# CLIMATIC CHANGE, ITS IMPACT AND FUTURE PLAN

BY
**M.H. PNAHWAR**

There have been climatic changes in the past 10,000 years, for example, it was very warm and wet during Mohenjo Daro or Indus Civilization times and that the decline of the civilization came due to on set of cold and aridity for over a thousand years. It again warmed up around 900 AD, and this warm period had more rainfall than today. This warm period ended around 1300 AD. It became cold again around 1500 AD, and cold spell continued up to 1850 AD.

The climatic records of the past 125 years show an interesting climatic behavior. It was warm from 1850 to 1873 AD, but cold set in from 1873 to 1915 AD, a period of approximately 42 years. Next 35 years i.e., 1915 were very warm to the extent that North Pole did not exist in 1945, as all ice that formed it melted away. From 1951 to 1981 it was a cold period and this cold delayed harvest of Sugdasi rice by about 2-3 weeks during which it was attacked by rice stem borer. Thus the crop was destroyed within a few weeks, before its harvest. From 1982 to this date it has warmed up again.

The statisticians have been taking wrong years to arrive at calculations suiting their own opinions. For example they have been taking averages of 1930-1960 or 1960-1990 or 1970-1995. These statistics mix warm and cold period and therefore average get distorted. We also know that the ancient civilization in Egypt, Mesopotamia and Pakistan rose when temperatures were about 1ºC higher than today and therefore the rainfall was more. What would happen if temperature were to rise by 1ºC higher than today? We really do not know. 5000 years back there were no monsoon winds which were established probably in 100 BC. With present patterns of winds, rise of temperature may or may not bring extra rainfall and humid conditions. Rise of temperatures may even create “hyper aridity”. There are so many climatic factors involved, that it is difficult to build a computer model incorporating all the factors and predict the shape of things to come.

The present studies blaming excessive $CO_2$ in the atmosphere, for causing rise in temperatures is misleading. Man has used fossil fuel as well as wood to generate steam power form 1775 onwards and added $CO_2$ to atmosphere. It is alleged that temperature has risen since 1775 by about 1-2ºC due to extra $CO_2$. This is also a misleading statement. The cold period from 1480 to 1850, is called the Little Ice Age and the worst period of the Little Ice Age was around 1650-1675. Between 1675 and 1775 temperatures rose throughout the world in the process of change over from the Little Ice Age to warm period. This rise of temperature is not accounted for, by the supporters of $CO_2$ theory. They must study that fluctuations in climate during the past 18,000 years and this would

lead to the conclusion that the temperatures have been rising and falling throughout this period and there is no case for alarm. However it does appears that there is panic and there are business interests of scientist in various fields, who are waiting to take advantage of various studies and these vested interest have made the situation more complicated.

The enclosed climatic map of Sindh has divided the area into 12 climatic zones and these climatic zones have different maximum and minimum temperatures, annual chill units and heat days. Supposing the temperature rise by 1ºC the climate of zones VI(a) and VI(b) becomes similar to zone V, that of zone V becomes similar to zone III and IV and that of zone III and IV similar to the zone I and II. In other words we have to change over the cropping pattern and grow the crops in a particular zone as are grown in the zones; one or two number higher than the present. With regards to zone No. I and II, where maximum temperature reach 48.5ºC, if temperatures rise further, one has to grow crops similar to those presently grown in Imperial Valley (California USA), in which temperatures reach 127ºF (52.8ºC) every year.

Thus if any study needs to be done, it would need to find out the crops presently grown in other parts of the World having climate similar to zone I to zone VII of Sindh, and also study the crops grown in areas where temperatures reach 52ºC and above. After this study it would be worth while to import seeds or plants of the crops grown in different countries under above ranges of temperatures and try them out in different parts of Sindh. It should also be known that most crops flourish well between temperatures of 77-97ºF (25-36ºC). The average maximum temperatures in different climatic zones of Sindh falls between 92 to 99ºF (33.3 to 37.2ºC) and therefore heat stress effects are minimum. Rise of one or two degrees Centigrade will not affect the present crops too much.

