DISCUSSION
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Winter dominant rainfall areas contribute a major part of the world dryland wheat production. Wheat is extremely well adapted to endure in such an environment, where its productivity and stability of production is exceeded only by barley. In the Mediterranean basin, a sequence of crops is often found with bread wheat in the wetter areas (more than 450mm average annual rainfall), durum wheat in the medium rainfall areas (250 to 450mm) and barley in the drier areas (less than 250mm) as the dominant crop (Impiglia and Ryan, 1997). The challenge for the agronomist in the dryland, winter-rainfall environments is to apply knowledge of climatic, edaphic, biological and economic factors to devise a system that optimize grain yield, yield stability, grain quality and long-term viability.

The present series of field investigations of wheat sown under various residual soil moisture and different level of nitrogen application has contributed to the management of wheat crop in dryland areas, but an attempt has been made to assess the agronomic requirements such as improvement in soil conditions including optimum soil moisture availability, increased nitrogen and reduced soil strength. The results obtained from the present investigation further been demonstrated that the combination and efficiencies of both water and nitrogen use can thus be improved.

5.1 Effect of weather condition on growth yield of wheat:

Weather conditions have a tremendous impact for wheat crop. It requires moderate temperature and solar radiation, which influence
the wheat yield by directly affecting the physiological process involved in grain production and indirectly through disease and insects damage. The results of present investigation indicate that there was a marked increase in growth and yield of wheat during the second than the first year. The temperature during both the years was happened to be satisfactory for the normal growth of crop. In the second year, the yield and the yield attributes were better than the first year. This was attributed to rainfall coinciding to CRI (16mm- between 22-36DAS) jointing (22.2mm) and ear emergence (22.2mm). The other probable reason seemed to be the bright sunshine hours and moderate fertility status of the experimental plots. More over winter rainfall of 122 mm the first year and 59.2 mm during second year was received by the crop different crop growth stages during its growing period. These factors positively affected growth and development of plants which ultimately resulted the better performance crop as compared to the first year crop during both the years.

5.2 Effect of available soil moisture at sowing:

The level of moisture availability in soil did not influence the initial plant stand per meter row length during both the years. On an average higher plant density was observed at highest available soil moisture during both the years of experimentation.

The tiller number progressively increased up to 90 day stage and declined slightly thereafter due to mortality of tillers. However, the magnitude of increase in number of tillers was highest between 30 to 60 day stage, exhibiting the maximum tillering period of the crop.
Increase in soil moisture availability significantly affected the number of tillers during both the years (1994-95 and 1995-96) at all the stages of crop growth. Higher available soil moisture (90%) recorded significantly higher tillers m\(^{-1}\) row length. This may be attributed to better early growth and plant vigour due to higher residual soil moisture coupled with winter rainfall (67.5 mm in 1994-95 and 59.2 mm in 1995-96) at different growth stages of crop improved the soil moisture status of the soil which enhanced the nutrient uptake by plant resulting in more tiller production. Sowing on normal residual soil moisture produced lowest tillers during both the years of experimentation. This result confirms the finding of Aspinal \textit{et al.} (1964), Day \textit{et al.} (1978) and Legg \textit{et al.} (1979).

Plant height of wheat, measured at different stages of growth, was affected significantly by different treatments. The stem elongation continued to increase with advancement of age till maturity. However, fast increase in plant height was observed upto 90 DAS there after the increase in this parameter was meager irrespective of the treatments. In general plant height recorded during the second year was comparatively more than that recorded during the first year.

Increased moisture availability of soil significantly affected the plant height at all the successive stages of growth. Maximum plant height was recorded with the highest available soil moisture (90%) which proved significantly superior to others levels at all the growth stages, during first year where as the highest levels of moisture were found at with 75% ASM, during second year. These
results are in accordance with findings of Day and Thompson (1975), Chaudhary and Kumar (1980).

