MILK PRODUCTION FROM IRRIGATED NITROGEN FERTILIZED PANGOLA GRASS

and MRS. J. STOKOE**

Abstract

The project compared milk production and composition of Jersey and
Friesian cows grazing irrigated pangola grass fertilized with 672 kg N/ha
annum. Friesians were stocked at 5.9 and 7.9 cows/ha, and Jerseys at 7.9
and 9.9 cows/ha. A supplement of 3.6 kg/head/day of molasses/urea/M.A.P.
(97:2:1) was also evaluated.

High levels of production per unit area were achieved. Supplemented
Friesians at the high stocking rate averaged 25626 kg milk and
863 kg fat/ha. Corresponding values for the comparable Jersey group were
21348 kg milk and 954 kg fat/ha. For both breeds increasing the stocking rate re-
duced per cow production and generally, though not always, increased per
hectare production. Per hectare production of the highly stocked Friesian
group exceeded that of the lower stocked group by an average of 6.7% for
milk (21551 kg x 25053 kg), 2.5% for fat (763 kg x 784 kg) and 6.5% for
S.N.F. (1771 kg x 1835 kg). For Jerseys, corresponding increases were 9.7% for
milk (17921 kg x 19668 kg), 3.9% for fat (830 kg x 862 kg) and 8.6% for
S.N.F. (1529 kg x 1651 kg).

Molasses supplement was very effective in raising milk production. On
average Friesians gave 0.67 kg milk per kg of molasses fed. For Jerseys
the figure was 0.39 kg milk per kg of molasses. Supplement feeding also
generally increased lactation length and the S.N.F. % of milk.

The project has demonstrated that dairying can be successfully under-
taken under true tropical conditions.

I. INTRODUCTION

Swain (1971) claimed it was doubtful whether a viable dairying industry could be maintained in the tropics if it had to rely on legume grass pastures. Basically this was because of low output per cow and per hectare. A grazing system based on nitrogen fertilization should be capable of far higher output per hectare because it should support higher cow numbers per

unit area. This project was undertaken to examine the effect on per hect-
are production of breed, stocking rate and supplementation at a high level of

grass fertilization in a tropical environment. With the increasing use of nitrogen fertilizer on dairy pastures in Queensland this question has major relevance.

II. MATERIALS AND METHODS

A 2 x 2 x 2 factorial design was used to examine the effect on milk
production of:-- breed (Friesian \* Jersey; 16 animals (four groups of four)
of each breed were involved); stocking rate (5.9 x 7.9 cows/ha for
Friesians, and 7.9 x 9.9 cows/ha for Jerseys); and supplement (nils 3.6
kg/head/day of a molasses/urea/M.A.P. mixture (97:2:1 - in year 3 urea
replaced biure t isonitrogenously).

*Department of Primary Industries, Ayr Research Station, AYR, Queensland.
**Griffiths University, BRISBANE, Queensland.

481
The pasture was irrigated with a two paddock system per group of four cows, each paddock being grazed for three weeks and rested for three weeks. Nitrogen (672 kg/ha/year as ammonium nitrate in years 1 and 2 and urea in year 3) was applied in equal applications every six weeks during the pasture rest phase. Phosphate (45 kg/ha) and potassium (62 kg/ha) were applied as a single dressing every August. An electric fence was used to ration pasture from autumn to late spring.

Initially within each breed cows were randomly allocated to one of four stocking rate treatments and supplemented with hay and molasses to determine initial milk yield under a fixed nutritional system. This data was used for a covariance correction to minimise variation due to initial yield differences. Apart from this 14-day period the cows were maintained year round on the same pasture area. Daily milk yield, weekly fat and S.N.F. percentages and monthly live weights were recorded. Cows were dried off when the weekly milk yield declined to 23 kg. Rectal temperatures of the cows were taken weekly at an afternoon milking over the period December, 1970 to March, 1971.

III. RESULTS

Each years results were analysed separately by covariance analysis using milk production over lactation days 5 to 14 on a standard ration as a covariate to correct for inherent differences in production. Corrected treatment effects on per cow and per hectare milk, fat and total solids production are shown in Table 1. Actual milk composition data (not covariance corrected) is also given in Table 1.
Milk production in the first lactation averaged 16.9% above the second lactation and 13.1% above the third lactation. Friesians and Jerseys averaged 3272 kg milk and 114 kg fat, and 2150 kg milk and 96 kg fat per lactation respectively. For both breeds increasing the stocking rate reduced per cow production and generally increased per hectare production. For Friesians, increasing the stocking rate (5.9 to 7.9 cows/ha) reduced average per hectare production in the first lactation but increased production in lactations two and three. The average increase in per hectare production due to increased stocking rate was 6.7% for milk (2155 kg vs 23003 kg), 2.9% for fat (763 kg vs 784 kg) and 6.9% for S.N.F. (1771 kg vs 1893 kg). For Jerseys corresponding increases were 9.7% for milk (17927 kg vs 19668 kg), 3.9% for fat (830 kg vs 862 kg) and 8.9% for S.N.F. (1529 kg vs 1651 kg).

Molasses raised milk yield by an average of 0.67 kg milk/kg molasses with Friesians and 0.39 kg milk/kg molasses with Jerseys. In addition, supplement feeding generally increased lactation length and the S.N.F. % of milk. Milk casein percentages were low especially over summer when Friesian milk averaged 2.1% and Jersey milk 2.6%.

Weekly variations in mean rectal temperature for each breed are shown in Fig. 1 for the period December, 1970 to March, 1971. The mean temperature for both groups over much of this period was outside what is regarded as a normal range (Hungerford 1967). Friesians showed more obvious signs of heat stress than did Jerseys.

Fig. 1. Variations in rectal temperature (°C) of Friesians and Jerseys at one afternoon milking weekly over period December 1970 to March 1971.
IV. DISCUSSION

Payne (1963) suggested it should be possible on "good humid tropical pastures" to maintain five dairy cows/ha each producing at least 2720 kg of milk annually; This target of 13600 kg milk/ha has been greatly surpassed in this experiment. Furthermore, consistent results in the second and third lactations would indicate that the system used was reasonably stable. The higher production levels recorded in the first lactations were caused by two factors. Firstly only mature animals were used in the first lactation while in the second and third lactations one heifer/group was used. Secondly, animals commenced the first lactation in better condition than they commenced subsequent lactations. Ephemeral fever was a problem in the third year, especially with Jerseys. This had the effect of nullifying the effect of supplement with this group in that year and is the major cause of the difference between breeds in milk response to supplement.

Rectal temperature data during summer indicated that heat stress was at a level where substantial effects on milk production and composition could be expected (Bianca 1965). Milk protein is a sensitive indicator of heat stress (Donnegan pers. comm.) and low summer casein percentages recorded for both Jersey and Friesian are consistent with this and go a way to explaining the problem of low S.N.F. content of milk. However, low S.N.F. percentages were recorded year round and it is probable that the low energy concentration of tropical species combined with relatively low intakes of pasture dry matter (c.f. temperate species) are largely responsible. Heat stress in summer would aggravate the problem further by reducing intake. The above would indicate good responses could be expected both in milk production and S.N.F. to energy supplementation even in those periods of the year when feed is available in excess (e.g. summer). Results from this trial are consistent with this,

It would seem that the tropics by exploiting the high levels of dry matter that can be produced under their climatic conditions and utilizing a cheap energy source such as molasses can rival temperate regions in milk production per unit of land even though individual cow yields are not high.

V. REFERENCES