

FORAGE PRODUCTION IN THE RICE FIELDS DURING DRY SEASON RYE GRASS, WHITE CLOVER AND OATS.

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ABSTRACT

In the highland of Madagascar, lack of good forage is very acute during the dry and cool season. The cultivation of temperate forage in rice fields under irrigation is practised by farmers to feed dairy-cattle. The main forages which are cultivated are oats (*Avena sativa*), Italian rye grass (*Lolium multiflorum*) and white clover (*Trifolium repens*).

Under experimental conditions rye grass has given the highest yield, but every species have their particularities, which can be useful in forage production. Three varieties of each species were studied in 1993 and 1994. Experiments were carried at five sites in the winter of 1993, and in 1994, and four sites in 1993.

The mean yield for the different forages were:

	1993	1994
Rye grass	6.5 tons of DM	5.5 tons of DM
Oats	5.0	4.6
White clover	3.5	1.3

KEYWORDS

Cool season. Highland of Madagascar.

INTRODUCTION

Madagascar is an Island in the Indian Ocean. It extends about 1 500 km from South to North, and some 600 km from West to East. It is situated between 11°57' and 25°32' South. In general the inland is Highland ranging from 800m to 2,200m above sea level.

The Highland is characterised by two distinct seasons: six months are hot and wet; and six months are cool and dry. The Highland has a "Tropical highland" type of climate. The rainfall of about 1 300mm per year falls mainly from October to April. The Eastern part of the highland receives drizzle during the cool season, but the Western part is arid. The night temperature may fall to -8°C in the highest regions. The climate in the Highland is suitable for dairy cattle, but the problem is the lack of good quality forage during the dry and cool season. In general, the farmers give their animals straws of different cereals (rice, barley, oats etc.), and rarely some conserved forage, such as hay or corn-silage. These forages are not good enough for dairy cattle. Three temperate forages (rye grass, white clover and oats) species were studied during the dry and cool season. They were cultivated under irrigation in the rice-fields. The yield potential for these three species has been studied for several years by the staff of FIFAMANOR in the middle of the Highland only. Farmers usually cultivate oats, but rye grass has been shown to have excellent seedling vigour and may displace oats for forage in winter. The maximum yield of: rye grass, oats and white clover are 13t, 10t and 11*t/ha of dry matter respectively (FIFAMANOR; 1992; 1993; 1994). The objective of this research is to determine the adaptive species on different soils in the South and North of the Highland during winter.

MATERIALS AND METHODS

Experimental design and treatments. Five similar trials were carried out on different sites in 1993. The same trials were repeated on four sites in 1994.

Treatments were replicated 3 times in a randomised complete block design. Soils were not analysed. But in general the characteristics of soils of the different sites are low in P and Ca and the pH is about 5. The different treatments are:

Rye grass:	1- Tama
	2- Fiesta
	3- Magnum
Oats:	4- 151
	5- 145
	6- 24
White clover:	7- Ladino
	8- Lousianna
	9- Regal

The trials were conducted on rice-fields, as they are free during the cool season. Each variety of each species was cultivated in plots of 3x3m, ploughed to a depth of 20-25 cm before sowing and repeated twice.

The seeding rates were: 20 kg/ha for rye grass and 100kg/ha for oats. White clover, we established by transplanting at rate of 30 cm X 30cm with about three or four stems per hole. For every trials we also applied 400kg/ha of NPK (11-22-16) and 500kg/ha of local dolomite.

The plots were irrigated immediately after establishment, and approximately every 2 week for the duration of the trials. Nitrogen was applied as a top-dressing (100 kg of urea/ha) one month after sowing the gramineas (rye grass and oats).

Harvests and measurements.

- The first harvest was three months after sowing the rye grass and oats.
- The second harvest for the graminea and first for the white clover was four months after establishment (one month after the first cut)
- 100 kg/ha of urea was applied as a top-dressing after each cut of rye grass and oats.
- the surface of each plot which was harvested and weighed was 2m X 2m in the middle of the plot.
- samples of each plot were oven-dried at 100°C for dry-matter content.

Statistical analysis. Analysis of variance was conducted to assess the more productive species or varieties by MSTAT and significance amount treatments were tested with Duncan's multiple range test.

RESULTS AND DISCUSSION

On fertile soil the three species studied thrive in rice-field under irrigation during dry and cool season in the Highland of Madagascar. It is possible to obtain 3 cuttings (at least) with rye grass, oats and white clover. Under good conditions we may get up to 9t/ha of DM with three cuttings of rye grass and oats if water is always available for irrigation. The main results obtained in both years (1993 and 1994) are summarised in Table 1. Three cuttings were obtained on five sites and two cuttings only on the other four sites for the rye grass and the oats because there was no more water for irrigation. Oats gave its maximum yield on first and second cuttings but on the other hand rye grass has its maximum yield on second and third

* on volcanic fertile soil

cuttings. The rye grass starts to flower from October. It was observed that the cultivar Fiesta flowered about one month before Tama and Magnum.

