METHODS
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I. Soil analysis

Soil was sampled for analysis during April 72. In all, nine pits were dug at random within the study area. After removing the superficial deposit of freshly fallen leaves and decomposing litter, each profile was sampled at the following depths: 0-10, 10-20 and 20-30 cm. Thus, in all, 77 samples were collected. The samples of the same depth were mixed together to obtain the composite samples at the three depths viz. 0-10, 10-20 and 20-30 cm.

Air-dried soil-samples were analysed for mechanical composition after separating the gravels by the mesh by pipette method, and water holding capacity, field capacity, moisture equivalent and calcium were determined as per the procedures outlined by Piper (1950). Organic matter was determined by Walkley and Black's rapid titration method, total nitrogen was estimated by Kjeldahl method and carbonate was analysed by Hutchinson and Macleman's method (Piper, 1950). Soil reaction was measured in 1:5 water suspension by photovoltaic pH meter.

II. Estimation of primary production

Primary production is defined as the weight of new organic matter created by photosynthesis over a period. It becomes productivity of the ecosystem when expressed as a rate. Net production is that part of gross
photosynthetic production which is not respired by plants, and hence becomes available for utilization (Westlake, 1963). Billings (1964) and Pearson (1966) have expressed similar views. Odum (1960) considers it to be apparent photosynthesis which means total photosynthesis minus respiration.

In terrestrial ecosystems annual primary productivity is measured by two methods. The first method is the "Gas analysis method" which consists of finding the average rate of photosynthesis by determination of oxygen production or carbon dioxide consumption throughout the year. The other method (harvest method) is based on studying the increase in plant biomass during an year's growth. In the present investigation the short term harvest method (Odum, 1960) has been followed for grasses. However, the difference method (Jablonski and Kucera, 1965) was followed for other species and underground parts. Standing crop refers to dry weight of plant materials at any given time, from a unit area (Westlake, 1963).

Sampling units of various sizes have been employed in evaluating the plant biomass. For herbaceous communities most commonly used sizes of the sampling units are 1 m² (Bliss, 1956; Odum, 1960; Iwaki et al., 1964) and 0.625 m² (Pearsall and Newbould, 1957; Colley, 1965). Billings and Bliss (1959) and Ovington (1964) consider 0.4 m² to be a suitable size of the sampling unit, while Siegert and
evans (1964) regard 0.5m² as the convenient size of the sampling unit.

In the present investigation a suitable size of the sampling unit was determined by species-area-curve (Goodal, 1952; Costing, 1956). It was observed that 50 x 50 cm size is the most suitable for estimating the above-ground standing crop.

Sampling was done at one month intervals from February 1972 to January 1973. Three quadrats chosen at random for investigation in each collection period, gave reasonable estimate of the standing crop. The same quadrat was never clipped twice in the following months. Sampling was done on the first day of the following month for each collection period. The clipping was done by hand very close to the ground surface. The cut vegetation was transferred to polythene bags, transported to the laboratory and was sorted into the following categories:

green Chrysopogon montanus,
green Digitapanum contortus,
green Aristida setacea,
green Panicum javanicum,
green Digitapanum fastigiatus,
green Setaria glauca,
non-green Chrysopogon montanus,
non-green Digitapanum marginata,
non-green Digitapanum contortus,
non-green *Pristia setacea*,
non-green *Cenchrus ciliaris*,
non-green *Alectoria fastigiata* and other species.

The litter present on the ground surface was also collected and later was washed in the laboratory using a sieve to avoid any wastage.

For the estimation of the standing crop of underground parts, however, soil monolith with a size of 30x30 cm was dug to a depth of 30 cm., although this did not represent the entire underground standing crop. The main mass of the underground parts in this field is concentrated within 20 cm. of the surface. Three monoliths were dug in each collection period. The roots and other underground parts were washed in running water.

The plant materials, thus collected, were dried at 100°C for 48 hours and weighed. Monthly data were averaged and the standing crop of different categories was expressed in g/m². Dry plant samples of each category of each collection period were kept carefully for the estimation of caloric values.

III - Estimation of clipping effects on net primary production

Three experimental plots, each with an area of 30 x 50 m were selected to study the effects of frequency of clipping
on the net primary production. Inside each experimental
plot three permanent quadrats, each of 1 m$^2$ size, were chosen
at random. The plant biomass of each quadrat was clipped
by hand close to the ground surface. The plant biomass of
all the quadrats from one experimental plot was clipped with
the same intensity but the frequency of clipping differed in
different experimental plots. The frequency of clipping
in the three experimental plots was as follows:

A. In experimental plot number one all the three
quad rate were clipped on the same day at six
months interval. Clipping was done in April
1972 and October 1972.

