SUMMARY
AND
CONCLUSION
Summary

The challenge for the agronomies in the dryland, winter rainfall environments is to apply knowledge of climatic, edaphic, biological and economic factors to devise a system that optimizes grain yield, yield stability, grain quality and long-term viability. The performance of crops depends on moisture and nutrient availability.

In India about 70 per cent of total cultivated area is rainfed which contributes about 42 per cent of total food production. In U.P. about 67 per cent area under wheat receives irrigation while in the remaining area the crop production depends on natural precipitation.

The yield of crop depends on its genetic potential, climatic conditions, water and nutrient supply, weed control and plant protection and other management practices. Hence any technological improvement to increase and stabilize the crop yields in dry land conditions will tremendously affect the nation's food production programme.

A dryland crop with high yield potential, but grown under inadequate fertilization will give poor yield unless it is fed properly because dryland soils are not only thirsty but they are hungry too. However, application of fertilizers under low soil moisture conditions may affect the crop adversely. Hence soil moisture at sowing in past rainy season crops is of immense importance, with deficient soil moisture, the beneficial effects of fertilizer might be negligible or even detrimental.
The present investigation entitled "Assessment of nitrogen requirement for wheat (Triticum aestivum L.) under varying soil moisture profile" was carried out at Agriculture Farm of the Shri Durga Ji Post Graduate College, Chandeshwar, Azamgarh during the rabi seasons of 1994-95 and 1995-96 with the following objectives:

i) To assess the growth and yield responses of the crop under varied moisture regimes and nitrogen levels,

ii) To evaluate nitrogen use efficiency by the crop under different treatment.

iii) To estimate consumptive use of water and water use efficiency of crops in different treatments.

iv) To work out the economics of the treatments.

The soil of the experimental field was loamy in texture with the pH or 7.5, containing 0.0475 per cent nitrogen and 0.3900 per cent organic carbon. The total rainfall received during the respective crops seasons were 59.2 mm and 87.5 mm. range of temperature in the respective season during crop period was 8.2°C to 42.4°C and 7.8°C to 39.7°C and range relative humidity was 19% to 94% and 28% - 97%, respectively.

The factors under study comprised (a) four moisture regimes at sowing (90±10 per cent, 75±10 per cent, 60±10 per cent available soil moisture and residual) (b) nitrogen levels (0, 40, 80 and 120 kg ha⁻¹). Moisture levels at sowing formed the main plots and nitrogen the sub-plot in a split plot design replicated 4 times. Wheat variety UP 2003 was the last crop.
The wheat variety UP2003 during both the years, were sown on 22nd November in 1994 and on 25th November in 1995 with the required available soil moisture and nitrogen as per treatment. Sowing was done in rows at a spacing of 25 cm. A basal dose of P2O5 and K2O in the farm of single super phosphate and murate of potash along with requisite amount of nitrogen (as per treatment) were applied as basal placement at about 10 cm depth before sowing. 10 days after sowing, gaps if any were filled by dibbling the seeds to maintain even population. The field was kept free of weeds throughout the cropping season by manual weeding and hoeing. Plant protection measures were taken as and when required.

In order to assess the effect of various treatments on growth on yield traits and yield, periodical observations on growth parameters like number of tillers m⁻¹, plant height, number of green leaves m⁻¹, leaf area, dry matter accumulation, were recorded at different crop growth stages. Studies on days to 50% flowering, yield traits like ear bearing tillers m⁻¹, length of spikes, number of grains spike⁻¹, 1000-grain weight, grain yield, straw yield, biological yield, harvest index etc. were also recorded. Quality parameter like protein content of grain was also estimated. Observations on nutritional aspects such as nitrogen concentration in grain and straw and their uptake by crop at harvest; nitrogen use efficiency i.e., agronomic efficiency, physiological efficiency and apparent recovery were worked out. Correlation studies of soil moisture depletion with yield and yield attributes. Consumptive use and water use efficiency were also worked out. The economic of various treatments and output: input ratio was coefficient.
The salient of the results thus obtained are summerised below:

Growth is the function of time representing sigmoid type curve. Till 30th day stage, the growth was rather slow and thereafter grained momentum up to 60th days stage. After that it increased with a diminishing rate till maturity of the crop. It is true for plant height and dry matter accumulation while number of shoots decreased slightly after 90th day stage and onwards.

All growth attributes like initial plant stand, plant height, number of tillers m⁻¹, number of green leaves m⁻¹, leaf area, leaf area index and dry matter accumulation were higher under sowing at 90 per cent available soil moisture, which was significantly superior to 75 per cent ASM, 60 per cent ASM and control.

Sowing at different available soil moisture had differential effect on yield attributes. As such significantly higher values of yield attributing characters like, ear bearing tillers, spike length, grains spike⁻¹ and 1000-grain weight were recorded under 90 per cent available soil moisture. However, days to 50 per cent flowering was reduced under sowing at higher available soil moisture.

