SUMMARY

A grassland community dominated by Iseilema laxum Hack. selected for present investigation was situated in Bohadpura Sheep Farm, Orai at lat. 25°59' N, long. 79°37' E and about 125 meters above mean sea level in Bundelkhand region, Uttar Pradesh. The study area was given full and fresh protection from all the type of biotic interferences.

Computation of water balance of the study area was made following the method proposed by Thornthwait and Mather (1955) and the ecoclimatic formula obtained as $C_1 C_1 a', d$ indicated a dry sub-humid climate of the study area.

To see the effect of fertilizer on forage production and quality of the grassland community, treatments consisting of 5 levels of nitrogen (0, 30, 60, 90 and 120 kg N/ha) and 3 levels of phosphorus (0, 30 and 60 kg P$_2$O$_5$/ha) were laid out in randomised block design with three replications. To obtain dry matter forage
production 4 cuttings i.e. August 9 and 29, September 20 and October 16 were taken as per growth.

To see the effect of legume introduction on forage production and quality of the grassland community, seeds of Stylosanthes hamata, S. scabra, S. guianensis and S. humilis were intercropped in the grassland community at the seed rate of 5 kg/ha. In each treatment there was one control i.e. without application of nitrogen, phosphorus and legume indicated as 0 (Zero) treatment.

Effect of fertilizer and legume introduction on the forage production and quality of a grassland community under present soil condition in Bundelkhand region was carried out from July, 1996 to June, 1997 with the following objectives:

1. To determine the needs and level of nitrogen for optimum forage production under present soil condition.
2. To find out the optimum level of phosphorus for forage production under present soil condition.

3. To assess the effect of legume introduction on forage production of a grassland community under present soil condition.

4. To work out the effect of nitrogen application on the forage quality (crude protein, fat, crude fibre and carbohydrate) of a grassland community under present soil condition.

5. To obtain information on effect of phosphorus application on forage quality (crude protein, fat, crude fibre and carbohydrate) of a grassland community under present soil condition.

6. To record the effect of legume introduction on forage quality (Crude protein, fat, crude fibre and carbohydrate) of a grassland community under present soil condition.
The result obtained on various aspects of fertilizer application and legume introduction on the forage production and quality of a grassland community under present soil condition in Bundelkhand region has been summarised as under:

A. FORAGE PRODUCTION

1. Effect of Fertilizer on Dry Forage Production

a) Effect of Nitrogen

There was an increase in dry forage production with increase in the levels of nitrogen. The minimum forage production of 3.98 t/ha was obtained with application of 30 kg N/ha and maximum of 4.70 t/ha with application of 120 kg N/ha over the control (3.28 t/ha) i.e. 0 level of nitrogen.
From observation it is evident that the dry forage production of the 1st cut is always higher i.e. normally two times in all levels of nitrogen.

b) Effect of Phosphorus

Application of superphosphate at 30 and 60 kg P$_2$O$_5$/ha increased the dry forage production by 4.12 and 4.50 t/ha respectively over the control (3.48 t/ha). However, the difference in dry forage production was not found to be significant.

2. Effect of Legume Introduction on Dry Forage Production

With respect to their effect on forage production, all the legumes introduced (Stylosanthes hamata, S. scabra, S. guianensis and S. humilis) in Iseilema grassland community showed good growth except the S. humilis which showed very poor growth and gave negligible total forage production (grass + legume = 3.38 t/ha) over the control (3.28 t/ha). Introduction of
S. hamata has proved to be advantageous giving a considerable total forage production of 4.73 t/ha followed by S. scabra (4.27 t/ha) and S. guianensis (4.25 t/ha).

The forage production due to legume alone was made maximum by S. hamata (0.63 t/ha) followed by S. scabra (0.60 t/ha), S. guianensis (0.15 t/ha) and minimum by S. humilis (0.04 t/ha).

