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SMALL-HOLDER MILK PRODUCTION IN A SEMI-ARID AREA OF ZIMBABWE FROM CROSSBRED JERSEY CATTLE AND FORAGE BASED ON *PENNISETUM* HYBRIDS: A PROGRESS REPORT

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ABSTRACT

Milk and dairy products are in short supply in rural areas of Zimbabwe. Small holder interest in dairying is increasing. Major constraints are lack of suitable cattle and feed. Indigenous cows are being crossed to Jersey bulls to produce an F_1 dairy type animal. The calves reached puberty at around nine months and of 26 heifers bulled 23 produced a calf. Milk production, in the first lactation, from the crossbred female was higher in those calving at three years , compared with two years of age (1255v821 l), in excess of rearing their calves). Thirteen heifers were bred for a second lactation and 12 have calved (calving interval 373 days). Male progeny have proved capable as a source of draught power. Slaughter weights of pen-finished steers were satisfactory (227 and 187kg for three and two year olds respectively). Forage is being produced from *Pennisetum* hybrids, but erratic rainfall in 1994-1995 (year of establishment) has delayed full evaluation.

INTRODUCTION

Milk and dairy products are in short supply in the rural areas of Zimbabwe. Intake of animal protein is low (1). A major constraint to milk production in the semi-arid tropics is lack of feed. In these areas livestock production is usually the preferred activity. Whilst the percentage off-take for beef from small-holder cattle systems is low (2), the reasons farmers give for owning cattle emphasise the importance of draught power, milk production and social security, with beef production being regarded as a terminal function (3). Within the indigenous cattle of Zimbabwe there has been no sustained selection for either milk production or ease of milk let-down.

Up to 10 tonnes forage dry matter can be grown with relatively low rainfall (< 600mm) using *Pennisetum hybrids* (4) . The superiority of indigenous breeds and their crosses as dam lines in these areas has also been demonstrated (5). In another study milk production was similar from crossbred (Friesian or Jersey) Mashona cows (6). When crossbreeding to produce milk in the small holder sector the male progeny must contribute to the overall livestock system.

At Matopos Jersey bulls are crossed with indigenous cows to produce F_1 females with potential for milk production. *Pennisetum* hybrids are grown for forage.

EXPERIMENTAL PROCEDURES

Site Matopos Research Station lies south of Bulawayo. Rainfall, between November and April, averages 610mm, but amount and distribution are variable. Soils at the trial site are predominately a sandy clay mixture (7).

Animals Since 1991 Nkone and Tuli cows have been bred to a Jersey bull to produce F1 progeny. The F_1 females have also been bred to a Jersey bull to calve for the first time at two or three years of age, from October to December (first groups of F1 heifers calved in 1994).

Steers have been fattened or used for draught, either for routine carting operations or in ploughing trials (8)

Feed The major feed resource is natural grazing (thornveld, 7). In late 1994 a forage garden was established with four lines of pennisetums: Bana grass; SDPN's 3, 29 and 38. The garden is rain fed with strategic watering available. Forages are cut and carried for feeding. Hay and a commercial dairy feed are purchased. Erratic and low rainfall in 1994-95 disrupted forage production. Evaluations will recommence in the 1995-1996 season.

Management The cows are hand-milked once a day and the calves then suckle for four hours. The parlour was designed with a ramp to hold four cows. Veterinary procedures, including tick control and vaccination programmes, are as applied to all cattle at Matopos (5).

RESULTS

Between 1991 and December 1995 a total of 109 F_1 calves have been born (57 males; 52 females). Birth weights averaged 27 ($\pm$5.0)kg and 90 day weights 98 ($\pm$11.2)kg for calves born in 1991, 1992 and 1993. Survival rate to weaning was 86%. Of the F1 females, bred for the first time, 26 have been bulled and 23 calves produced . Of the 13 F1 females bred to produce a second calf 12 have calved, with a calving interval of 373 ($\pm$39.0) days.

The seven 3 year old calvers gave 1255 ($\pm$347.0)l of milk in 282 ($\pm$41.6) days and reared their calves. In mid-lactation four of them received 3kg hay and 5kg dairy meal and a supplement of SDPN3, either chopped or long. Intake of chopped forage was higher (fixed at 30kg/head/day) than long (28kg/head/day). Milk yield (5.5$\pm$0.77 l/head/day) was not improved by chopping the forage.

