SUMMARY AND CONCLUSION
6. Summary and Conclusion

An experiment on "Effect of tillage and tree biomass on growth, yield and quality of oats (Avena sativa L.)" was carried out in rabi season of 2005-06 and 2006-07 in the PCFC block (field No. 366) of central experimental farm of Indian Grassland and fodder research Institute, Jhansi – 284003.

The variables evaluated in this study were tractor tillage management treatments viz. Disc harrow (3), Cultivator (3), Cultivator (1) + Rotavator (1) and MB Plough (1) + cultivator (2) with combination of four level of INM Sole fertilizers, Dalbergia sp. Biomass 3t/ha + 40 kg N/ha through urea, Subabool biomass 2 t/ha + 40 kg N/ha through urea and Dalbergia sp. Biomass 1.5t/ha + Subabool biomass 1t/ha + 40 kg N/ha through urea. In all there were 16 treatments combinations and these were replicated 3 times following Strip-Plot Design. The soil of the experimental plot was sandy clay loam in texture with medium in organic carbon, low in nitrogen, medium in phosphorus and high in potassium.

The fodder oats (Kent) was sown on November 20, 2005 and November 18, 2006 and was harvested on March 11, 2006 and March 14, 2007. Fodder oat was sown at 25 cm row spacing using seed rate of 60 kg/ha.

Fertilizers were applied at the recommended rate of 80 kg/ha nitrogen, 40 kg/ha, phosphorus and 40 kg/ha potash in fodder oat. Tree litter
biomass was applied as per treatment. The whole quantity of phosphorus, potash and half dose of nitrogen were applied at time of sowing and remaining N was top dressed at 30 days after sowing.

The soil analysis was done in central soil testing laboratory at crop production division, IGFRI, Jhansi. Allelopathic studies were conducted in the laboratory of Seed Technology Division of IGFRI, Jhansi. Total nitrogen was estimated with the help of Kjeldahl method for computing protein content and protein yield in the laboratory of FM & PHT division of IGFRI, Jhansi.

The observations were recorded at different interval on plant population/m², plant height (cm), number of functional leaves/plant, leaf area index, fresh and dry weight of plant/m², green fodder yield, stover yield, protein yield, and soil pH, EC, organic carbon, available nitrogen, phosphorus and potassium from each treatment. The energy input and output (MJ/ha) was computed on the basis of observed input and produce. The cost of cultivation, gross and net return were calculated as per price rise in local market.

The results of experiment are summarized as follow:

**Tractor tillage**

Small size of clods were formed in one pass of cultivator + one pass of rotavator during both the years.
The plant population of oats/m² was maximum in one pass of Cultivator + one pass of Rotavator.

One pass of MB Plough + Cultivator (2) produced significant differences for plant height on initial stage of crop growth (25 DAS), whereas maximum plant height was observed under Cultivator (1) + Rotavator (1) at 50 DAS and 75 DAS.

Number of functional leaves/plant was not influenced due to different tractor tillage.

Maximum energy input in tractor tillage was used in MB Plough (1) + cultivator (2) i.e. 1633 MJ/ha.

Marginal change in number of tillers per plant was recorded in both the years of crop cultivation due to tractor tillage.

The leaf area index of oats was less in other tractor tillage operations viz disc harrow, cultivator, MBP + cultivator treatments.

Green fodder yield level in MB Plough (1) + cultivator (2) treatment was i.e. 410.16 and 410.91 q/ha during 2005-06 and 2006-07 which was at par with one pass of cultivator and rotavator each.

Maximum soil organic carbon, available nitrogen, phosphorus, potassium, Crude Protein content, protein yield and soil moisture in fodder oats was recorded in one pass of Cultivator (1) + Rotavator (1).
Cultivator (1) + Rotavator (1) gave more Gross and net income (Rs/ha) from oats fodder i.e. RS. 32893.30 and 33019.80 Gross income, 13770.00 and 13896.80 net income (Rs/ha) during 2005-6 and 2006-07, respectively

Maximum energy output 74144.70 MJ/ha in tractor tillage was observed in MB Plough (1) + cultivator (2).

