Pakistan Meteorological Department

Drought Bulletin of Pakistan

October-December 2014

National Drought Monitoring Centre

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Drought Bulletin
October – December, 2014

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Quarterly Drought Bulletin
October – December ,2014

By

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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

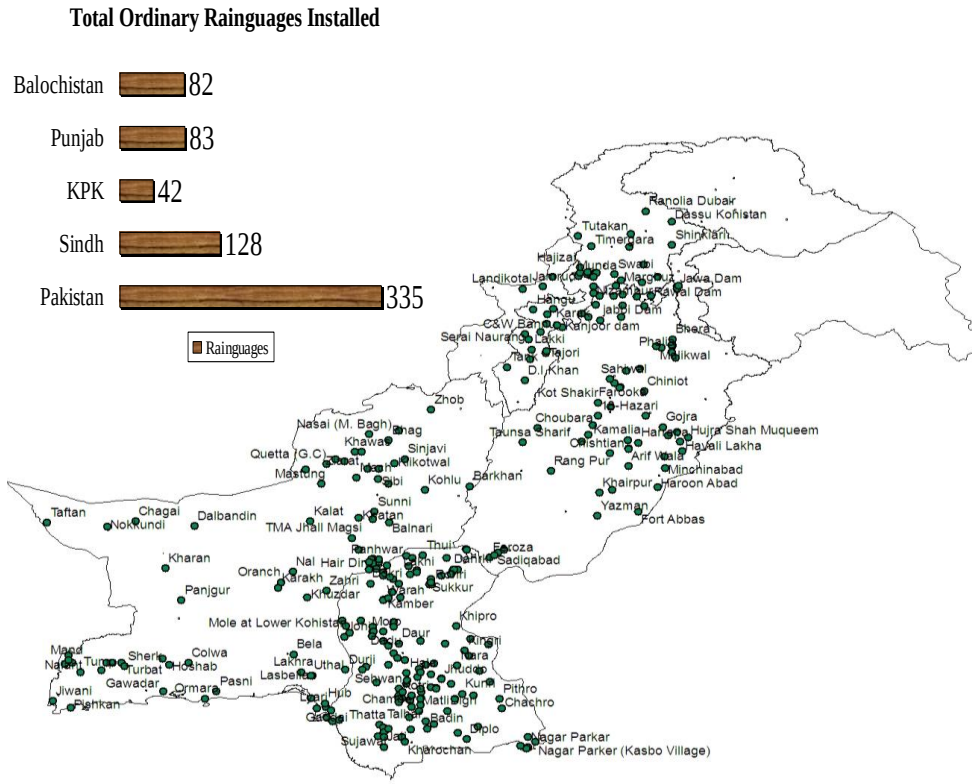


Figure-1 Rain-gauges Network of Pakistan by NDMC

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 more than hundred year’s period between 1871-1988, 11 out of 21 drought years were El Nino years. The El Nino phase of the Southern Oscillations (ENSO) has 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, costal flood and river flood).

3. Rainfall Distribution (Oct –Dec) 2014

During the last quarter of the year (Oct-Dec) 2014, below-normal (-49.3 %) precipitation was observed over Pakistan. During the quarter high temporal and spatial variability in precipitation was observed. Normally, October and November are the driest month in the country. But good amount of rainfall was recorded during October in Khyber Pukhtoonkha (83.04%) while in rest of the province it was well below normal except Punjab where it was near normal(-9.86%). The

maximum departure was observed in Sindh(-99.69%) and Balochistan(-99.39%). The rainfall was normal in Pakistan(-3.73%) during October-2014. In November, above normal rainfall was observed in Balochistan (52.43%) while below normal was observed in Gilgi-Baltistan and Kashmir (-67.41%), and Sindh (-54.25%). The whole country received slightly below normal rainfall (-12.56%) during November. December 2014 was the driest month recorded in the country in which well below normal rainfall (-98.7%) observed. During this month, below normal rainfall observed in Punjab and KP (-100%), Sindh and Gilgi-Baltistan/ Kashmir (-99.8%),and Balochistan (-95.7%). The figure shows the percentage area weighed departure rainfall occurred during (Oct-Dec) 2014, Viewing the quarterly rainfall distribution on province basis, over Sindh and Balochistan, it was well below-normal (-93.6%) and (-72.2%) respectively, over Gilgi-Baltistan and Kashmir (-59.2%), over Punjab (-48.5%)over Khyber-PK below normal (-20.6%) as shown in figure-2

