SUMMARY AND CONCLUSION

A field experiment entitled "studies on Nitrogen management in linseed intercropped with winter pulses under limited moisture availability" was conducted in rabi seasons of 1994-95 and 1995-96 on a sandy loam soil of medium fertility at A.S. College, Agricultural Research Farm Lakhaoti, Bulandshahr (U.P.). The treatments comprised seven cropping systems (Sole linseed, sole lentil, sole gram, linseed + lentil 2:2, linseed + lentil 3:2, linseed + gram 2:2 and linseed + gram 3:2) and four doses of nitrogen (0, 25, 50 and 75 kg/ha) replicated thrice in a randomised block design.

6.1. Linseed

6.1.1 EFFECT OF CROPPING SYSTEM :

(i) Sole linseed produced more number of branches/plant during both the years of study. Inter cropping F + G 3:2 had more number of branches/plant than other cropping system involving linseed.

(ii) highest dry matter was recorded in F + G 2:2 and the lowest in sole linseed, during both the years. F + G
2:2 row ratio produced higher leaf area index over other cropping systems but was at par with F + L 2:2 and F + L 3:2 in 1994-95.

(iii) F + L 2:2 and F + G 2:2 cropping systems produced more number of capsules/plant than other systems during both the years. Highest values in this respect were noted in sole linseed.

(iv) Sole linseed recorded more number of seeds/capsule during both the years. F + G 2:2 produced more number of seeds/capsules during both the years except F + G 3:2 in 1994-95.

(v) Maximum weight of capsules/plant was recorded with sole linseed during both the years as compared to other cropping systems. F + L 2:2 intercropping system had the highest weight of capsule/plant over other cropping systems during both the years except F + G 2:2 in 1995-96.

(vi) Sole linseed produced significantly higher grain straw and biological yield/ha over other cropping systems. F + G 3:2, F + G 2:2 and F + L 2:2 produced more grain yield/ha than F + L 3:2.
(vii) Sole linseed recorded significantly higher nitrogen uptake in grain, stalk and total N uptake in both the seasons over intercropping systems.

6.1.2 **EFFECT OF NITROGEN** :

(i) Growth attributes (plant height, dry matter accumulation and leaf area index) increased with increasing doses of nitrogen upto 75 kg N/ha.

(ii) All the intercropping systems produced significantly higher dry matter/m over sole linseed at all the doses of nitrogen but F + G 2:2 had higher dry matter/m over other cropping systems at all the doses of nitrogen.

(iii) All the yield attributes viz. number of capsules/plant, no. of seeds/capsule, weight of capsules/plant and weight of 1,000 seed recorded higher values at 75 kg N/ha during both the years except number of capsule/plant in 1994-95 where it was higher at 50 kg N/ha.

(iv) Application of nitrogen significantly increased the grain, stalk and biological yield upto 75 kg N/ha.

(v) Nitrogen uptake in grain, stalk and total N uptake was significantly increased with increasing doses of nitrogen upto 75 kg/ha.
(vi) Higher levels of N (50 & 75 kg/ha) had depressing effect on harvest index.

(vii) Application of 25 kg N/ha increased N uptake in grain over no nitrogen. N uptake in grain reduced at higher levels of N compared to 25 kg N/ha.

(viii) N uptake in straw increased up to 75 kg N/ha and total N uptake increased with increasing levels of N up to 25 kg N/ha.

6.3. GRAM

6.3.1 EFFECT OF CROPPING SYSTEM:

(i) Plant height was higher in F + G 2:2 row ratio than sole gram.

(ii) Sole gram produced significantly higher number of branches/plant over intercropping system.

(iii) Sole gram recorded higher LAI and dry matter accumulation compared to intercropping systems. Among the intercropping systems F + G 2:2 row ratio produced higher LAI and dry matter than 3:2 row ratio.

(iv) Sole gram recorded higher number of pods/plant, number of grains/plant and grain yield/plant compared to intercropping of linseed + gram. F + G 2:2 intercropping system produced higher number of grains and grain yield/plant than F + G 3:2 system.
(v) Sole gram recorded significantly higher grain, straw and biological yield/ha over intercropping system. F + G 3:2 row ratio proved superior over F + G 3:2 row ratio.

(vi) N uptake in grain and straw and total N uptake were higher in sole stand compared to intercropping systems. F + G 2:2 had higher N uptake over F + G 3:2.

6.3.2 EFFECT OF NITROGEN:

(i) Plant height increased with the increasing of N level up to 50 kg/ha.

(ii) Number of branches/plant, in general, increased with the increase in N levels up to 25 kg/ha.

(iii) Dry matter accumulation and LAI increased with the increase in N levels up to 75 kg/ha.

(iv) 25 kg N/ha produced more branches/plant, pods/plant, grains/plant and grain yield/plant as compared to other doses. Higher level of 75 kg N/ha adversely affected number of branches/plant, grains/plant and grain yield/plant.

(v) Grain yield/ha increased upto 25 kg N/ha.

(vi) Application of N up to 25 kg N/ha produced significantly higher straw yield compared to 0 and 50 kg N/ha.
(vii) Biological yield increased with increasing doses of N upto 25 kg/ha only.
(viii) Harvest index was adversely affected by higher doses of nitrogen beyond 25 kg/ha.
(ix) 25 kg N/ha recorded markedly higher N uptake in grain and total N uptake over 0, 50 and 75 kg N/ha.

