sufficient water availability.

- **Rice Crop**

The rice crop 2014-15 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 field transplantation will start by end of June or early July.

5.3 Crop Situation: June, 2014

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. The spring maize crop 2013-14 has been harvested in June. The sowing of rice nurseries in Sindh and Punjab was going on. The optimal sowing time of Cotton in Sindh is from April to mid-May while in Punjab it is from May to mid-June. The transplanting of nurseries of coarse rice was in progress at a high pace in Punjab, Sindh and Balochistan. In Kallar tract, Basmati rice nurseries are under establishment phase and field transplantation will start by mid-July and continue till mid- August, 2014

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.

The optimal sowing time of cotton in Sindh is from April to mid-May while in Punjab, it is from early May to mid-June. In view of CLCV problem, cotton sowing period took a wider temporal frame, starting from end Feb- March and extended beyond June. In Punjab, core growing divisions are Multan, Bahawalpur and Dera Ghazi Khan which contribute almost 90% of total cotton production of the province. Punjab alone contributes around 8-10 million bales annually to national economy.

Cotton in Sindh is promising this year and has reached the blooming stage. A few Ginning factories 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.

- **Sugarcane Crop**

Sugarcane crop was sown in Sindh on about 75 percent of the area in September, 2013. The rest of the crop in Sindh, and the entire crop of Punjab and KP were sown during February and March, 2014. Crop is at healthy growth stage in most part of the country due to sufficient water availability. Sugarcane crop is at early stage and attaining a boost in growth for sucrose accumulation in coming months.

- **Rice Crop**

The transplanting of nurseries of coarse rice is in progress at a high pace in Punjab, Sindh and Balochistan. There is a growing trend for replacing IRRI cultivars by high yielding hybrid seeds to increase rice productivity to around 7000-8000 kg per ha against 3000-4000 kg per ha in IRRI cultivars. Under smooth irrigation water supply from canals, it is expected that the sowing of coarse rice will be completed by end of July. The basmati rice is generally sown four weeks after sowing of coarse rice. In Kallar tract, the non-basmati rice transplantation started by early June and has reached peak by end of June in Punjab. Basmati rice nurseries are under establishment phase and field transplantation will start by mid July and will continue till mid-August, 2014.

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 southeastern Sindh, southwestern parts of Balochistan and barani areas of Punjab including Potwar plateau because of the below normal rainfall in these areas during April to June 2014

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 Southeastern 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 department Sargodha 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>