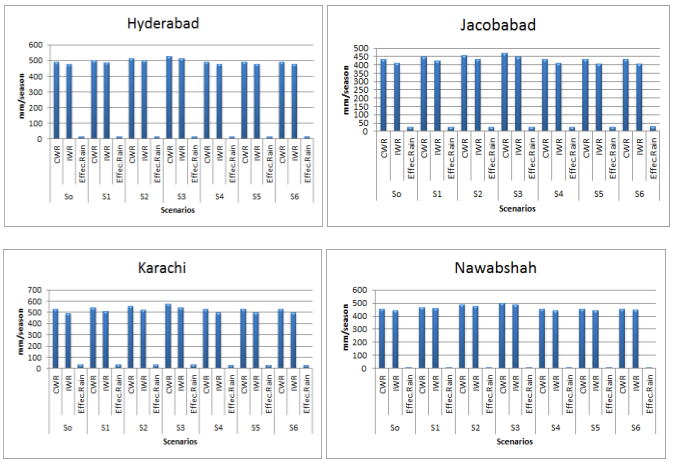

Figure 2: Crop water, irrigation water requirements of wheat crop in 4 cities (Hyderabad, Jacobabad, Karachi and Nawabshah) under seven scenarios

According to IPCC future projection in Hyderabad, Jacobabad, Karachi and Nawabshah the overall rainfall will be decrease that is why rainfall scenarios show decreasing trend in these areas (Salma et al., 2012). In Figure 4 from S1-S3 in Hyderabad crop water requirement of wheat is increasing from 490mm to 520mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement almost remain constant. Similarly in Jacobabad, Nawabshah and Karachifrom S1-S3, crop water requirement showed increasing trend from 435mm to 470mm, 450mm to 500mm and520mm to 580mm respectively but in case of S4-S6 the irrigation water requirements become more due to less precipitation trend in all 4 cities.

3.2 CWR, IWR and Effective rainfall of maize crop in Sindh province

Hyderabad, Jacobabad, Karachi and Nawabshah are the selected regions of Sindh province for maize crop in which CWR, IWR and effective rainfall of each region is find out. In some regions CWR for maize crop is more than other regions.

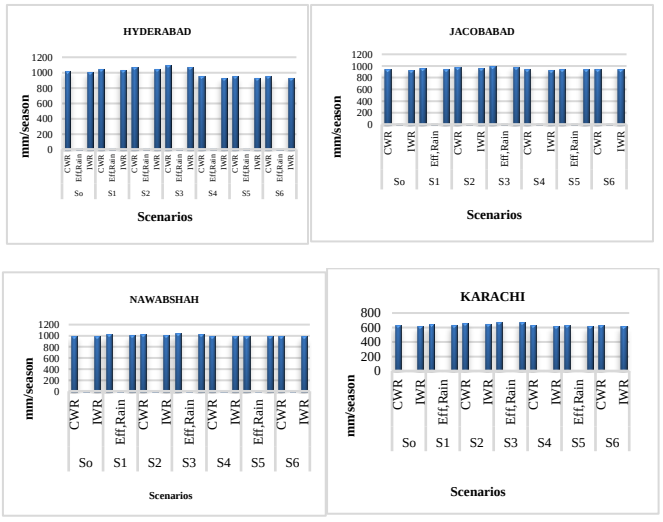

Figure 3: Regions for maize crop in Sindh

In Hyderabad CWR decreases, from S1-S3 , crop water requirement is increasing from 1020mm to 1100mm, but in case of S4-S6(decrease in precipitation rate) the crop water requirement decreased and its value reached at 1020mm.In Jacobabad CWR decreases from S1-S3 , crop water requirement is increasing from 950mm to 1000mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 950mm. In Nawabshah, CWR decreases from S1-S3 , crop water requirement is increasing from 1000mm to 1040mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 1000mm.In Karachi CWR decrease from S1-S3 , crop water requirement is increasing from 620mm to 680mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 620mm (Salma et al., 2012).