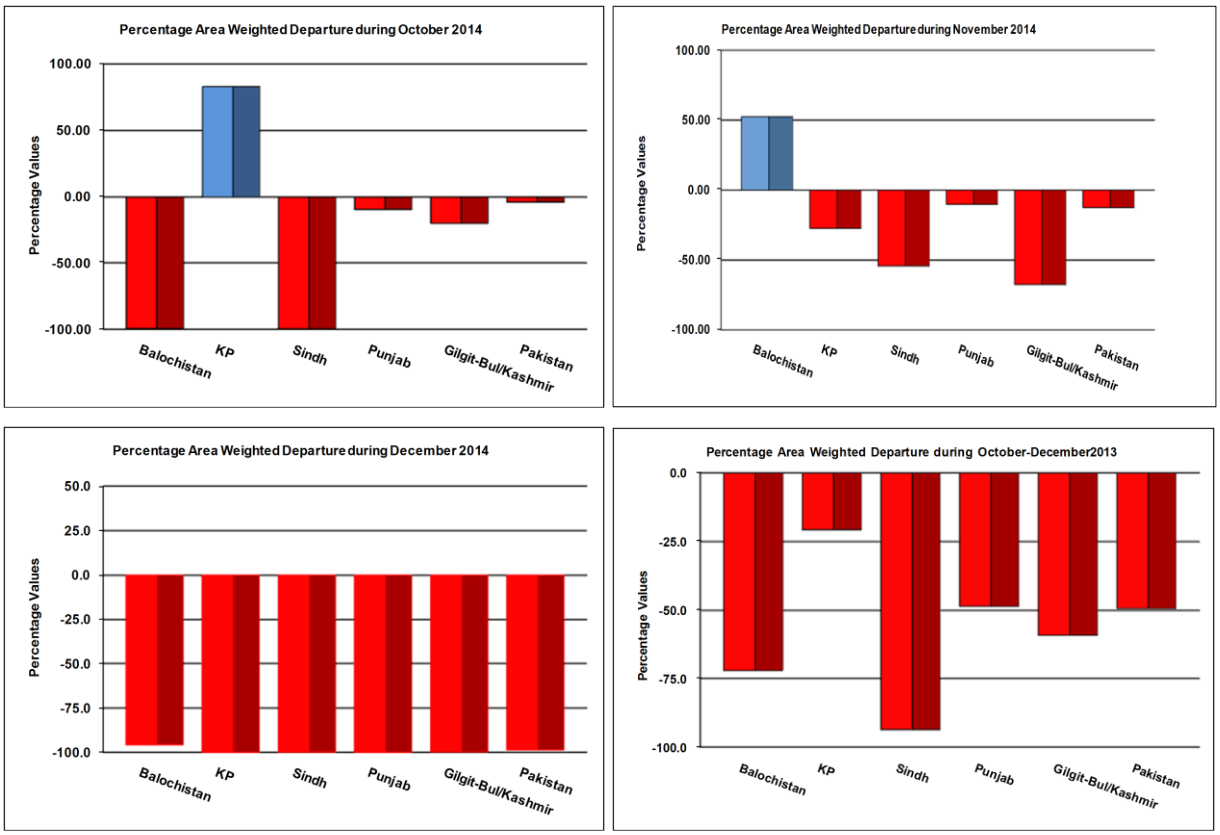


Figure-2: Percentage Area Weighted Departure of rainfall during (Oct-Dec) 2014

The rainfall pattern during October to December, set on by westerly disturbances, showed a systematic gradient from northern to southern areas of the country. This upshot of rainfall, on vast areas of the country, is highly timely and is likely to sustain a good stand (tillering) of wheat crop. North Atlantic Oscillation (NAO) is in positive phase and may effect on normal western

disturbances track in the region (below normal precipitation) (Horrell pc-based monthly calculation of NAO). ENSO is expected to be in neutral phase up to summer 2015. The monthly and seasonal analysis on regional and country basis are as shown below in figure-3.