B. In experimental plot number two all the three
quad rate were clipped on the same day at three
months interval and clipping was done in January

C. In experimental plot number three all the three
quad rate were clipped on the same day at one month
interval. Clipping was done every month from
January 1972 to December 1972.

The plant material (including green and non-green)
after clipping, was collected at different intervals from
the three experimental plots. The periods of collecting
the data were as follows:

A. In experimental plot number one sampling was done
six months after the date of clipping. The plant biomass was collected in October 1972 and April 1973.

B. In experimental plot number two sampling was done three months after the date of clipping. The plant biomass was collected in April 1972, July 1972, October 1972, and January 1973.

C. In experimental plot number three sampling was done one month after the date of clipping. The freshly developed plant biomass was collected every month from February 1972 to January 1973.

Sampling was done by putting a quadrat of 50 x 50 cm. in the centre of 1m² quadrat. The vegetation (newly developed after the date of clipping) within the quadrat of 50 x 50 cm., was clipped very close to the ground surface. It was then transferred to polythene bags, transported to the laboratory and was sorted into the following categories:

Chrysopogon montanus,
Aristida setacea,
Dicotomis fastigiatus,
Setaria glauca and other species.

These were then dried at 100°C for 48 hours and weighed. The data, thus obtained, were averaged and the net primary production of different categories was expressed in g/m².
IV - Estimation of disappearance rate of dead material

The rate at which the dead material disappears from the field is usually estimated by two methods (Niebert and Evans, 1964). The first method is known as the "paired plots method" and in the second method the disappearance rate of the dead material is estimated by "litterbag technique". In the present investigation the second method was followed. On August 1st, 1972, nylon screen mesh bags containing dead vegetation were placed at random on the ground in the experimental plot number four of the field. Each nylon bag measured 23 x 23 cm and contained 10.0 g. of dead material. In all 36 nylon bags were used. The site was prepared by removing all vegetation, dead material and humus. The bags were then placed on the exposed soil and covered by chicken wire so as to prevent displacement by wind or animals. The dead material used in the experiment was collected at the end of the growing season. It was unweathered and contained all above-ground parts of the representative plants. The nylon mesh bags were collected every month up to July 73. The samples were cleaned of soil and of new growth that had pushed through the mesh of the bag. These samples were then dried at 100°C for 48 hours and weighed. From the mean values, the disappearance rate was calculated. In calculating the instantaneous rate of disappearance during a period, the rate was assumed to be the same for all the thirty six bags. Thus the weights of
samples picked up in August, 1972, were treated as the starting weights for the period of September. The instantaneous rate of disappearance was expressed in mg/g/day (Siegert and Evans, 1964).

V. Determination of caloric value

The samples collected monthwise from February, 1972 to January, 1973 were put into the following categories for the estimation of caloric values:

- green Chrysopogon montanus,
- green Heteropogon contortus,
- green Aristida estacas,
- green Panicum javanicum,
- green Dictamis fastigiatus,
- green Setaria glauca,
- non-green Chrysopogon montanus,
- non-green Digitaria marginata,
- non-green Heteropogon contortus,
- non-green Aristida estacas,
- non-green Cenchrus ciliaris,
- non-green Dictamis fastigiatus,
- other species,
- litter,
- and
- underground parts.

These were oven dried at 100°C for 48 hours and then reduced to powder to pass through a 40 mesh sieve. The
powder of plant material from each category was compressed into pellets (about one gram in weight) and dried in a desiccator. After recording the exact weight of the pellets each sample was analysed in triplicate. The caloric values were determined by igniting the pellets in an oxygen bomb calorimeter. In order to determine the percentage of ash, the calorimeter crucible containing the ash and residue, was dried over a desiccating agent and weighed. The caloric values were corrected to a 0% ash residue. In the present investigation caloric values have been expressed, both, in calories per gram dry weight of plant material and calories per gram ash free dry weight.

The standing crop of energy was obtained on multiplying the grams dry matter of any species or species group by the appropriate caloric equivalent of that species or species group and was expressed as kilogram calories per square metre.

In the present study an attempt has also been made to calculate the efficiency of net primary production by converting the annual net production per square metre to gram calories per square metre on multiplying the dry matter production of different categories by the appropriate caloric value. The latter was expressed as ash free dry weight basis. Caloric values per square metre were then divided by half of the solar radiation available during the
year (Bliss, 1966). Half of the solar radiation values are used in the calculations because only this much amount of energy is in the range of visible light, potentially usable in photosynthesis (Laubenheimer, 1959). The percentage efficiency is obtained by multiplying it with 100. Since radiation figures for Raipur are not available, the averages have been shown based on the figures of Nagpur, Poona, and Calcutta.

VI - Statistical analysis

Values for standard deviation, coefficient of correlation, analysis of variance and critical difference were calculated as suggested by Bernard Ostle (1954) in "Statistics in research".