3.3 CWR, IWR and Effective rainfall of wheat crop in Baluchistan province

Kalat and Zhob are the regions selected in the Baluchistan province. In Kalat region CWR for wheat crop is more than that of the CWR in Zhob as shown below.

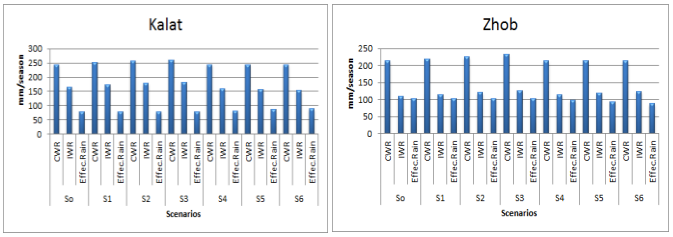

Figure 4: Regions for wheat crop in Baluchistan

In Kalat CWR decreases from S1-S3 , crop water requirement is increasing from 240mm to 260mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 240mm.In Zhob CWR decreases (Salma et al., 2012). We conclude that in Zhob from S1-S3, crop water requirement is increasing from 210mm to 240mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 240mm.

3.4 CWR, IWR and Effective rainfall of maize crop in Baluchistan province

Kalat and Zhob are the regions selected in the Baluchistan province. In Kalat region CWR for maize crop is more than that of the CWR in Zhob as shown below.

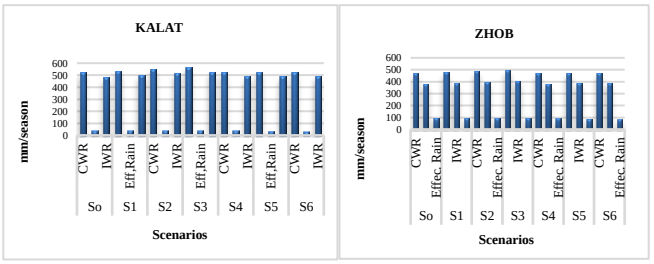

Figure 5: Regions for maize crop in Baluchistan

In Kalat, CWR decreases from S1-S3 , crop water requirement is increasing from 520mm to 580mm, but in case of S4-S6(decrease in precipitation rate) the crop water requirement decreased and its value reached at 520mm (Salma et al., 2012). In Zhob, CWR decreases crop water requirement is increasing from 480mm to 500mm, but in case of S4-S6(decrease in precipitation rate) the crop water requirement decreased and its value reached at 480mm.

3.5 CWR, IWR and Effective rainfall of wheat crop in Punjab province

Faisalabad and Multan are the regions selected in the Punjab province. In Multan region CWR for wheat crop is more than that of the CWR in Faisalabad as shown below.

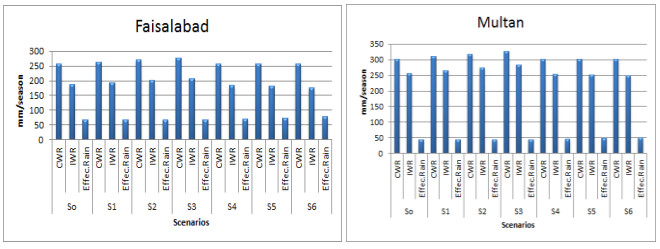

Figure 6: Regions for wheat crop in Punjab

In Faisalabad CWR decreases (Salma et al., 2012). In figure 16, from S1-S3, crop water requirement is increasing from 260mm to 280mm, but in case of S4-S6(decrease in precipitation rate) the crop water requirement decreased and its value reached at 260mm. In Multan CWR decreases (Salma et al., 2012). In figure 17, from S1-S3, crop water requirement is increasing from 300mm to 330mm, but in case of S4-S6 (decrease in

precipitation rate) the crop water requirement decreased and its value reached at 330mm.

3.6 CWR, IWR and Effective rainfall of maize crop in Punjab province

Faisalabad and Multan are the regions selected in the Punjab province. In Multan region CWR for maize crop is more than that of the CWR in Faisalabad as shown below.