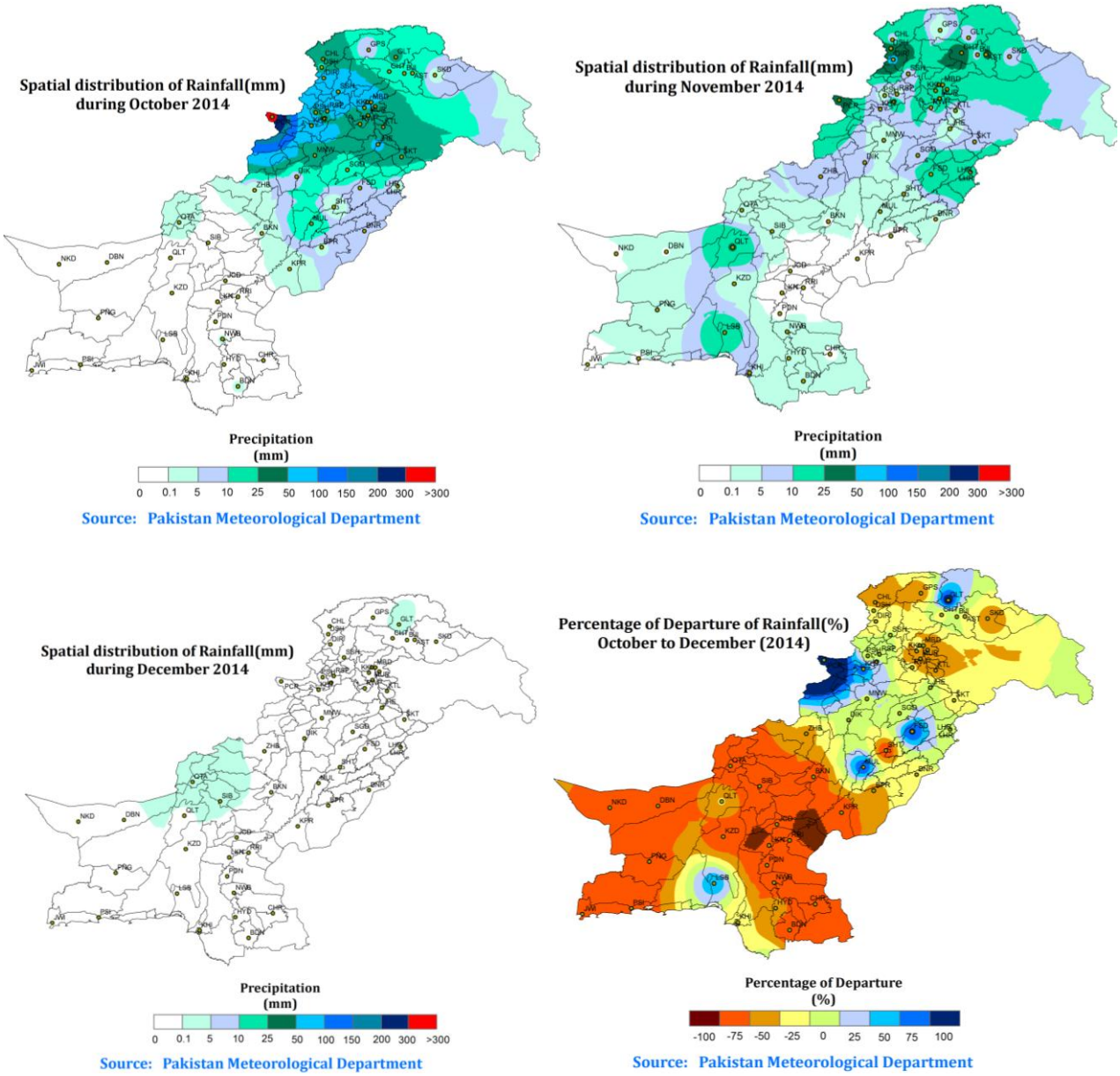


Figure-3: Spatial Distribution of rainfall during (Oct-Dec) 2014 of Pakistan

- ***Rainfall spell***

➢ ***October, 2014***

Light rainfall showers were observed three times: 8-9, 14-16 and 18-29 during October. Potohar, KPK and GB received above normal rainfall while the rest of the country received below normal rains.

- ***November, 2014***

A light rainfall shower was observed in Punjab, KP and GB during 7-9 November, 2014. The November was generally a dry month and the rainfall was below normal.

- ***December, 2014***

December 2014 remain dry while last year in November and December wheat received considerable rain. This dry spell can decrease wheat yield.

- ***Temperature***

The maximum temperature was observed slightly higher than last year, while the minimum temperature remained slightly lower. In November, Both maximum and minimum temperatures were observed slightly lower in The first half of the month while in second half remained slightly higher than last year.. The Both maximum and minimum temperatures were observed lower in 2nd half of December than last year December 2014 as compared to last two years.

- **Mist and Fog Development**

Mist and Fog are atmospheric natural phenomena where small water droplets become suspended in air for a longer period of time. The water vapors condense into fog when ambient temperatures become cooler. In South Asian region, fog formation starts from foothills of Himalayas in India and moves towards the eastern parts of Pakistan in Punjab. It finally covers large parts of Punjab, major areas of Sindh crossing into adjoining districts of Balochistan across Sibbi, southern parts of Khyber Pakhtunkhwa mainly around Indus River.

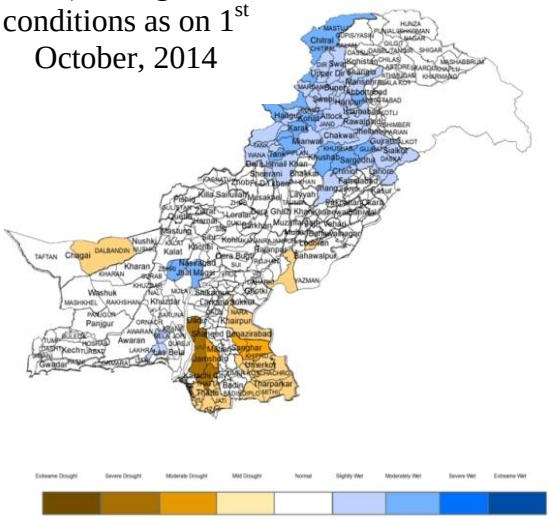
Mist and Fog are atmospheric natural phenomena where small water droplets become suspended in air for a longer period of time. This phenomenon was observed in November which is unusual for this timeline. The burning of rice stubbles supports the formation of this early fog. Heavy and dense fog were reported throughout the country, especially the Punjab and Sindh region where it prevailed throughout the day. While in some agricultural plains of upper parts of Punjab, frost was observed during the last ten days of December 2014.