The number of functional leaves was highest under maximum soil moisture (90% ±10) which decreased significantly with the reduction in level of available soil moisture at all the stages of crop growth during both the years.

Different available soil moisture at sowing significantly influenced the leaf area at all the crop growth stages values being maximum at 90% ASM in both the years of experimentation. Sowing on residual soil moisture produced lowest leaf area than 60, 75 and 90 per cent ASM in both the years at all stages of observation. These results are in conformity with the findings of Chaudhary and Kumar (1980) and Imtiyaz et al. (1983).

An evaluation of the data clearly showed that dry matter accumulation continued to increase with advancement of age of crop till maturity. The soil moisture availability significantly influenced the dry matter production at all the stages of crop growth. As such highest available soil moisture (90% ASM) resulted in the significant increase in dry weight than 75% and 60% of moisture availability in the soil at all the stages of crop growth during both the years. This may be because of cumulative effects of increased plant height, tillers, green leaves and chlorophylic area which resulted in more photosynthate accumulation by plants. These results are in accordance with the findings of Imtiyaz and Jensen (1981) and Imtiyaz et al. (1983) in barley.

Increasing available soil moisture at the time of sowing invariably increased the number of ear bearing tillers, spike length,
fertile spikelets, grains spike\textsuperscript{-1} and test weight up to highest moisture regime i.e. 90% ASM. This may be due to better early growth of plant in the beginning.

The available soil moisture significantly affected the number of ear bearing tillers during both the years. The maximum ear bearing tillers were associated with 90% available soil moisture. Higher availability of moisture at sowing under 90% ASM, coupled with 67.5mm winter rains in the first year and 59.2mm during second year at different phonological stages were beneficial for crop growth which resulted in better growth and development of plant and higher effective tillers. These results are in conformity with the finding of Day \textit{et al.} (1978) and Imtiyaz (1983).

The available soil moisture significantly affected the spike length. The crop grown at 90 per cent available soil moisture significantly enhanced spike length followed by 75 per cent and 60 per cent. Singh (1981) were in full agreement with the findings of present investigation.

The highest soil moisture also influenced the fertility of spikes. An increasing trend in number of fertile spikes was observed with increase in available soil moisture at sowing and the highest value was recorded with the 90 per cent soil moisture and lowest being under control during both years. This result gets full support from those reported by Nassar \textit{et al.} (1980).

Test weight of (1000-grain) increased significantly up to 90 per cent available soil moisture. On an average of two years highest 1000-grain weight (27.73) was recorded with highest available soil
moisture which excelled test weight 2.29, 3.25 and 6.26 per cent over 75 per cent, 60 per cent and control, respectively.

The highest yield was recorded when available soil moisture was 90 per cent in both the years which excelled to 75 per cent and 60 per cent soil moisture by a margin of 9.35 and 16.46 per cent during first year and 9.76 and 19.27 per cent during second year, respectively. Based on the mean values of two years, the 90% available soil moisture secured 9.64, 17.89 and 24.66 per cent higher grain yield as compared to 75 per cent, 60 per cent ASM and residual soil moisture, respectively. Increasing available moisture at the time of sowing invariably increased the number of ear bearing tillers, spike length fertile spikelets, grains spike$^{-1}$ and test weight of grain upto highest moisture regime i.e. 90% ASM. This may be because of better early growth and plant vigour in the beginning and winter rainfall during crop growth period increased nutrients availability to plants which interns resulted in translocation of photosynthates from source to sink which finally resulted more grain production at higher available soil moisture at sowing. These results are in accordance with the findings of Legett (1959) who obtained a correlation coefficient of 0.77, 0.53 and 0.87 between winter wheat yield and stored soil moisture, seasonal rainfall and stored soil moisture with seasonal rainfall, respectively.