The highest average grain (31.53 and 34.15 q ha⁻¹) and straw yields (49.69 and 53.39 q ha⁻¹) were recorded under sowing at 90 per cent available soil moisture. Sowing at 90 per cent ASM registered 7.62, 21.72 and 42.44 per cent more grain yield than 75 per cent ASM, 60 per cent ASM and residual soil moisture, respectively. Sowing at higher ASM (90 per cent) proved most instrumental in registering higher value of harvest index and was significantly superior to lower level of available soil moisture in this respect.
Highest protein content in grain was recorded under 90 per cent available soil moisture at sowing. Crop sown on higher available soil moisture (90 per cent ASM) recorded significantly higher values of nitrogen content and their uptake by grain and straw than sowing on 75 per cent, 60 per cent ASM and residual soil moisture, respectively.

Nitrogen use efficiency i.e. agronomic efficiency, physiological efficiency and apparent recovery were higher at lower soil moisture regime at sowing.

Increasing available soil moisture at sowing enhanced net return and output : input ratio and the highest returns were associated with 90 per cent ASM at sowing.

The consumptive use of water increased with increase in available soil moisture at sowing values being maximum at 90 per cent ASM. At sowing, however, the water use efficiency increased up to 75 per cent ASM at sowing.

Different nitrogen levels did not influence the initial plant density. In general, all growth attributes increased significantly with increasing fertility levels from control to 120 kg N ha\(^{-1}\) at all the stages of crop growth. Plant heights at 30, 60 DAS and at harvest stages, number of green leaves at 60 and 90 DAS stages as well as dry matter accumulation at 60 and 90 DAS stages and at harvest stages were significantly higher under 120 kg N ha\(^{-1}\), nitrogen levels.

The yield contributing characters like ear bearing tillers, length of spike, spikelets spike\(^{-1}\), grains spike\(^{-1}\) and 1000-grain weight significantly increased with corresponding increase in
nitrogen level from 40 kg N ha\(^{-1}\) to 120 kg N ha\(^{-1}\). However, significant increase in spike length was recorded up to 80 kg N ha\(^{-1}\). A slight increase in number of days taken to 50 per cent flowering was noted with increasing fertility levels up to 120 kg N ha\(^{-1}\).

Application of 120 kg N ha\(^{-1}\) produced significantly higher straw yields in both the years and grain yield in the seed year but the significant improved in grain yield was recorded up to 80 kg N ha\(^{-1}\) dry the first year. Based on two year mean data application of 120 kg N ha\(^{-1}\) registered 2.70, 26.61 and 88.24 per cent improvement grain yield over 80 kg N ha\(^{-1}\), 40 kg N ha\(^{-1}\) and control, respectively. Highest nitrogen level (120 kg N ha\(^{-1}\)) resulted in to highest value of harvest index, which declined with decreasing levels of fertility.

Protein content or grain progressively increased with increasing levels of nitrogen, being significantly higher under 120 kg N ha\(^{-1}\). Increase in fertility level from control to 120 kg N ha\(^{-1}\) significantly enhanced nitrogen in grain and straw and its uptake the content and nitrogen, significantly.

Increasing rates of nitrogen augmented yield and N uptake but the maximum values of agronomic efficiency, physiological efficiency and apparent recovery were associated with 40 kg N ha\(^{-1}\).

The highest net return and output: input ratio was associated with 80 kg N ha\(^{-1}\) in the first year and 120 kg N ha\(^{-1}\) during the second year of experimentation.

Consumptive use of water by crop differed due to levels of nitrogen values being maximum in case of 120 kg N ha\(^{-1}\) in both the
years. The highest water use efficiency was associated with 80 kg N ha\(^{-1}\) in the first year and 120 kg N ha\(^{-1}\) during second year.

**Conclusions:**

On the basis of experimental findings as summarized above, the following broad conclusions are drawn.

1. Significant improvement in growth attributes, yields attributes and yield was observed when crop was sown at 0.90 ± 10 per cent available soil moisture.

2. Application of 120 kg N ha\(^{-1}\) augmented growth and yield attributes and stever yield. The grain yield significantly increased upto 80 and 120 kg N ha\(^{-1}\) in the first and second year, respectively.

3. Nitrogen use efficiencies such as agronomic efficiency, physiological efficiency and apparent recovery, were lower at higher rate of available soil moisture at sowing and nitrogen levels.

4. Increasing availability of moisture at sowing and nitrogen rates improved protein content of grain there by improved the quality of grain.

5. Sowing at 90 per cent available soil moisture increased consumptive use of water by crop appreciably. The value of water use efficiency was associated with 0.75% available soil moisture of sowing. Similarly increasing rate of application upto 120 kg N ha\(^{-1}\) increased consumptive use of crop but highest water use efficiency was recorded at 80 kg N ha\(^{-1}\).
6. Sowing at 90 per cent available soil moisture and 80 kg N ha\(^{-1}\) recorded maximum net return as well as output: input ratio.

**Recommendation:**

Based on the experimental findings, it should be sown at about 90 per cent available soil moisture and it should be fertilized with 80 kg nitrogen ha\(^{-1}\) along with recommended dose of 40 kg ha\(^{-1}\) each of P\(_2\)O\(_5\) and K\(_2\)O ha\(^{-1}\) for optimum yield under dry land conditions.