4. 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). Such a series is fitted to a probability distribution, which is then transformed into a normal distribution so that the mean SPI for the location and desired period is zero (Edwards and McKee, 1997). 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.

a) Drought conditions as on 1st October, 2014



b) Drought conditions as on 31st December, 2014

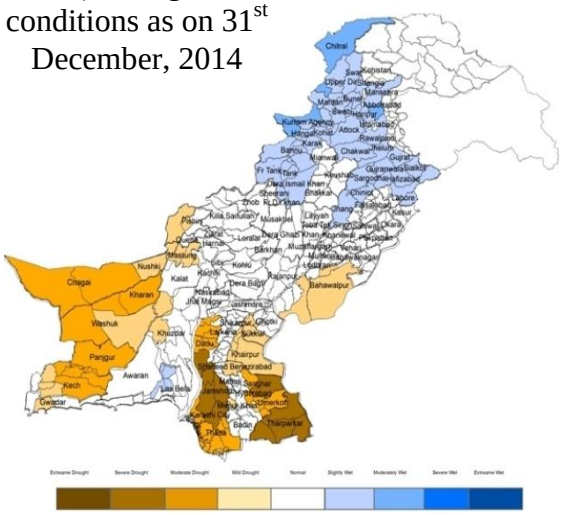


Figure-4 Drought conditions of Pakistan

ii. Cumulative Precipitation Anomaly (CPA)

October and November are the transitional month between summer & winter season, which have the characteristic of dry weather. It is the hottest month in coastal areas, whereas dry, cold weather starts to prevail in the remaining part of the country. During the month of December, winter weather systems commonly known as “Western Disturbances” become active over the country. Three to four troughs of Westerly waves are expected to pass across the upper KP, sub mountainous areas and snowfall over the hills. Generally the northern half of the country receives

the precipitation more frequently than the southern half under the influence of western disturbances.