The six 2 year old calvers gave 821 ($\pm$172.3)l of milk in 252 ($\pm$19.8) days reared their calves. In mid-lactation four of them received supplements, to natural grazing, of Bana grass (12.5 or 25.0kg/day) or dairy meal (2.5 or 5.0kg/day) but yield levels were such (3.1$\pm$1.06 l/head/day) that no differences were noted.

In late 1995 nine steers (three 1992 born; six 1993 born) were finished for slaughter, by group feeding of a high energy diet *ad libitum* for 90 days. Intake averaged 1020kg/head as fed. Carcass weights were 227 ($\pm$9.5) and 187kg ($\pm$9.4) for the 1992 and 1993 born respectively.

DISCUSSION

The three year old first calf F1 heifers produced more milk in longer lactations than the two year old. The three year old group included one low yielder (519 l) and one off-season first calver, bred with her peers for the second calf. The three year old heifers produced similar amounts of milk as those reported elsewhere (9). In both groups maternal ability was high and incidences of mastitis were low. Females reached puberty at $\pm$ 9 months, suggesting that in the small-holder system early calving is likely. The Jersey cross gave less milk, but calved at a younger age and had a shorter calving interval than the Friesian or Brown Swiss cross (10). Calf mortality was lowest when *Bos taurus* was 50% of the cross, in a range from 0 to a 100% (11).

However, maintenance of an F_1 herd is difficult and it is intended to test various combinations of Jersey and indigenous blood. Artificial insemination, group bull owning schemes etc. are practical possibilities (12). Seasonal calving (october to December) is being practised at present because of feed constraints in the dry season. Silage making systems suitable for small- holder production in semi-arid areas are needed.

The carcasses were 'satisfactory' as 'dairy beef'. In a 'consumer survey' of Matopos staff the meat was judged of good quality but over-fat, suggesting that more work on system of finishing is required. In a ploughing trial the power output of a team of two crossbred Jersey steers was higher than a team of four donkeys (8) and on farm they have been judged 'highly satisfactory' (Agritex, pers. comm.). At Matopos they are used regularly for cart work. Jersey crossbred steers were also found to work well in Nepal (13).

The objective of this project is to increase production of milk in rural areas but the overall impact on cattle production should not be ignored. The incentive of a regular cash income should stimulate management, thereby increasing calving percentage (in the small-holder sector currently around 40%) and calf survival (14), thus increasing cattle available for other productive functions. Farmer interest in this project is high, with three groups comparing crossbreds (male and female) from Matopos with local cattle. Five groups are producing forage from selected lines of hybrid *Pennisetum*.

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REFERENCES

1) Food and Agricultural Organization (FAO) 1988. Year Book; FAO, Rome.
2) Christiansen, G. and Zindi, C. 1992. Working paper AEE4/91, Department of Agricultural Economics and Extension, University of Zimbabwe, Harare.
3) Gupare, R.L. 1988. In:(C.G. McLaren) Livestock research and extension for communal area farming systems (proceedings), pp12-15. DR&SS/Agritex, Harare.
4) Gupta, S.C. 1992. ICRISAT Annual Report, pp50-51. ICRISAT, Hyderabad.
5) Moyo, Siboniso. 1990. Report to the International Livestock Centre for Africa, Ethiopia, and the Department of Research and Specialist Services, Zimbabwe.
6) Tawonezvi, H.P.R., Khombe, C.T. and Dube, I.A. 1987. Zimbabwe Journal of Agriculture (in press).
7) Ward, H.K., Richardson, F.D., Denny, R.P.and Dye, P.J. 1979. Rhodesia Agricultural Journal, 76,5-18.
8) Nengomasha, E.M. and Jele, N. 1995. Workshop Proceedings. Animal Power Network for Zimbabwe (APNEZ):(in press).
9) Muinga, R.W., Topps, J.H., Rooke, J.A. and Thorpe, W. 1995. Animal Science, 60: 13-23.
10) Syrstad, O. 1987. In:(H.O. Gravert, ed.) Dairy-Cattle Production, pp 291-301; Elsevier, Amsterdam.
11) Madsen, O. and Vinther, K. 1995. In: (G. Williamson and W.J.A. Payne) Animal Husbandry in the Tropics, p260. Longman, London.
12) Moyo, S. and Mpofu,Z. 1996. Proceedings, All Africa Conference on Animal Production, Pretoria.
13) Pearson, R.A. 1991. Asian Journal of Agricultural Science: 4, 31-40.
14) Department of Research and Specialist Services 1994. In:(P. Nyathi and J. Gambiza, eds) Proceedings of the livestock and pastures review (1993). Zimbabwe Agricultural Journal (special publication).