6.4 TOTAL PRODUCTIVITY :

6.4.1 EFFECT OF CROPPING SYSTEM :

(i) sole linseed produced higher linseed equivalent yield during both the years. F + G 2:2 in 1994-95 and F + G 2:2 and F + L 2:2 in 1995-96 had higher linseed equivalent yield over the other intercropping systems.
(ii) F + L 2:2 in 1994-95 and F + G 2:2 in 1995-96 gave significantly higher LER compared to other cropping systems.
(iii) F + G 2:2 and sole lentil recorded the highest nitrogen uptake in grain over other cropping systems during both the years.
(iv) N uptake in straw was found to be highest in sole lentil and lowest in sole linseed. Among the intercropping systems F + L 2:2 had higher N uptake in straw over the other intercropping systems except F + G 2:2 in 1995-96.
(v) Sole lentil recorded significantly higher total nitrogen uptake over the other cropping systems in both the years. Sole linseed had the lowest total nitrogen uptake.

(vi) Sole linseed fetched maximum gross return in both the years. Among the intercropping systems, F + L 2:2 in 1994-95 and F + G 2:2 in 1995-96 gave higher gross returns.

(vii) All the cropping systems gave significantly lower net return compared to sole linseed. Highest net return was recorded in sole linseed in both the years. Among the intercropping system, F + L 2:2 in 1994-95 and L + G 2:2 in 1995-96 gave higher net returns over the systems.

(viii) Sole linseed gave higher net return/rupee invested. Among the intercropping systems, F + L 2:2 and F + G 2:2 recorded higher net return/rupee over other cropping systems in 1994-95 and 1995-96, respectively.

(ix) Sole linseed recorded maximum net return/day in both the years over cropping systems.

6.4.2 EFFECT OF NITROGEN:

(i) Increasing rates of N upto 25 kg/ha produced higher linseed equivalent yield. The response/kg of applied N at
25 kg/ha was higher with F + L 2:2 and F + G 2:2 in 1994-95 and 1995-96, respectively. At higher levels of 50 and 75 kg N/ha, the response was greater in case of sole linseed as compared to other cropping systems.

(ii) In sole linseed, equivalent yield showed favourable response up to 50-75 kg N/ha while there was no response to applied N in sole gram and lentil except in 1995-96 where linseed equivalent yield increased up to 25 kg N/ha in sole gram. In intercropping system, the response was restricted to 25 kg N/ha.

(iii) Application of 75 kg N/ha significantly increased N uptake in grain over 0 and 25 kg N/ha.

(iv) Nitrogen uptake in straw and total N uptake increased with increasing doses of N up to 75 kg/ha.

(v) In sole linseed N uptake increased up to 75 kg N/ha. In sole grain legumes, significant increases was noted up to 25 kg N/ha. N uptake was, however reduced under higher doses of nitrogen in legumes. In intercropping systems, 25 kg N/ha recorded higher N uptake over 0 kg N/ha. However F + L 3:2 and F + G 3:2 recorded higher N uptake at 75 kg N/ha over 25 kg N/ha.

(vi) In 1995-96 straw of sole lentil recorded significantly higher N uptake over other cropping systems.
at all the levels of nitrogen. Intercropping systems had high N uptake in straw upto 50 Kg N/ha.

(vii) Total N uptake in sole linseed showed increase upto 50 Kg N/ha while sole gram and lentil recorded increase in total N uptake up to 25 Kg N/ha only. All the intercropping systems showed significant increase in total N uptake at lower doses of N.

(viii) Gross and net return increased with increasing levels of N up to 25 Kg/ha.

(ix) Application of nitrogen increased the net return/rupee invested. Net return/day increased upto 25 kg N/ha only.

(x) Higher gross return were realized with sole grain legumes fertilized with lower levels of N (25 kg/ha). Sole linseed gave higher return at 50 kg N/ha while intercropping system at 25 kg N/ha.

(xi) In 1994-95 sole gram and lentil fetched higher net return at no nitrogen and 25 kg N/ha respectively. These systems along with F*G 2:2 recorded higher net returns at 50 kg N/ha while F*L 2:2 was the best system with 75 kg N/ha. Sole linseed recorded higher net return with 75 and 50 kg N/ha in 1994-95 and 1995-96, respectively.
(xii) In 1995-96 sole linseed recorded higher net return/rupee invested at 50 kg N/ha. Sole lentil and gram had higher net return at 25 and 0 kg N/ha, respectively. Intercropping system recorded higher net return/rupee invested at 25 kg N/ha.

(xiii) Sole linseed gave increased net return/day upto 50 kg N/ha. Sole gram and lentil recorded maximum net return/day with 25 kg N/ha and decreased with further increase in level of N. In intercropping systems, maximum net return/day was with 25 kg N/ha. Sole gram gave the maximum net return/day among all the cropping systems. Sole lentil was at par with sole gram in 1994-95.

CONCLUSION:

The results of the study have clearly revealed that sole crop of linseed gave higher production and proved remunerative than sole grain legume (gram and lentil) intercropping systems. Among the intercropping systems, linseed + gram in 2:2 row ratio was the best treatment in terms of production potential and profitability. Sole grain legumes and linseed + gram in 2:2 row ratio gave higher production and monetary returns at a lower dose of 25 kg N/ha under the conditions of the present experiments.