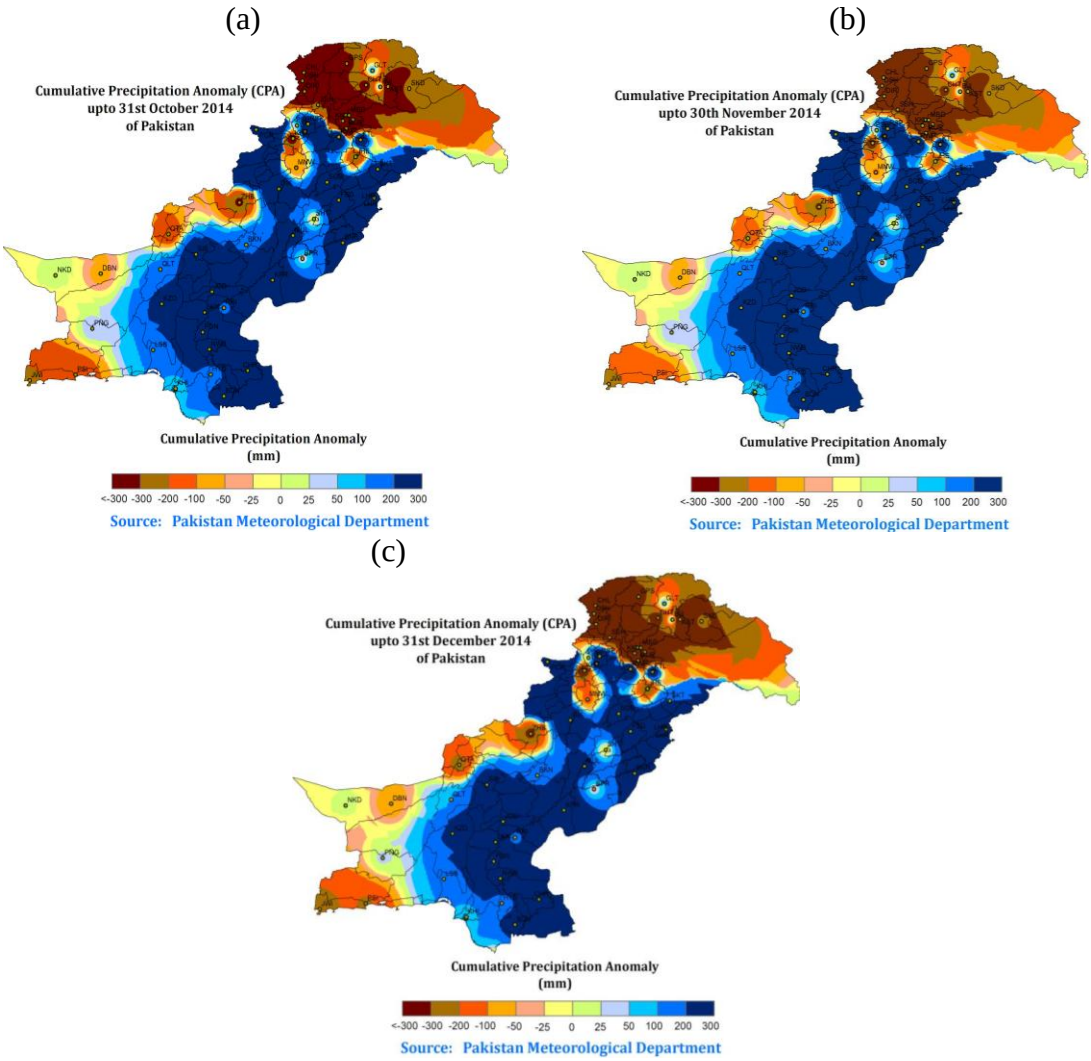


Figure-5 Cumulative precipitation anomaly during (Oct-Dec) 2014 of Pakistan

During October to December 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 where it was negative. The daytime temperature is low and Evapotranspiration is relatively stumpy as compared to the previous quarter therefore conditions are satisfactory and no moisture stress has observed northeastern and central regions of the country.

iii. Soil Moisture Anomaly (SMA)

It was observed that the amount of rainfall during October to December was well below normal and negative anomaly of soil moisture in southern parts of Pakistan shows that these regions were affected by this deficiency of rainfall as shown in figure-6. Soil moisture conditions in eastern KP and Balochistan are under the stress of soil moisture. It is predicted that rainfall will be near normal during January to March (2014), however below normal rainfall is expected in the southern half of the country due to which soil moisture stress may strengthen to arise drought conditions.

(a) (b)

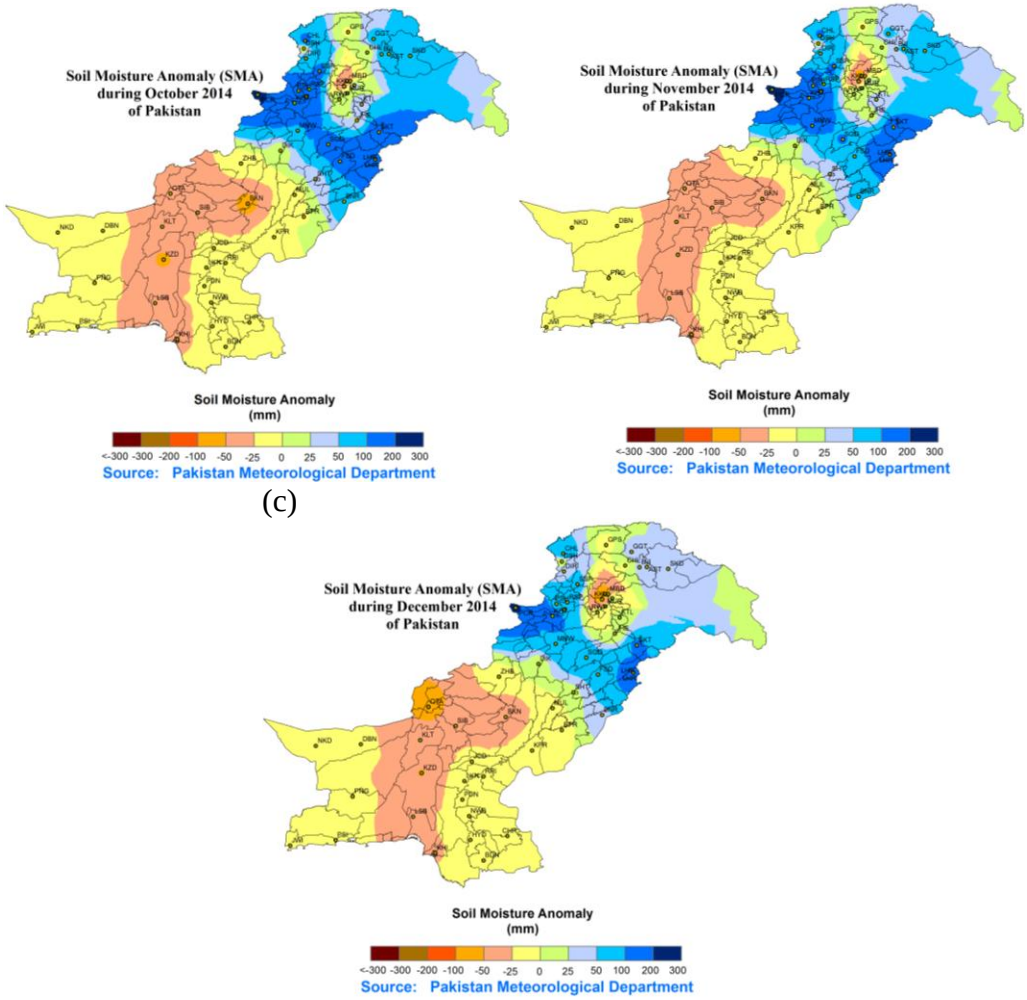


Figure-6 soil moisture anomaly during (Oct-Dec) 2014 of Pakistan

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 good monsoon rains, reservoirs were filled to their capacity. 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 October to December 2014 was calculated for both dams are shown below in figure -7;

