International Journal of Agricultural Sciences
Volume 8 |Issue 1| January, 2012 | 154-157

RESEARCH PAPER

Effect of land configurations on forage yield of pasture grasses

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Abstract **:** An experiment was carried out during the *Kharif* seasons *o*f 2001-02, 2002-03 and 2003-04 to study the effect of land configuration methods on forage yield of pasture grasses at Grassland Research Station, Junagadh Agricultural University, Dhari. The treatments comprised of two grasses *viz.,* anjan grass *(Cenchrus ciliaris)* and marvel grass *(Dichanthium annulatum)* and five methods of land configuration (Earthing up at 25 days after showing, dead furrow after every third row, compartment bunding after every third row, trench cum mulching and flat sowing). In order to find out the suitable pasture grass and appropriate land configuration method for obtaining maximum biomass yield, the experiment was laid out in strip plot design and replicated thrice. The pooled results showed that marvel grass *(Dichanthium annulatum)* produced significantly maximum green forage, dry matter yield and tillers/plant as well as it also recorded the highest net return and benefit cost ratio (BCR) as compared to anjan grass *(Cenchrus ciliaris).* However, there was non significant difference among these grasses for crude protein content, crude protein, yield, plant height and soil moisture content. Trench cum mulching and earthing up methods were being at par with each other and produced significantly the higher green forage, dry matter yield, tillers/plant, plant height and soil moisture content over remaining all the land configuration methods in pooled results. Crude protein content also higher in the entire land configuration compared to control (flat sowing). The earthing up method recorded the highest net return (1385 Rs./ha) and the highest benefit cost ratio (1 :0.86).

Key Words **:** Land configurations, Forage yield, Economics, Anjan grass, Marvel grass

View Point Article **:** Dudhat, M.S., Chovatia, P.K., Thesiya, N.M. and Kikani, V.L. (2012). Effect of land configurations on forage yield of pasture grasses. *Internat. J. agric. Sci.*, **8**(1): 154-157.

Article History **: Received :** *25.06.2011;* **Revised :** *25.09.2011;* **Accepted :** *15.11.2011*

INTRODUCTION

India has huge livestock wealth which plays an important role in its agricultural economy. The deficiency of green forage is one of the major causes of malnutrition in the livestock resulting in low animal productivity. The annual production of green and dry fodder in the country is 250 and 441 million tones as against the requirement of 932 and 780 million tones, respectively (Anonymous, 2000). At present, natural grassland areas have been degraded through over grazing and careless exploitation of the biodiversity. It is now a days considered important to utilize the uncultivated land and cultivated wastelands for developing forage resources and to maintain and manage the natural grassland areas along with by adopting appropriate soil manipulation technology. In this context, various pasture grasses *viz.,* anjan *(Cenchrus ciliaris),* marvel *(Dichanthium annulatum)* can play an important role in increasing the availability of green forage by utilizing the uncultivated land and cultivated wastelands. Rainfall is most important and single factor affecting crop productivity in the rainfed areas. The erratic rainfall pattern coupled with poor soil and their degradation and consequent scanty vegetation cover renders the arid and semi arid environments very fragile, resulting into poor agriculture productivity. In this context, appropriate land configuration methods are very useful for capturing and harvesting of rain water and ultimately

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conserving soil moisture which resulting in increasing the crop productivity. Keeping in view, to find out the suitable pasture grass and appropriate land configuration method, the experiment was carried out to study the effect of land configurations on forage yield of pasture grasses.

MATERIALS AND METHODS

The field experiment was conducted during the *Kharif* seasons of 2001-02, 2002-03 and 2003-04 at Grassland Research Station, Junagadh Agricultural University, Dhari. The soil of the experiment site was marginal land with shallow depth. The treatments comprised of two grasses *viz.,* anjan grass (*Cenchrus ciliaris*), marvel grass *(Dichanthium annulatum)* and five methods of land configuration (earthing up at 25 days after sowing, dead furrow after every third row, compartment bunding after every third row, trench cum mulching and flat sowing). The experiment was laid out in strip plot design and was replicated thrice. All these five methods of land configuration were applied to these two grasses as per strip plot design.

Both the grasses were sown on 05/07/2001 during *Kharif* season of 2001-02 *i.e.* during first year of experiment. These grasses are perennial pasture grasses, so in the remaining two years of the experiment, sowing was not done. Both the grasses were sown with keeping 60 cm spacing between two rows and 60 cm spacing within row *i.e.* at 60 cm x 60 cm spacing. Anjan grass was sown by seed @ 5 kg/ha and marvel grass was sown by transplanting of rooted slips of old marvel grass. All the methods of land configuration were done manually in every year in the same plot. In the method of trench cum mulching, castor shell used as a mulching material @ 2.5 t/ha. Neither irrigation nor fertilization was done. The grass was harvested at 50 per cent flowering stage at a stubble height of 12 cm from the soil surface. The *Kharif* seasonal rainfall received was 451.6, 481.7 and 434.5 mm during 2001, 2002 and 2003, respectively. 500 g fresh samples were collected randomly from each plot and dried in hot air oven at 70° C till constant weight for dry matter estimation and these oven dry samples were also used for crude protein content. Soil was sampled from each plot at 0-15 cm depth of the soil after 5th days of rainfall and samples were taken total three times in every *Kharif* season of the experiment for soil moisture content. Soil moisture was estimated by taking 100 g soil in an aluminum box and drying it at 105° C to constant weight. Soil moisture was calculated on dry weight basis. Standard statistical procedure was followed for analyzing the results obtained.

