

## Effect of cutting management and nitrogen on yield, economics and energetic relationships of paragrass (*Brachiaria mutica*)

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### ABSTRACT

A study was carried out during 1992 and 1993 to find out effect of cutting management and nitrogen levels on fodder production of paragrass [*Brachiaria mutica* (Forskaal) Stapf]. The highest green-forage and dry-matter yields of 359.0 and 101.20 q/ha respectively were recorded when the crop was cut at 60-day intervals and fertilized with 60 kg N/ha. This treatment also gave the highest gross return (Rs 17 950/ha), net return (Rs 12,489/ha), net return/rupee invested (Rs 4.67/Re), gross energy out put (182,160 MJ/ha) and net energy out put (178,719 MJ/ha). However, the highest energy-use efficiency (152.23) and energy productivity (6,743 g MJ/ha) were obtained where no N was applied and the crop was cut at an interval of 75 days.

**Key words :** Paragrass, Cutting management, N, Yield, Economics

Balance feed including green fodder is pivotal for enhancing the milk production. Paragrass is an important fodder crop particularly for the low-lying areas of Bihar where no other fodder can be grown successfully. It provides green forage to milch animals, specially during lean period of November and December. An information on its agro-technology for higher green-forage production in the plateau region of Bihar is scanty. Hence an experiment was conducted on this aspect.

### MATERIALS AND METHODS

A field experiment was conducted during the rainy (*khari*) season of 1992 and 1993 at Fodder Farm, Birsa Agricultural University, Ranchi. The treatments comprised 5 levels of N, viz. control, 20 kg N/ha as basal, 40

kg N/ha (20 kg N/ha as basal + 20 kg N at 30 DAP), 60 kg N/ha (20 kg N/ha as basal + 40 kg N in 2 equal split at 30-day intervals) and 80 kg N/ha (20 kg N/ha as basal + 60 kg N in 3 equal splits at 30-day intervals), and 4 cutting managements, viz. 30, 45, 60 and 75 days intervals.

The annual rainfall during 1992 and 1993 was 1,170.3 and 1,284.6 mm respectively. The soil was clay loam (Alfisol) with 35.5% clay. It was almost neutral in reaction (pH 6.6), medium in organic carbon (0.65%), available nitrogen (450 kg/ha),  $K_2O$  (190.0 kg/ha) and  $P_2O_5$  (45.0 kg/ha).

The experiment was laid out in randomized block design with 3 replications. Cuttings of paragrass, having 3 nodes, were planted on 30 July at the spacing of 50 cm x

50 cm. The crop was fertilized uniformly with 50 kg P<sub>2</sub>O<sub>5</sub> and 25 kg K<sub>2</sub>O along with 10 tonnes FYM/ha as basal application in the first and second year with the beginning of the crop season. From the second fortnight of December to June it did not produce forage due to low temperature in winter and lack of irrigation in summer. The pooled green- and dry-fodder yields for 2 years were statistically analysed, different economics (gross and net returns, net returns/rupee invested) and energetic relationships (gross and net energy output, energy-use efficiency and energy productivity) were calculated (Singh and Mittal, 1992).

## RESULTS AND DISCUSSION

### Forage yield

The trend of green-forage and dry-matter yields under different treatments during 1992 and 1993 was almost similar. Pooled data of 2 years indicated significant variation in green-forage and dry-matter yields. Though crop cut at 75-day interval gave the highest green-forage yields, it was statistically at par

with the crop yield obtained under 60-day cutting interval. These were significantly superior to those cut at 45- or 30-day intervals. Nitrogen applied @ 60 kg/ha resulted in significantly highest green-forage yield over rest of the N levels except 80 kg/ha. Highest green-forage yield was obtained when crop received 60 kg N/ha and was cut at an interval of 60 days; however, it was statistically at par with the treatment where forage was cut at 75-day cutting intervals and fertilized with either 60 or 80 kg N/ha. However, in case of dry matter significantly highest dry-matter yield was recorded when the crop was fertilized with 60 kg N/ha and cut at an interval of 60 days (Table 1).

The crop was planted on 30 July 1992 and it was establishment period for a perennial crop. The crop was cut for green forage only up to the first fortnight of December. Afterwards the crop growth ceased due to low temperature. In lack of irrigation facility the crop was not cut during summer months. Thus, the yield obtained was not up to the mark during the first year. In second year, it

**Table 1.** Effect of cutting management and nitrogen levels on green-forage and dry-matter yields (q/ha) of paragrass (pooled mean of 1992 and 1993)

Cutting interval	N (q/ha)					Mean
	0	20	40	60	80	
30 days	214 (41.66)	220 (47.58)	231 (47.57)	286 (62.37)	255 (54.88)	241 (50.85)
45 days	251 (69.00)	267 (73.36)	289 (79.61)	323 (88.84)	314 (86.38)	289 (79.44)
60 days	274 (71.99)	312 (82.79)	318 (85.68)	359 (101.20)	316 (90.42)	316 (86.42)
75 days	303 (84.79)	307 (88.42)	319 (87.38)	339 (95.74)	337 (93.84)	321 (90.03)
Mean	261 (66.86)	277 (73.04)	289 (75.06)	327 (87.04)	306 (81.38)	
CD (P = 0.05)		Green forage		Dry matter		
Cutting intervals (C)		21.55		5.91		
Nitrogen levels (N)		21.02		5.76		
C x N		32.99		9.05		