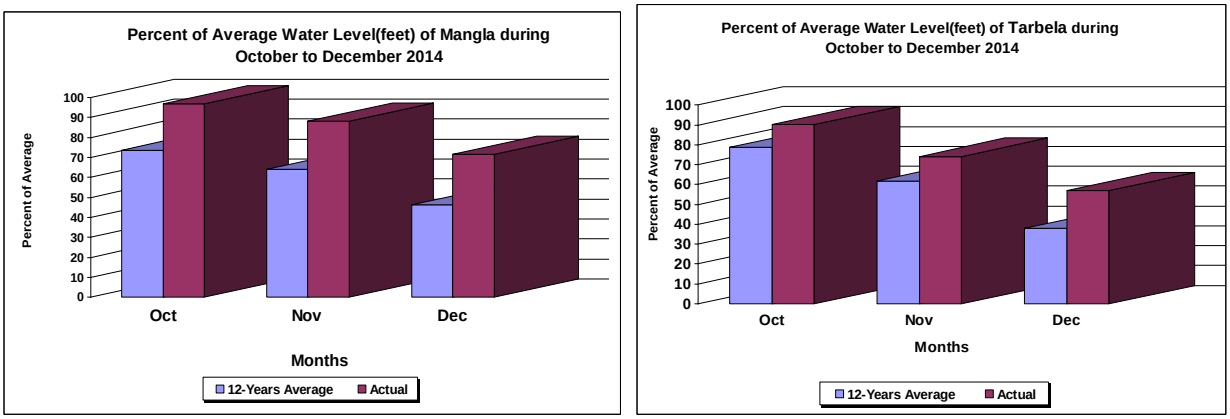


Figure-7 percent of water level of Mangla and Tarbela during (Oct-Dec) 2014

5. Agriculture

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

- **Crop Condition during the period.**

October-2014

Kharif crops 2014-15 proved to be more promising for some crops like Rice and Cotton and least for Sugarcane due to economic shifts to rice and maize crops. Some damages were caused to rice, cotton, sugarcane, autumn maize and fodders in Punjab due to floods 2014.

The Kharif and Rabi seasons integrate into each other during the month of October. The Kharif crops progressively lose chlorophyll contents, culminating the process of photosynthetic activity and reaching maturity. The harvest operation of Kharif crops kicks off in October and stretch over to November and beyond. This includes harvest of rice, chilies, autumn maize & onions and other seasonal crops. The picking of cotton starts much earlier, but ends in synchronization with the above crops. The harvest of sugarcane starts by mid November and continues up to February or March. The growth patterns of all above crops slow down during October and onwards, ending up in senescence of crop plants.

The month of October also makes a debut in sowing of Rabi crops. The sowing of chickpeas, oilseeds, vegetables and fodders was completed during this month. The sowing of the potato crop

was also completed in the maize -potato-maize cropping patterns. The sowing of wheat was initiated in October and continues through the next two months. The sowing of wheat starts from rain-fed areas after maize harvest, availing moisture conserved from monsoon rains. In irrigated areas, the sowing of wheat crop in October, is generally confined to fallow lands. The sowing of wheat in cotton-wheat and rice-wheat cropping pattern will be completed in subsequent months, after the harvest of cotton and rice crops.

- ***Cotton Crop***

The picking of February sown cotton started in June and the picking of May sown cotton started in September. The cotton picking touched a peak in October. The cotton picked in October is of the best quality with respect to Micronaire, fiber strength and other characters. Attack of mealy bug and pink boll worm infestation in some areas of Sindh and Whitefly & Jassids in Punjab along with high temperature in September have affected the final crop yield negatively

- ***Rice Crop***

The harvesting of rice crop started in all parts of the country during end October. The Basmati growing tract, including Sialkot, Narowal, Sheikhupura, Gujranwala and Chiniot districts were affected. The damage to rice crop is estimated at around 217 thousand tons of production. Major districts in term of damage to rice were Hafizabad, Jhang, Gujranwala and Chiniot.

- ***Sugarcane Crop***

Sugar cane based agro-industry is the country's second largest after textile. The crushing of sugarcane by design of provincial legislation has to begin from 1st October but it is usually delayed. About 3 percent of early harvested sugarcane crop area is used for sowing of wheat crop. Sugarcane produces valuable byproducts like alcohol used by pharmaceutical industry, ethanol used as a fuel, biogases used for paper and fuel and chipboard manufacturing.