In general the rye grasses gave a higher yield than oats and white clover, and the yield of each species in 1993 is better than in 1994. This is explained by the lack of water and soil fertility. Within the species there were no significant difference in yield of dry matter. In the Ambositra and Ijely sites where the soils are fertile in 1993 compared with the other sites, white clover gave the same yield as oats. In these two sites, the white clover grew quickly, as much as the graminea, so three cuttings were obtained. It is not useful to cultivate white clover on no fertile soil because the yield is very low.

White clover normally has a shallow rooting habit so it consequently suffers easily from drought conditions (Smith & Morrison, 1983). During the experiments, we also observed that rye grass and white clover are more sensitive to drought conditions than oats. This latter cannot bear water logging. It is useful to cultivate white clover because it fixes its own nitrogen from the atmosphere so it doesn't need nitrogen fertilizer. Nevertheless white clover is not normally tolerant of low P, low Ca and high Al soil contents (Tainton, 1980).

However if white clover succeed in growing in rice-fields it may improve the soil fertility and increase the next yield of rice; on the other hand gramineas (rye grass and oats) impoverish the soil.

The cultivation of temperate forage on rice fields helps farmers to feed their cows during the dry season in the Highland of Madagascar. After several years of studying of some temperate forages it seems that rye grass, oats and white clover are the best. Each one of these three species has unique characteristics. The two gramineas (rye grass and oats) thrive on different sites. White clover needs good soil. In fertile soil where water is always available, the white clover and the rye grass are the species to cultivate. In more or less fertile rice fields where water is not enough during the dry season oats are the best species.

REFERENCES

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Table 1

Yield of each variety (kg DM/ha) in 1993 and 1994.

Years Sites	Year 1993					Year 1994				
	Ambositra	Ambanimaso	Ankazondandy	Iboaka	Ijely	Fandriana	Manjakandriana	Ambatolampy	Iboaka	Means
Varieties/species										
Rye-grass	3 cuttings	3 cuttings	2 cuttings	2 cuttings	3 cuttings	3 cuttings	2 cuttings	3 cuttings	2 cuttings	
Tama	8234 a*	7800 a	4518 ab	4808 ab	7104 abc	6398 ab	5133 b	6747ab	4282 a	6114
Fiesta	7578 a	8446 a	5564 a	4296 ab	8769 ab	6856 a	4423 b	6282ab	4533 a	6305
Magnum	7882 a	8042 a	4735 a	5055 a	9891 a	6490 ab	4856 b	5581b	3959 a	6277
Oats	3 cuttings	3 cuttings	2 cuttings	2 cuttings	3 cuttings	3 cuttings	2 cuttings	3 cuttings	2 cuttings	
151	5536 b	5326 b	4517 ab	4511 ab	8499 ab	6100 ab	8165 a	6492ab	4045 ab	5910
145	4906 b	4494 bc	3410 b	3333 c	7078 abc	5353 b	4616 b	6143ab	4002 ab	4815
24	5413 b	5312 b	4507 ab	4026 bc	9891 a	5592 ab	7400 a	6933a	4014 ab	5899
White clover	3 cuttings	2 cuttings	1 cuttings	1 cuttings	3 cuttings	1 cuttings	1 cuttings	2 cuttings	1 cuttings	
Ladino	4736 b	3539 c	1634 c	2444 d	4866 c	821 c	1326 c	1537c	1957 c	2540
Louisiana	5789 b	3666 c	1255 c	2274 d	2037 d	892 c	816 c	1987c	1920 c	2293
Regal	5529 b	4487 bc	1890 c	2330 d	6206 bc	894 c	896 c	1852c	2892 bc	2997
Coefficient of variation	13.33%	17.38%	11.6%	16.71%	17.25%	17%	13.46%	19.48%		

* Numbers followed by different letters are significantly different at 5% level according to Ducanis multiple range test

Table 2

Mean of each species on the 9 sites (kg/ha of DM)

Years Sites	Year 1993					Year 1994				
	Ambositra	Ambanimaso	Ankazondandy	Iboaka	Ijely	Fandriana	Manjakandriana	Ambatolampy	Iboaka	Means
Varieties/species										
Means of rye-grass	7898	8096	4939	4720	8588	6582	4808	6203	4258	6232
Means of oats	5285	5044	4145	3957	8489	5682	6727	6523	4020	5541
Means of white clover	5351	3897	1593	2349	4370	869	1013	1792	2256	2610