The soil moisture significantly affected straw yield in both years. The crop sowing at 90 per cent available soil moisture produced significantly higher straw yields than 75 per cent and 60 per cent which had an edge of 6.75, 11.93 and 8.41, 12.67 per cent over the later two soil moisture, respectively. Day et al. (1978),
Legget *et al.* (1959), Choudhary and Kumar (1980), Imtiyaz and Jensen (1981) and Imtiyaz *et al.* (1982) also supported the findings of present investigation.

The biological yield was also influenced by available soil moisture at sowing. The highest biological yield was recorded during 1994-95 and 1995-96, respectively when at 90% available soil moisture which excelled the biological yield than 75 and 60% ASM during both year (1995-96), respectively. Based on the mean values of two years, the highest level of available soil moisture (90 per cent) secured 9.64, 17.89 and 24.66 per cent higher biological yield as compared to 75 per cent, 60 per cent and residual soil moisture, respectively.

The data, revealed that soil moisture resulted in significant variation in harvest index exhibiting higher value under higher available soil moisture (90 per cent), which excelled significantly over 75 per cent and 60 per cent soil moisture 11.76, 6.54 per cent and 15.65, 8.91 per cent, respectively.

Data on nitrogen content in grain showed that the nitrogen content due to available soil moisture was significant during both the years. Low level of soil moisture or residual soil moisture caused drastic reduction in nitrogen concentration in grain. The crop sown at 90 per cent available soil moisture contained higher percentage of nitrogen during both the years than that of 75, 60 per cent of available soil moisture and residual soil moisture (control). This may be probably due better soil moisture status of soil improving efficient use of applied nutrients by crop.
Available soil moisture brought about significant difference in nitrogen content in straw. The differences in nitrogen content due to available soil moisture were significant during both the years. Low level of soil moisture or residual soil moisture caused drastic reduction in nitrogen concentration in straw. The crop sown in 90 per cent available soil moisture contained higher percentage of nitrogen during both the years than that sown in 75 per cent and 60 per cent of available soil moisture.

The data pertaining to nitrogen uptake by grains reveals that nitrogen uptake by grains differed significantly due to available soil moisture at sowing. Sowing at 90 per cent available soil moisture proved significantly superior to 75 per cent, 60 per cent and control in this respect. The crop sown in 90 per cent available soil moisture removed and per cent higher nitrogen uptake respectively.

Highest available soil moisture at sowing (90 per cent ASM) enhanced the nitrogen uptake by straw over 75, 60 per cent and control during both the years. This moisture level proved significantly superior to other levels in this respect during both the years.

Data on nitrogen translocation in grain showed that the translocation of nitrogen in grain due to available soil moisture was significant during both the years. Low level of soil moisture or residual soil moisture caused highest translocation of nitrogen in grain. The crop sown at 75 per cent available soil moisture contained drastic decrease of nitrogen during both the years than that of 90, 60 per cent of available soil moisture. This may be probably due better use of residual soil moisture status of soil improving efficient use of applied nutrients by crop.
Available soil moisture was found to have significant influence on protein content. 90 per cent available soil moisture maintained its superiority over 75 per cent, 60 per cent and control.

The data pertaining to protein yield in grains reveals that protein yield by grains differed significantly due to available soil moisture at sowing. Sowing at 90 per cent available soil moisture proved significantly superior to 75 per cent, 60 per cent and control in this respect. The crop sown in 90 per cent available soil moisture higher protein yield during both the years followed by 75 per cent and 60 per cent ASM.

5.4 Effect of Nitrogen level:

Response of crop to nitrogen may vary with the level of water supply (Lethwal et al., 1991). Reddy and Bhardwaj (1984) and Singh et al. (1989) observed the increase in wheat yield with increase in nitrogen level up to 120 kg ha\(^{-1}\) under adequate irrigation as compared to limited number of irrigation, while Bains and Bhardwaj (1976) reported nitrogen showed response up to 80 kg N ha\(^{-1}\) under dry regimes. So apart from nutrient status of soil moisture availability is experimental factor in determining nitrogen requirement in wheat.