Sugarcane crop is at the harvesting stage throughout Sindh, Punjab and Khyber Pakhtunkhwa. Significant reduction in sugarcane area has been observed in Punjab while the areas in Sindh have increased. Floods in Punjab have affected an area of 12.8 thousand ha and production loss has been estimated at around 725.8 thousand tons. Major districts in term of damage to Sugarcane were Jhang, Multan, Chiniot and Muzaffargarh. Harvest purchase price factor is one of important economic factor for annual crop and somewhat determines the future of sugarcane productivity in next season.

- ***Rabi Crops***

Rabi crops 2014-15 season has started by mid-October in rainfed areas of Punjab, Balochistan and lower Sindh. In Northern rainfed areas of Punjab season has started with a positive note.

Wheat Crop

Wheat sowing started by mid-October in Rainfed areas of Punjab and KPK. The rainfall during October has benifitted the germination process. The sowing of wheat is continuing in the irrigated areas of Punjab, Sindh, KPK and Balochistan.

November, 2014

Kharif Crops Situation

The significant event of Kharif season was river floods in Punjab. These floods affected around 200 thousand farmers. Major damaged crops were rice, cotton, vegetables and fodders. Some damages also accrued to sugarcane, autumn maize and other crops.

Rice Crops

Coarse rice harvesting has been completed in all provinces; however in basmati growing areas of North Eastern Punjab, harvesting was at its peak at the end of November.

Cotton Crops

Cotton crop is main cash crop in Pakistan which almost contributes 1.5 percent to national GDP and main source for textile industry. The cotton crop is at terminal stage and the last picking is in progress. The harvesting of Cotton sticks started from mid November and was continuing at the end of the month.

Sugarcane Crops

Sugarcane based agro-industry is the country's second largest after textile. Sugarcane produces valuable by products like alcohol used by phar-maceutical industry, ethanol used as a fuel, biogases used for paper and fuel, chipboard manufacturing. Crop reached harvesting stage by the end of October/early November, 2014. Currently, the crushing has started and will pick momentum in December.

Rabi Crops

Rabi season in Pakistan begins with the advent of November and characterized by the end of Kharif or summer season crops as well as accelerated sowing of Rabi crops. The potato crop was

sown during October after harvesting of autumn maize in Sahiwal division of Punjab. The sowing of oilseeds like Mustard and Gram crop was started in October and completed by end of November.

Wheat crop

Being a major food security crop of the country, wheat production estimate is debated at all forums. Wheat crop productivity is the function of the area under crop and yield per unit area. Area factor is mainly derived by the government policies, especially the support price for the farmers and availability of crop inputs like irrigation water, fertilizers, etc. whereas,the wheat crop yield is the function of crop inputs (irrigation water, fertilizer, seed and farming practices) and Agro meteorological growing conditions (Temperature and Rainfall).

The sowing of wheat in barani areas was completed by early November. In irrigated areas, the sowing started in November and was continued till the end of November. The wheat sowing beyond November will continue in cotton and rice growing areas after harvest of these crops. The crop is at an emergence stage in most of the areas, sown during October/early November.

December, 2014

Rabi season in Pakistan begins with the start of November and sowing of rabi crops is almost completed by end December. The potato crop has reached its harvesting stage in major growing areas of Punjab. The sowing of oilseeds like Mustard and Gram crop was started in October and completed by end of November and is in full boom.

Autumn potato crop is mostly sown in Punjab province districts of Okara, Kasur, Pakpattan, Sahiwal, Chiniot, Faisalabad, Toba Tek Singh, Sialkot, Jhelum and others. Flood 2014 in Punjab has affected around 250 thousand bales of production. Main cotton affected districts were Multan, Muzaffargarh, Khanewal and Jhang

Rabi Crops 2014-15

Rabi season in Pakistan begins with the advent of month of November and sowing of rabi crops is completed by end December. In Rabi sea-son, the sowing of crops is mainly carried out during Oct-Dec period. The potato crop was sown during October after harvesting of autumn maize in

Sahiwal division of Punjab. The sowing of oilseeds like Rapeseed Mustard and Gram crop were completed by end of November and are in full bloom.

Wheat crop

Wheat sowing was completed all over Pakistan by the end of December. Wheat plants have established in areas where crop was sown in October-November. The drought situation may lead to an adverse effect on the Rabi crops. In irrigated areas, optimum wheat sowing time is the month of Novemeber. The water level in the reservoirs is better as compared to last year and agro-met condition will remain optimistic in upper parts of the country

Potato Crop

Three crops of potato are sown in Pakistan viz. autumn (80%) spring (12%) and hill crop (8%). Autumn crop is grown mainly in Punjab and to some extent in Khyber Pakhtunkhwa. In Punjab, the crop is mainly sown in Okara, Sahiwal, Pakpattan, Kasur, Chiniot, Jhelum, Lahore and Sial-kot districts. The cropping patterns of potato usually involve maize-maize-potato or rice-potato-maize rotation.