**Litter biomass of tree species**

The differences in clods formation were marginal due to different litter biomass of tree species and tractor tillage.

The combination of *Dalbergia* sp. Biomass 1.5t/ha + Subabool biomass 1t/ha + 40 kg N/ha through urea produced maximum plant population.

The combination of Subabool biomass 2 t/ha + 40 kg N/ha through urea produced maximum plant height throughout the crop growth an both the years.

Application of Subabool biomass 2 t/ha + 40 kg N/ha through urea produced more functional leaves at 25, 50 and 75 days after sowing (DAS) in both the years, 2005-06 and 2006-07.

Maximum energy input was used in sole fertilizer application (6166 MJ/ha),
The number of tillers was drastically reduced due to sole fertilizer application.

The leaf area index was drastically reduced due to sole fertilizer application at 25, 50 and 75 days after sowing in both the years, 2005-06 and 2006-07.

The application of Subabool biomass 2 t/ha + 40 kg N/ha through urea gave highest yield of 431.16 and 431.50 q/ha green fodder during 2005-06 and 2006-07, respectively.

Application of Subabool biomass 2 t/ha + 40 kg N/ha through urea increased 20% dry fodder yield over sole fertilizers application, 18 % over Delbergia sp. Biomass 3t/ha + 40 kg N/ha through urea and 17 % over combined application of Delbergia sp. Biomass 1.5t/ha + Subabool biomass 1t/ha + 40 kg N/ha through urea.

Application of Subabool biomass 2 t/ha + 40 kg N/ha through urea gave maximum Crude Protein content (%), soil organic carbon, available nitrogen, phosphorus, potassium and soil moisture.

Application of Subabool biomass 2 t/ha + 40 kg N/ha through urea produced highest energy output i.e. 77609.25 and 77728.95 MJ/ha during 2005-6 and 2006-07, respectively.

Germination of field crops was reduced on each successive increase in addition of tree litter biomass from 4 to 8 and 12 % on dry weight basis in maize, oats, sorghum and mustard.
CONCLUSION

On the basis of results obtained and presented the following conclusions are drawn:

One pass of MB Plough + two pass of cultivator formed bigger size of clods in field preparation during both the years i.e. 12.81 cm in 2005-06 and 12.58 cm in 2006-07, respectively. However, small size of clods were formed in one pass of cultivator + one pass of rotavator i.e. 1.76 cm in 2005-06 and 1.64 cm in 2006-07. The differences in clods formation were marginal due to different litter biomass of tree species.

Plant population (initial and final), height, tillers/plant, LAI, were significantly influenced in fodder oats in one pass of cultivator + rotavator and this effect was maximum at 50 DAS.

One pass of Cultivator (1) + Rotavator (1) gave marginally more Gross and net income (Rs/ha) of oats fodder i.e. RS. 32893.30 and 33019.80 Gross income, 13770.00 and 13896.80 net income (Rs/ha) during 2005-06 and 2006-07, respectively.

Maximum organic carbon, available nitrogen, phosphorus and potassium were observed in one pass of cultivator and rotavator each and was found maximum in application of Subabool biomass 2 t/ha + 40 kg N/ha through urea. Further this treatment combination also gave maximum Crude
Protein content (%), soil organic carbon, available nitrogen, phosphorus, potassium and soil moisture.

Maximum energy output 74144.70 MJ/ha in tractor tillage was observed in MB Plough (1) + cultivator (2) in 2005-06 and 74295.55 MJ/ha in Cultivator (1) + Rotavator (1) during 2006-07 followed by disc harrow and cultivator tillage operations.

Crude protein content as well as protein yield was more in one pass of cultivator and rotavator at different stages of crop growth.

The allelopathic effects on germination of field crops were reduced on each successive increase in tree litter biomass from 4 to 8 and 12 % on dry weight basis not only in oats but in maize, sorghum and mustard.