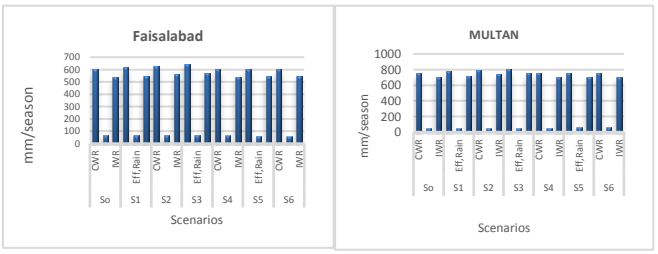

Figure 7: Regions for maize crop in Punjab

In Lyallpur CWR decreases from S1-S3, crop water requirement is increasing from 600mm to 640mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 600mm (Salma et al., 2012). In Multan CWR decreases crop water requirement is increasing from 750mm to 800mm, but in case of S4-S6 (decrease in precipitation rate) the crop water requirement decreased and its value reached at 750mm.

3.7 CWR, IWR and Effective rainfall of wheat crop in Khyber Pakhtunkhwa province

Peshawar is the region selected in the Khyber Pakhtunkhwa province. In Peshawar, CWR for wheat crop increases and effective rainfall also increases.

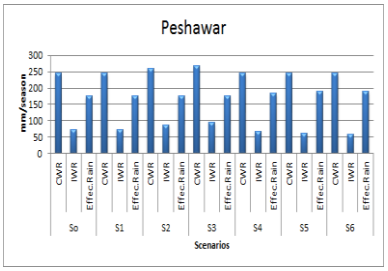

Figure 8: Regions for wheat crop in KPK

In Peshawar CWR increases from S1-S3, crop water requirement is increasing from 240mm to 260mm, but in case of S4-S6 (increase in precipitation rate) the crop water requirement decreased and its value reached at 240mm (Salma et al., 2012).

3.8 CWR, IWR and Effective rainfall of maize crop in Khyber Pakhtunkhwa province

Peshawar is the region selected in the Khyber Pakhtunkhwa province. In Peshawar, CWR for maize crop increases and effective rainfall also increases.

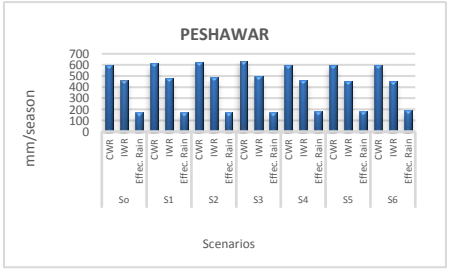

Figure 9: Regions for maize crop in KPK

In Peshawar CWR increases (Salma et al., 2012) from S1-S3 , crop water requirement is increasing from 600mm to 640mm, but in case of S4-S6(decrease in precipitation rate) the crop water requirement decreased and its value reached at 600mm.

4. Conclusions

From the above discussion we conclude that the rainfall and temperature variation occurs in every station all over the Pakistan. The decreasing trend is due to the arid and semi-arid area. In general the rainfall and temperature trend increases in northern areas like Peshawar, Skardu, Gilgit etc and decreases in western areas like Multan, Faisalabad.In future the rate of precipitation is increasing in humid areas but unfortunately rainfall intensity is decreasing annually due to this reason the crop water requirement is increasing rapidly. Furthermore, the trend observed in rainfall data for the whole country is (-3.55mm) in two-time intervals and per decade it became (-1.18mm) which are found in consistent with the IPCC report. From the present study it is concluded that change in the rainfall pattern and prolonged droughts will pose severe risks to agriculture and water management sectors. Therefore, the present study will be useful to detect the changes in the rainfall pattern as a baseline data for future research work in fields of hydrology, agriculture and disaster risk management. In general, the Crop water requirement in Arid and in Semi-arid is increasing annually on the other hand the total value of effective rainfall in Pakistan is decreasing.

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