Tillering ability is genetically controlled, but much dependent on the environmental factors and increasing nitrogen supply increased further the tillers number (Evans, 1975) as the growth of buds and tillers are promoted by the phytohormone cytokinins (Bruinsma, 1979) which are purine or pyrimidine derivative, both of which are N containing ring structures and are synthesized from amino acids. The stimulating effect of nitrogen
nutrition on tillering in thus probably due to the effect of nitrogen on cytokinin synthesis.

Increasing nitrogen rates from 40 to 120 kg ha\(^{-1}\) resulted in appreciable increase in growth characters such as plant height, tillers (No), number of green leaves, leaf area index and dry matter production. The stimulated growth under adequate nutrient supply is a well known fact. Due to increased nitrogen application the nitrogen supplying capacity of soil to plant increased. The better start and early vigour under 120 kg N ha\(^{-1}\) was indicative of proper nitrogen utilization during early growth stages of the crop. Inadequate nitrogen availability in case of control and 40 kg N ha\(^{-1}\) caused poor growth of crop to certain extent. Proper supply of nitrogen to plant depends mostly on nutrients status of the soil and suitable soil moisture condition to bring the nutrients in solution for their timely uptake by plant. Higher dose of nitrogen i.e. 120 kg ha\(^{-1}\) increased the nutrient status of soil and at early growth when soil moisture conditions were favourable its utilization was better resulting better early growth of crop.

Nitrogen is a constituent of amino-acids and chlorophyll. Therefore increased efficiency of nitrogen utilization resulted in lush and luxuriant growth of seedlings from very beginning which stimulated the synthesis of protein and protoplasm. This caused increase in meristematic activities and enlargement and thus resulted in better development of plant (Baba, 1961). Increased nutrients status and supplying capacity of soil in initial stage due to basal application of 80 and 120 kg N ha\(^{-1}\) coupled with 60 Kg P\(_2\)O\(_5\) and 40 Kg K\(_2\)O provided favourable condition for effective early
growth and synchronized tillering. The early vigour of the seedlings coupled with sufficient nutrient availability to plant resulted in greater production of tillers. Production of more leaves, and also chlorophyllic area under higher nitrogen rate resulted in greater photosynthetic activities and accumulation of dry matter in plants as evident in case of 120kg N ha\(^{-1}\). Tillering ability is genetically controlled but is much dependent on the environmental factors and increasing nitrogen supply increased further the tillers number (Evans, 1975) as the growth of buds and tillers are promoted by the phyto hormone cytokinins (Bruinsma, 1979) which are purine of pyrimidine derivative, both of which are N containing ring structures and are synthesized from aminoacides. The simulative effect of nitrogen nutrition on tillering is thus probably due to the effect of nitrogen on cytokinin synthesis. Effective utilization of nutrients applied in soil growth spike of crop indicative of better performance of vegetative organs and also it is known to stimulate the yield attributes. Increased nitrogen application either due to its 80 or 120kg ha\(^{-1}\) application accounted for better utilization of P & K. Higher rate of nitrogen application not only brought about its proper utilization but was also responsible for better utilization of P and K by the plants.

Although the experiment was conducted under dryland conditions, there was a good soil moisture in the early stages because of different moisture regimes. Besides there was winter precipitation of 67.5 mm. (38-53 DAS, 17.7, 38-53 DAS- 46.5 mm; 95-102 DAS- 15.4 mm) in 1994-95 and 59.4mm (22-26 DAS- 16.0mm; 35-49 DAS- 20.2 mm; 75-85 DAS – 20.1 mm) in 1995-96.
provided higher available soil moisture availability to plant resulting in better utilisation of applied nitrogen and good growth and development of plant. The increased response in growth characters due to nitrogen applications has also been reported by Singh et al., (1968), Brown (1971). Singh et al. (1974) and Bastia and Rout (2001) yield attributes and yield.

