

Climate and wheat productivity

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FORTUNATELY wheat production in the year 1999-2000, was extraordinarily high. Different reasons have been given for this.

Government agencies and agricultural extension department claim that it was due to their efforts while the farmers are astonished for such higher yields because having the same inputs (seed, fertilizer and water) during previous years they had harvested much lower yields. Also, it may not be wrong to mention that the total availability of irrigation water was relatively less during 1999-2000.

Factors listed by most experts for the bumper wheat crop of the year 1999-2000 are as under:

- increase in wheat area;
- increase in support price of wheat;
- desilting of canals and distributaries upto the tail;
- better supply of fertilizers as compared to the previous years and
- timely sowing of the wheat crop.

Dr. Abdul Salam (Dawn, August 6) in addition to the above listed factors, also pointed out the contribution of rainfall and low temperature but he did not elaborate their impact.

In our opinion, suitable climate during the whole growing season was the most important factor responsible for high yields. Most likely, we would not have such suitable climatic conditions in the coming years, so we should concentrate on other factors i.e. provision of seed, fertilizer, irrigation, weedicides etc., to obtain higher yields on a sustainable basis. The objective of this paper is to identify and analyse the real reason of higher wheat yield during 1999-2000 and to suggest strategies for maintaining sustainability in wheat production.

Weather is the combination of natural phenomena as temperature, precipitation, light intensity and duration, wind direction and velocity and relative humidity. In any given location these weather factors assume a certain pattern changing day by day, week by week, month by month and season by season and the same pattern repeats year by year. This pattern is the location's climate.

Climatic factors influence all aspects and stages of plant growth and hence affect agricultural productivity and stability of production. Their influence extends from the upper limits of the atmosphere, in which clouds

mulated during the past several decades in some regions of the world, suggest that the year-to-year variations of wheat growth and development are mostly due to weather changes. Cool and moist weather during early

where the annual precipitation is neither less than 38 cm nor more than 100 cm except in those areas where irrigation is used. In some places, wheat is grown on as little as 25 cm of rainfall but irrigation is used to supplement

and fertilizers. But still many farmers are ignorant of the effects of weeds on the crop yield. They can easily control weeds by adopting suitable rotations and practicing "Daab" which requires no finances. Use of comparatively higher seed rate, helps in reducing weed. Similarly fertilizer use efficiency could be considerably improved by side dressing the fertilizer instead of broadcasting, this technique requires very little extra cost.

Canal closure due to shortage of water in rivers and reservoir at sowing and early growth stages have adverse effects on the wheat crop. However, supplementing canal water with tube wells during acute water shortage is necessary. Application of irrigation at critical stages of wheat crop is also very essential to improve water use efficiency. The irrigation scheduling has to be adjusted according to the rainfall and temperature. Normally four to five irrigations are enough but if temperatures shoot up during pollination or grain filling, additional irrigation is a must. Addition of organic wastes as press mud in to soil, would improve soil organic matter and higher organic content in soil, not only improves nutrient supply to the crop but also improves the water use efficiency.

Use of new innovative tech-

Table 1. Average wheat yield of different farms of Punjab (t/ha-1)

Wheat Season	Farm No.1	Farm No.2	Farm No.3	Farm No.4
1996-97	2.50	2.40	2.80	3.20
1997-98	3.20	2.70	2.60	3.60
1998-99	3.50	2.80	3.40	3.50
1999-2000	4.20	3.30	4.60	4.20

Source: Survey conducted by Department of Agronomy, UAF.

growth, and warm and dry weather during grain formation are generally considered ideal for wheat. Exactly similar conditions prevailed during 1999-2000 in irrigated areas of Punjab and Sindh.

Out of many climatic factors, wheat plant is determined largely by temperature and rainfall.

Temperature: Early chemical, physiological and biological process in plants is influenced by temperature, from solubility of minerals and organic solutes in its tissue, to the most critical physiological process in plant life.

The water supply. In regions where high rainfall occurs, grain crops do not thrive because of the prevalence of diseases, leached soils and logging. The rainfall patterns (Table 3) reveal that there was sufficient rainfall during the early vegetative growth of wheat in January and February, 2000. This was the maximum growth time and so the rainfall supplied the optimum moisture to complete physiological growth satisfactorily.

Rainfall during the month of March and April is the more important climatic factor which affects the production of wheat

Table 2. Average minimum and maximum temperature (°C) 1996-2000.

Year	January		February		March		April	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1996	8.9	19.0	9.7	22.7	15.3	26.5	19.0	34.2
1997	6.5	20.0	7.9	22.3	13.7	26.3	18.6	30.1
1998	6.4	20.0	9.5	20.0	13.1	25.5	20.1	34.7
1999	8.9	16.8	10.0	23.6	13.8	28.2	19.0	37.0
2000	5.7	18.9	7.3	20.2	12.5	27.6	20.6	38.1

Source: Meteorological section, Department of Crop Physiology, UAF.

Photoperiodically, wheat is classified as a long-day plant. Transition from vegetative to reproductive stage as well as the transition from initiation of growth to biological maturity does not depend on the day length factor alone but on both, length of day and temperature. It is commonly recognized that a definite amount of heat is required to bring a crop from planting to maturity. It is also commonly recognized that there are certain restricted time limits within which crops must be planted for best results defined by the temperature conditions of the locality. When sowing is delayed, the length of develop-

ment period is prolonged and in Pakistan. In addition during the later stages of wheat crop, winds blowing due to the unequal heating of the soil surface adversely affect the crop. These winds are lethal for the wheat crop because if these winds and rainfall occur simultaneously the lodging of the wheat occurs which reduce the yield too much. As when lodging occurs shortly before earing, pollination is poor and if it occurs after earing, grain formation and maturation will not proceed normally

techniques as sorghum-allopathy, zero tillage, saline agriculture, would be very useful for improving wheat yields. Two sprays of sorgaab (sorghum water extract) at 30 and 40 days after sowing, increases wheat yields by 20 per cent and combination of sorgaab with the soil application of optimum nitrogen or two foliar sprays of Nitrophoska @ 1 kg/ha at booting and earing could further increase wheat yield by 25-30 per cent. The use of no-tillage seed planter for sowing wheat after rice and cotton is quite feasible because it utilizes the previous crops moisture by saving rauni irrigation, cuts cost for land preparation and could aid sowing at proper time i.e. upto 30th November. Salt tolerant wheat

Out of many climatic factors.