RESULTS AND DISCUSSION

Green forage, dry matter, tillers/plant, plant height, crude protein content as well as soil moisture content were significantly influenced by the different treatment during all the years and in pooled (Table l). The yields during 1st year were low because of this year was establishment year of the experiment. The yields during 2nd year were very high as compared to 1st and 3rd year, because of during this year, two cut of grasses were obtained which might be due to well distributed rainfall during growing season of second year.

Effect of grasses:

Significant differences were observed in green forage yield, dry matter, tillers/plant and 50 per cent flowering days among the grasses. The marvel *(Dichanthium annulatum)* grass produced the highest green forage yield, dry matter yield and tillers/plant during 2002-03 and in pooled. The green forage and dry matter yield during 3rd year and crude protein yield and plant height in pooled result did not differ significantly although the trends were similar. The marvel grass gave 29.0 and 24.6 per cent higher green forage yield and dry matter yield, respectively as compared to anjan grass *(Cenahrus ciliaris)* in pooled. Where as, the lowest 50 per cent flowering days (early flowering) was recorded in anjan grass. Significant difference was not found in soil moisture content due to the effect of grasses.

Effect of land configuration methods:

Green forage and dry matter yield, crude protein content, tillers/plant were significantly influenced by the land configuration methods during all the years and in pooled. The pooled result, showed that significantly the highest green forage (62.10 q/ha), dry matter (21.86 q/ha), tillers/plant (105.2) and plant height (106.5 cm) were recorded by the treatment of trench cum mulching, however, statistically, it was at par with the treatment of earthing up and compartment bunding after every third row. Whereas, the highest crude protein content (4.68 %) was recorded by the treatment of compartment bunding and it was at par with the treatment of earthing up at 25 DAS, trench cum mulching and dead furrow after every third row. The early flowering (the lowest 50 % flowering of 35.9 days) was found in dead furrow treatment and it was at par with the trench cum mulching treatment. The highest soil moisture content (22.55 %) was recorded by the treatment of earthing up. The similar finding of forage yield were recorded by Patil and Sheelavantar (2000) and Jat and Gautam (2000).

Interactions effect:

The interaction effect of grasses x land configuration methods was found non significant for forage yields, crude protein, crude protein content, plant height, tillers/plat, 50 per cent flowering days as well as soil moisture.

Economics:

With regards to economics among two grasses, the marvel grass gave the highest net return of 1734 Rs./ha and benefit cost ratio of 1.32 and among different land configuration methods, the earthing up produced the maximum

Table 1 : Green forage, dry matter and crude protein yield as well as crude protein content, number of tillers, plant height, days to 50% flowering as affected by grasses and different land configuration methods

Treatments	Green forage yield (q/ha)				Dry matter yield (q/ha)				Pooled of three years					
	2001	2002	2003	Pooled	2001	2002	2003	Pooled	Crude protein yield (q/ha)	Crude protein content (%)	Tillers /plant (No.)	Plant height (cm)	50% flowering days (No.)	Soil moisture content (%)
Grasses														
Anjan	34.00	62.75	45.10	47.28	12.62	23.80	14.52	16.98	0.76	4.48	82.90	106.70	34.20	20.14
Marvel	31.51	100.28	51.23	61.01	11.39	35.61	16.48	21.16	0.89	4.20	88.50	108.30	39.90	20.12
S.E.±	0.40	1.99	1.42	1.30	0.12	1.02	0.46	0.53	0.10	0.09	0.55	0.96	0.19	0.11
C.D. (P=0.05)	2.45	12.13	NS	7.70	0.72	6.20	NS	3.23	NS	NS	3.21	NS	1.03	NS
Land configuration methods														
Earthing up at 25 DAS	35.12	96.47	48.57	60.05	13.22	35.67	15.58	21.49	0.97	4.51	90.60	104.0	35.90	22.55
Dead furrow after every third row	28.98	78.66	45.07	50.90	10.26	28.64	14.47	17.79	0.75	4.20	78.60	93.20	38.40	19.63
Compartment bunding	33.66	81.95	44.75	53.45	12.46	29.79	14.42	18.89	0.88	4.68	81.30	98.10	38.10	20.20
Trench cum mulching	38.89	85.89	61.51	62.10	14.82	30.86	19.91	21.86	0.97	4.42	105.20	106.50	36.70	21.35
Control (flat sowing)	27.11	64.68	40.98	44.26	9.31	23.54	13.08	15.31	0.60	3.90	66.70	85.90	40.60	18.45
S.E.±	0.79	7.18	2.49	3.49	0.29	2.66	0.80	1.25	0.17	0.17	1.95	1.07	0.88	0.21
C.D. (P=0.05)	2.43	22.50	7.76	10.90	0.90	8.00	2.49	3.80	NS	0.52	5.97	3.30	0.85	0.60
Interaction effect	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS=Non-significant

Table 2 : Economics of grasses and different land configuration treatments

Treatments	Green forage yield (q/ha)	Gross return (Rs./ha)	Cost of cultivation (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio (BCR)
Grasses					
Anjan	47.28	2364	1317	1047	1:0.79
Marvel	61.01	3051	1317	1734	1:1.32
Land configuration methods					
Earthing up at 25 DAS	60.05	3002	1617	1385	1:0.86
Dead furrow after every third row	50.90	2545	1467	1078	1:0.73
Compartment bunding	53.45	2673	1567	1106	1:0.70
Trench cum mulching	62.10	3105	2367	738	1:0.31
Control (flat sowing)	44.26	2213	1317	896	1:0.68

Selling price: 50 Rs. /1 q Green forage

net returns of 1385 Rs./ha and the highest benefit cost ratio of 0.86 (Table 2).

It can be concluded that the marvel grass *(Dichanthiun annulatum)* gave economically maximum biomass yield and earthing up methods produced economically optimum biomass yield under rainfed conditions of North Saurashtra Agro-climatic zone.

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