Autumn potato crop is mostly sown in Punjab province districts of Okara, Kasur, Pakpattan, Sahiwal, Chiniot, Faisalabad, Toba Tek Singh, Sialkot, Jhelum and others. Potato crop sowing is generally done during late October. The crop is of a higher size than last year and this has depressed the farm gate prices of potato.

Kharif Crops Situation 2014

The perceptible features of Kharif season 2014 were (a) strong heat wave extending into early Kharif season (b) Reduction in cotton area (c) Kharif crops damages due to floods (d) Water shortage may have marginally reduced sown area in major cotton growing districts of Sindh.

Cotton crop

Cotton crop is the main cash crop in Pakistan which contributes almost 1.5 percent to national GDP and is the main source for textile industry. Cotton picking touched peak in October and was almost completed by end of November. The cotton picked in the October is of the best qual-ity with respect to micronaire, fiber strength and other characteristics. Attack of mealy bug and pink boll worm infestation in some areas of Sindh and whitefly & jassids in Punjab along with high temperature in September; have affected the final crop yield negatively.

Rice crop

This is the fourth flood since 2010 to hit the rice growing areas of Pakistan. Basmati growing tract Including Sialkot, Narowal and Gujranwala districts were affected. The flood waters receded quickly minimizing the extent of the damage. Flood 2014 in Punjab has affected around 217 thousand tons of production. Major Rice damaged rice crop in the districts of Hafizabad, Jhang, Gujranwala and Chiniot.

Sugarcane crop

Sugarcane based agro-industry is the country's second largest after textile. Sugarcane produces valuable by products like alcohol used by pharmaceutical industry, ethanol used as a fuel, bagasse used for fuel, paper and chipboard manufacturing. Major Sugarcane damaged districts are Jhang, Multan, Chiniot and Muzaffargarh. Harvesting of the crop picked momentum during December, 2014 with the active crushing season of various Sugar Mills.

6. 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 northeastern, southwestern parts of Balochistan (Taftan, Dalbandin,Kharan,Musakhel,Panjgur and Turbat) and barani areas of Punjab including Potohar plateau while in some districts of Sindh Province(Tharparkar, Sanghar, Mirpurkhas, Dadu, Thatha) reported moderate to severe droughts because of the below normal rainfall during October to December 2014.

Impacts on crops: Early drought conditions have been observed in potohar due to dry conditions during December which may affect mainly on wheat growth. Secondly frost condition during mid December in Potato growing areas causes early harvesting of potato in addition to the high price of potato in the market.

7. Seasonal Weather Outlook (Jan-14 to Feb-14)

"Average precipitation is expected during the season all over the country with slightly above normal temperature during early and below normal during late of the predicted season."

- Below average precipitation is expected over the country during January with higher deficit over southern Punjab, Sindh and southern Baluchistan.
- Average precipitation is expected over Northern Punjab, GB, KP and Kashmir.

- 1-2 light to moderate rain spells are expected over northern parts of the country during January.
- Average precipitation with snow fall over the hills is expected during January.
- Chances of dense fog over central parts of the country are positive, but it would be slightly above normal during this winter season.
- One moderate rainy spell is expected during the first decade of February.
- The March would be wettest month during the season.
- Less chances of a rainy spell to approach over southern parts of the country.
- Below normal night temperature are expected during January.

8. Monthly Quantitative Weather Forecast:

	Jan-14		Feb-14		Mar-14		(Jan-Mar) 2015	
Regions	**Average**	**Expected**	**Average**	**Expected**	**Average**	**Expected**	**Average**	**Expected**
Gilgit-Baltistan	27.2	Above Average	29.7	Above Average	34.6	Below Average	91.5	Above Average
Khyber Pukhtoonkawa	49.0	Average	71.9	Above Average	92.5	Below Average	213.4	Above Average
Azad Jammu Kashmir	91.1	Below Average	110.5	Below Average	127.5	Below Average	329.0	Below Average
FATA	30.2	Above Average	54.0	Above Average	67.4	Average	151.6	Above Average
Punjab	17.2	Above Average	27.2	Average	30.9	Average	75.2	Average
Balochistan	19.5	Above Average	20.9	Above Average	23.3	Average	63.7	Above Average
Sindh	3.0	Above Average	5.4	Above Average	4.7	Above Average	13.1	Above Average
	Precipitation is in mm/month							
Pakistan	20.8	Average	27.2	Above Average	31.7	Average	79.6	Above Average

Below Average > -15 %, Average precipitation range = -15 to +15 %, Above Average > +15 %

Note: Average precipitation is computed by using Global Precipitation Climatology Centre (GPCC) girded data by resolution (0.5x0.5°) latitude by longitude. Ensembles of different climate models are used for computation of expected precipitation over the region.

9. Government reactions to drought

All functionaries of the state machinery remained engaged in providing relief to flood affecties of Sindh. Since there was no significant impact of drought during the quarter, no intervention was made at official level. However, 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

10. 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.

11. Acknowledgement

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

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