Thus, the result revealed that the beneficial effect of introduction of S. hamata and S. scabra in Iseilema pasture for getting the higher forage production.
B. FORAGE QUALITY

1. Effect of Fertilizer on Forage Quality

a) Effect of Nitrogen on Forage Quality

i) Crude Protein Content

It increased with increasing levels of nitrogen from 30 to 120 kg N/ha but was not much pronounced in 1st and 2nd cuts while in 3rd and 4th cuts the crude protein content was higher with application of 90 and 120 kg N/ha. However, the maximum crude protein of 8.31 and 9.61 % was observed during 3rd and 4th cuts respectively with application of 90 kg N/ha.

ii) Fat Content

Result of chemical analysis revealed that the percentage of fat content increased gradually with increasing age i.e.
successive number of cuts. The minimum fat content (1.24 %) was noted at 1st cut without application of nitrogen and maximum (1.67%) with application of 90 kg N/ha at 3rd cut. On average basis the minimum of 1.32% fat was recorded without nitrogen application and maximum of 1.57 % fat with application of 90 kg N/ha.

iii) Crude Fibre Content

On average basis the maximum (41.15%) crude fibre was found with application of 120 kg N/ha when the plants have reached its maturity stage and minimum (39.09%) with application of 90 kg N/ha at the stage when crude protein was highest. However, the crude fibre content was lower at 1st cut and higher at 4th cut in all the doses of nitrogen application.
iv) Carbohydrate Content

Results are noted on treatment-wise and harvest-wise (cuts-wise). Treatment-wise the minimum value of 41.78% was recorded with application of 0 kg N/ha and maximum of 51.68% with application of 120 kg N/ha.

Normally the harvest-wise values were lower at 1st cut ranging from 41.78 to 44.70% and higher at 4th cut ranging from 45.85 to 51.68%.

b) Effect of Phosphorus On Forage Quality

i) Crude Protein Content

Results indicated that the application of phosphorus did not show any beneficial effect on crude protein content except in the 3rd cut where nominal increase was noted without phosphorus application. However, on average basis an increasing trend i.e. 5.58, 7.91 and 7.71% was noted.
ii) Fat Content

Similar to nitrogen, the application of phosphorus has shown a gradual increasing trend in fat content percentage with increasing amount of phosphorus application (kg P$_2$O$_5$/ha) and age i.e. 1st to 4th cuts. On average basis the minimum of 1.06% and maximum of 1.16% of fat contents were obtained without application of phosphorus and 60 kg P$_2$O$_5$/ha level of application respectively.

iii) Crude Fibre Content

The results revealed that application of phosphorus did not show any beneficial effect on crude fibre content but, however, on average basis an increasing trend has been found i.e. minimum of 33.91% without application of phosphorus (0 kg P$_2$O$_5$/ha) and maximum of 34.92% with application of 60 kg P$_2$O$_5$/ha.

Overall there is an increasing trend of crude fibre
content with increasing developmental stage. Thus, the values were lower at 1st cut and higher at 4th cut with all doses of phosphorus application.

iv) Carbohydrate Content

The effect of phosphorus is like-wise nitrogen i.e. there is an increasing trend of carbohydrate content with increasing amount of phosphorus i.e. 0 to 60 kg P₂O₅/ha. On average basis the value was found minimum of 51.96% at 0 kg P₂O₅/ha level and maximum of 53.83 % at 60 kg P₂O₅/ha level.

2. Effect of Legume Introduction on Forage Quality

(i) Crude Protein Content

The maximum crude protein content of the grass was recorded (13.10%) when intercropped with *S. hamata* followed by *S. scabra* (12.10%), *S. guianensis* (8.20%) and *S. humilis* (7.20%). Amongst the legumes, the maximum crude protein content of
7.44% was obtained in *S. hamata* and minimum of 2.60 % in *S. humilis*.

**(ii) Fat Content**

The maximum fat content of grass was 1.99% when intercropped with *S. hamata* and minimum of 1.34% when grown with *S. humilis*. Similarly amongst the legumes, the maximum fat content of 0.96% was recorded in *S. hamata* and minimum of 0.32% in *S. humilis*.

**(iii) Crude Fibre Content**

The value of crude fibre content for grass legume mixture was recorded maximum of 45.50% when intercropped with *S. hamata* and minimum of 34.80% intercropped with *S. humilis*.

Crude fibre content estimated for grass alone, was found maximum (41.30%) in *S. humilis* intercropping plot and
minimum (32.60%) in *S. hamata* intercropping plot in comparison with control (42.16%).

(iv) **Carbohydrate Content**

*Iseilema* grassland community in Bundelkhand region when intercropped with *S. hamata* showed maximum carbohydrate content (53.31%) and minimum when cropped with *S. humilis*. When values were analysed for grass alone, it was recorded maximum of 40.21% in the plot grown with *S. hamata* and minimum of 40.00% grown with *S. humilis* in comparison to control (41.30%).

Thus, in conclusion the study shows that *S. hamata* and *S. scabra* are suitable legume for sowing with *Iseilema laxum* to increase forage production and forage quality of the grassland. It would be appropriate for small holder farmers who cut and carry forage for their animals.