In the present investigation, it was noted that increasing rates of nitrogen invariably improved the number of ear bearing tillers, length of spike, number of spikelets and grains/spike resulting in increase in grain yield. Application of 120 kg N/ha increased the production of ear bearing tillers. Increased nitrogen availability in their treatment brought about effective short of plot to produce more number of ear bearing tillers, spike length, number of spikelets and grains per spike and test weight. However, the rate of increase could not reach to the level of test significance in weight first year. Upon moisture availability investigation higher moisture availability of sowing and subsequent winter rainfall of 67.5 mm in 1994-95 and 59.2 mm during 1995-96 of during crop growth period enhanced the soil moisture availability to crop which improved utilization of nitrogen by crop resulting in to corresponding increase in yield traits with increasing rates of nitrogen application. Increased response in yield attributes due to nitrogen application has also been reported by Kumar et al, (1995) Rawat et al., (2000) and Bostia and Rawat (2001).

Nitrogen levels, caused significant improved in grain yield upto 80 Kg during first year. However, significant increase in grain yield was obtained upto 120 Kg N/ha during second year. The
application of 120 Kg N ha\(^{-1}\) registered significantly higher grain yield than 40 Kg and control in the first year but remained at par with 80 Kg/ha during second year. Based on the average of two years, the application of 120 Kg N ha\(^{-1}\) produced 5.46, 15.28 and 23.39 per cent higher grain yield as compared to the 80, 40 kg N ha\(^{-1}\) and control, respectively. The positive response to applied nutrients up to 75 Kg ha\(^{-1}\) was also reported by Singh \textit{et al.} (1995) and Tripathi. However, Girothia \textit{et al.} (1987), Patra (1990), Behera (1995) and Rawat \textit{et al.} (2000) found 120:90:60 kg N, P and K ha\(^{-1}\) as an optimum dose. Further increase beyond this level did not record any appreciable increase in grain yield.

Nitrogen levels also influenced the straw yield significantly. Increasing nitrogen levels up to 80 Kg ha\(^{-1}\) increased the straw yield during significantly first year. Highest nitrogen level (120 kg N ha\(^{-1}\)) recorded the maximum straw yield as against of 80 kg N ha\(^{-1}\) and 40 Kg N ha\(^{-1}\) and control. Based on two years mean application of 120 kg N ha\(^{-1}\) produced 5.55, 13.05 and 24.11 per cent higher straw yield as compared to 80, 40 kg N ha\(^{-1}\) and control, respectively. More grain yield and proportionally less biological yield under highest level of fertility led to higher harvest index, as it is a conversion efficiency of total dry matter to grain portion. This finding is well supported with the findings of Singh and Awasthi (1985) and Srivastava \textit{et al.} (2002).

Nitrogen levels, also caused marked variation in biological yield during both years. An increase of the doses of nitrogen resulted into increase in biological yield that control during both years. Based on the average of two years, the application of 120 kg N ha\(^{-1}\)
produced 5.46, 15.28 and 23.39 per cent higher biological yield as compared to the 80 kg N ha\(^{-1}\), 40 kg N ha\(^{-1}\) and control.

The harvest index increased with corresponding increase in nitrogen level during both the years. On an average the maximum value of harvest index (40.04) was found at 120 kg N ha\(^{-1}\) followed by 80, 40 kg N ha\(^{-1}\) and control, respectively with corresponding increase in harvest index 1.64, 5.59 and 10.95 per cent over value of harvest index. Although increasing level of nitrogen up to 120 kg ha\(^{-1}\) improved the value of harvest index significantly however, maximum increase in HI was obtained between 40 to 80 kg N ha\(^{-1}\).