Figures in parentheses are dry-matter yield

**Table 2.** Effect of cutting management and nitrogen levels on economics and energetic relationships of paragrass (pooled mean of 1992 and 1993)

Treatment	Economics			Energetic relationship				
	Gross return (Rs/ha)	Net return (Rs/ha)	Net return (Rs/Re)	Gross energy output (MJ/ha)	Net energy output (MJ/ha)	Energy use efficiency	Energy productivity (gMJ/ha)	
C <sub>1</sub>	N <sub>0</sub>	10,700	5,342	1.93	74,988	73,964	72.23	3,003
	N <sub>1</sub>	11,000	5,501	1.96	85,644	83,835	46.34	2,151
	N <sub>2</sub>	11,550	5,910	2.18	85,626	82,724	28.50	1,576
	N <sub>3</sub>	14,300	8,517	3.00	112,266	108,877	32.12	942
	N <sub>4</sub>	12,750	6,827	2.87	98,784	94,610	22.66	760
C <sub>2</sub>	N <sub>0</sub>	12,550	7,276	2.76	124,200	123,178	120.52	5,005
	N <sub>1</sub>	13,350	7,915	2.86	132,048	130,240	72.03	2,829
	N <sub>2</sub>	14,450	8,859	2.95	143,298	140,700	54.15	2,093
	N <sub>3</sub>	16,150	10,431	3.29	159,912	156,530	46.28	1,772
	N <sub>4</sub>	15,700	9,841	3.04	155,484	151,312	36.26	1,381
C <sub>3</sub>	N <sub>0</sub>	13,700	8,665	3.19	129,582	128,574	127.55	5,334
	N <sub>1</sub>	15,600	10,423	3.46	149,022	147,228	81.88	3,257
	N <sub>2</sub>	15,900	10,582	3.55	154,224	151,643	58.75	2,267
	N <sub>3</sub>	17,950	12,489	4.67	182,160	178,719	53.06	1,713
	N <sub>4</sub>	15,800	10,199	3.58	162,756	158,597	38.13	1,453
C <sub>4</sub>	N <sub>0</sub>	15,150	10,331	3.58	152,626	151,630	152.23	6,743
	N <sub>1</sub>	15,350	10,389	3.71	159,156	157,376	88.41	4,002
	N <sub>2</sub>	15,950	10,848	3.90	157,284	154,714	60.20	2,325
	N <sub>3</sub>	16,950	11,705	4.07	172,332	168,977	50.36	1,697
	N <sub>4</sub>	16,850	11,465	4.04	168,912	164,766	39.74	1,550
CD (P = 0.05)								
Cutting (C)	53.32	278.73	0.34	109.69	426.76	6.2	360.30	
Nitrogen levels (N)	52.05	271.86	0.47	107.00	416.27	6.0	351.43	
C x N	81.68	426.79	0.74	168.01	653.53	6.7	501.72	

Birsa Agricultural University's selling rate of green forage, Rs 50/q

C<sub>1</sub>, Cutting at 30-day interval; C<sub>2</sub>, cutting at 45-day intervals; C<sub>3</sub>, cutting at 60-day intervals; C<sub>4</sub>, cutting a 75-day interval; N<sub>0</sub>, control; N<sub>1</sub>, 20 kg N/ha; N<sub>2</sub>, 40 kg N/ha; N<sub>3</sub>, 60 kg N/ha; N<sub>4</sub>, 80 kg N/ha.

gave proper yield during the monsoon season. However, the yield trend was almost similar.

The crop cut at 60-day interval resulted in the highest green-forage yield. It was observed that beyond this period the plants showed gradual lodging. The lower leaves were turning yellow and ultimately dried up which adversely affected the crop yield.

The crop fertilized with 60 or 80 kg N/ha gave statistically equal yield. The crop was planted in lowland situation with excess moisture during application of N nutrient. The N

nutrient beyond 60 kg might have lapsed due to leaching before the crop utilized the entire quantity. Thus the crop response to application of N nutrient beyond 60 kg was not significant.

The crop was cut for green herbage primarily during the rainy season and post-rainy season up to the first fortnight of December. The moisture contents were high in almost all stages of cutting. The pooled dry-matter yield indicated that there was increasing trend in dry matter with the advancement of crop age.

**Economic viability**

The economic viability based on monetary return from paragrass indicated that significantly highest gross and net return were obtained when paragrass was fertilized with 60 kg N/ha and cut at 60-day interval. Similar trend was observed with net return/rupee invested (Table 2).

**Energetic relationships**

Paragrass fertilized with 60 kg N/ha and cut at an interval of 60 days resulted in significantly highest gross and net energy output. However, significantly highest energy-use

efficiency and energy productivity (Table 2) were recorded when the crop was cut at an interval of 75 days without N application (Table 2).

Hence it appears that for getting a good harvest, higher monetary return along with better energetic values of the paragrass it should be cut at an interval of 60 days and fertilized with 60 kg N/ha in the plateau region of Bihar.

**REFERENCE**

Singh, S. and Mittal, J.P. 1992. *Energy in Production Agriculture*, pp 1-15. Mittal Publication, New Delhi.