With regards to conventional crops if the temperatures rise, the following will be the picture:

- Cotton can still grow and probably perform better. Cotton was being grown in the Imperial Valley California (maximum temperatures 52.8ºC) and also in Hermosillo in North-Western Mexico, where similar temperatures prevail.

- Lucerne (alfalfa) can also grow well in Sindh, as is doing in the Imperial Valley (Southern California). Rice is grown in Hermosillo and therefore can be grown in Sindh, even at temperature one or two degree centigrade higher than the present.

- Wheat would be affected and badly. It is a crop of high latitude subtropics and also of temperate zones. Rise of temperature 1-2ºC, would reduce winter season, increase minimum winter temperatures and thereby decrease chill hours or chill units. This will reduce yields and wheat will not be economical crop under such conditions in Sindh.

- The same will happen to winter oil-seed crops.

- Sugarcane yields will improve if winter temperatures rise. Sugarcane is being grown in Haft Tapi (Iran), where temperature hit 52.8ºC with yields of 1400 mounds per acre of even 25$^{th}$ ratoon crop. The high temperature therefore will not retard the sugarcane yield but improve it further. Similarly higher winter temperatures will help in increasing sucrose content of sugarcane.

- The vegetable crops will remain unaffected. Winter vegetables have low-chill requirements and higher winter temperature will improve their yields. The summer vegetables will also be not be affected as is proved from their performance in Imperial Valley (California).

## Fruit crops.

- **Mango.**

  Fruit crops will be affected in different manner. High temperatures may cause sun-burn and pre-mature ripening of mango on the tree. Rise of 1ºC temperature in the areas of Sindh, south of Nawabshah, will not affect mango production but would affect it in zone I to IV. Mangoes are grown in Hermosillo (Mexico) and the loss due to premature ripening and sun-burn usually does not exceed 5%. Mango flowering will be affected in zone V to VII due to higher temperatures because winter chill hours would reduce considerably. Mango needs about 200 chill units to flower. These may not be available and therefore the only alternate is to create water stress i.e., stopping water for 2 months before flowering. This will have an adverse affect on yield, which may decrease by about 10%, provided adequate moisture is made available during the rest of the fruit development period. The climatic change may therefore affect mango yield by about 10-30%. Maintenance of optimum level of moisture is difficult.

- **Citrus.**

  Citrus will not be adversely affected, especially grapefruit, pummelo, tangelo, oroblanco and Mel gold. These fruits will mature early by one to two months and may be available from first week of July.

- **Guava.**

  It can stand temperatures higher than the present by 1 to 2ºC. It does not sun-burn and usually one crop is taken in winters i.e., November to March. With new technologies it is possible to adjust the harvest period within 4-5 weeks, and thus these crops will remain un-affected.

## Conclusion.

It is suggested to study the crops grown from Indo (California) in the north to Hermosillo town (Mexico) in the south and introduce various fruit corps grown in this area.

It is also suggested that preliminary studies may be under-taken to find-out various field crops, fruits and vegetables grown in various desert areas of the world, where temperatures are higher than ours in Sindh, and bring those for trials in Sindh.

**Average maximum temperatures of hottest months in various zones of Sindh.**

| S.No. | Name of station | Zone | Average month temperature | Hottest Month |
|---|---|---|---|---|
| 1. | Jacobabad. | I(a) | 114ºF | June |
| 2. | Rohri. | I (a) | 109ºF | June |
| 3. | Nasirabad. | II | 110ºF | May |
| 4. | Pad Idan. | III | 111ºF | |
| 5. | Nawabshah. | IV | 110ºF | May |
| 6. | Khipro. | V | 109ºF | May |
| 7. | Tando Jam. | V | 108ºF | May |
| 8. | Umerkot. | VI(b) | 104ºF | May |
| 9. | Badin. | VI(a) | 104ºF | May |
| 10. | Ghorabari. | VI(b) | 96ºF | May |
| 11. | Karachi (Airport) | VII | 97ºF | May |
| 12. | Hyderabad. | IX | 108ºF | May |