Increasing nitrogen level successively improved the nitrogen content in both the years. Application of 120 kg N ha\(^{-1}\) significantly increased the nitrogen content in grain over lower rates of nitrogen in both the years. The highest mean of nitrogen content in grain (1.67 and 1.83 per cent) was recorded with 120 kg N ha\(^{-1}\) followed by 80 kg N ha\(^{-1}\) (1.56 and 1.68 per cent), 40 kg (1.28 and 1.39 per cent) and control (1.13 and 1.19 per cent) respectively during both years. The result is in accordance with the findings of Parihar and Tripathi (1989) who reported that nitrogen increased the concentration of N, P and K in grain and straw.

The higher concentration of nitrogen in grain due to 120 kg N ha\(^{-1}\) might be due to stimulated absorption of nitrogen because of increased nitrogen supplying power of the soil. Besides, basal application of 60 kg P\(_2\)O\(_5\) and 40 kg K\(_2\)O might have accelerated that absorption by plants under higher rates of nitrogen application. Protein molecules are built up through systematically controlled condition of aminoacids molecules, formed by combining reduced
nitrogen with derivatives of carbohydrates obtained within the plant system as a product of photosynthesis. Accumulation of protein in grain and straw might be due to continuous availability of nitrogen for protein synthesis. On contrary availability of nitrogen with control plots due to certain extent 40 kg N ha\(^{-1}\) might have failed to meet the nitrogen requirement to protein synthesis resulting into low protein content of grain and straw. Findings of many workers have shown higher N content in grain and straw with the increasing nitrogen grains (Mishra et al., 1968 and Ulmann, 1973).

Increasing nitrogen level has direct effect on nitrogen uptake by grain during both the year of experimentation. Highest nitrogen levels enhanced the nitrogen uptake by grain which was significantly superior to rest of the nitrogen levels.

Similarly, nitrogen level has direct effect on nitrogen uptake by straw during both the year of examination. Highest nitrogen levels enhanced the nitrogen uptake by and per cent respectively over 120, 80, 40 and control level of fertility proved significantly superior to rest of the fertility levels.

Increasing nitrogen level has direct effect on translocation of nitrogen in grain during both the year of experimentation. Highest nitrogen levels enhanced the translocation of nitrogen in grain which was significantly superior to rest of the nitrogen levels.

It is evident from the data that the agronomic efficiency, physiological efficiency and apparent recovery were higher at the lower rate of nitrogen application. The data revealed that the 40 kg N ha\(^{-1}\) resulted 20.14 and 34.37 per cent increase in agronomic efficiency (AE), 5.49 and 7.13 per cent increase in physiological
efficiency (PE) and 9.51 and 29.43 per cent increase in apparent recovery (AR) during first year, respectively. Similar finding was observed during second year of experimentation with 8.24 and 24.43 per cent increase in agronomic efficiency (AE), 1.06 and 12.56 per cent increase in physiological efficiency (PE) and 7.20 and 13.54 per cent increase in apparent recovery (AR), respectively.

Nitrogen level also caused significant variation in protein content in grain. During both years highest nitrogen level i.e. 120 kg ha\(^{-1}\) significantly improved protein content in grain over 80 kg N ha\(^{-1}\), 40 kg N ha\(^{-1}\) and control. Similar result has been also reported by Singh et al. (1975).

Nitrogen level also caused significant variation in protein yield in grain. During both years highest nitrogen level i.e. 120 kg ha\(^{-1}\) significantly improved protein yield in grain over 80 kg N ha\(^{-1}\), 40 kg N ha\(^{-1}\) and control.

5.5 Correlation of Soil Moisture and Yield:

The correlation of soil moisture and yield attributes one week before each sowing indicates that the correlation was found positive between soil moisture depletion and other variables (yield and yield attributes). As the moisture increased, various parameter of yield and yield attributes positively increased. Simultaneously, it recorded the non-significant response in this respect. Since, the yield declined successively in delayed sowing dates, this "r" value followed the above course of manifestation. This increase can be explained on the basis that applied fertilizer increased the nitrogen availability as well as cation exchange capacity of roots which ultimately enhanced
the absorption of nitrogens. These results get full support from those reported by Kumar et al. (1995).

5.6 Consumptive use and water use efficiency:

In general consumptive use of the crop differed markedly due to variation in winter rainfall in the two years of experimentation. As such higher consumptive use was in the first year as compared to the first year.

It is apparent for the data that consumptive use by crop differed markedly due to available moisture values being maximum in case of M3 in both the years. M3, M2 and M1 moisture levels brought about 17.92, 11.01 and 4.67 per cent increase in total moisture use respectively, as compared to M0 in the first year and 15.32, 9.44 and 6.42 per cent in the second year of study. Availability of soil moisture to plant is the most important factor governing crop production under dryland condition. Therefore, seasonal variation and rainfall and/or stored soil moisture and/or rainfall which affect the storage of soil moisture may result into success or failure of the crop.

In the present investigation more moisture use under high available soil moisture of sowing (90 per cent ASM) as compared to low moisture levels of soil was probably due to vigorous growth of plant at early stages compared with nitrogen rainfall of 122. In the first year and 59.2 mm second year any method caused higher moisture extractive by the crop. As show more consumptive use water was associated with 90% ASM of soil.
It is clear from the data that consumptive use by crop also differed markedly due to nitrogen rates, in both the years. The highest consumptive use was recorded with the application of 120kg Nha⁻¹, while the lowest value was associated with control plot. Application of 40, 80 and 120 kg Nha⁻¹ resulted in 20.0, 18.0 and 10.1 per cent increase in moisture use as compared to control in the first year and 8.57, 16.7, 23.66 per cent during second year, respectively.

Higher consumptive use under high nitrogen rate that soil of lower rates and controls may be because of vigorous growth of that under higher N-rates and more root extensive to deeper soil layers. Studied of Olson et al. (1960), Olson et. al. (1964) showed that fertilizer application results indeed to increase water use by crops. Brown et al. (1971) concluded such as the rate of nitrogen increased mainly amount of rate was used b at each of different growth-stages because nitrogen had increased total plant growth a developer have effective root system.

5.7 Moisture use efficiency:

The moisture use efficiency was also influenced by available soil. The highest moisture use efficiency was recorded under M3 level in the first year and at M2 level during second year.

Similarly, moisture use efficiency increased with the increasing rate of nitrogen values being maximum as 120kg Nha⁻¹. This was probably to because of nitrogen trended to increase grain yield per unit of water consumed. The results of present investigation confirm the findings of Warder et al. (1963), Bond et al. (1971) and Singh et al. (1976).
5.8 Economy:

The maximum net returns of Rs. 11,136 and Rs. 12,694 obtained due to the availability of 90 per cent available soil moisture during first and second years, respectively. The average extra net returns of Rs. 1242, Rs. 3153 and Rs. 5041 were obtained as compared to 75 per cent available soil moisture, 60 per cent available soil moisture and residual soil moisture (control) at sowing, respectively. This indicates more income was obtained with maximum available soil moisture at sowing, whereas minimum net returns were obtained with residual soil moisture.

The economy of different doses of nitrogen application has been worked out as per the cost of inputs involved during the course of the study and the present rates of fertilizer and produce. The present study reveals considerable economy can be obtained due to nitrogen application in wheat even under dry land conditions. The maximum net returns of Rs. 11,521 were obtained with the application of 80 kg N ha\(^{-1}\) during first year while Rs. 13,762 were obtained with the application of 120 kg N ha\(^{-1}\) during second year. The higher net returns were obtained during the second year due to higher grain yields. The mean value showed that the produce worth of Rs. 12,300 could be obtained with the application of 80 kg N ha\(^{-1}\). The two years average values indicate that due to the application of 80 kg N ha\(^{-1}\) extra net returns of Rs. 70, 2964 and 7962 were obtained with the application of 120 kg N ha\(^{-1}\), 40 kg N ha\(^{-1}\) and control, respectively.