COMPARATIVE DAIRY PRODUCTION OF JERSEYS AND FRIESIAN-JERSEY CROSSBREDS

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SUMMARY

Of two originally matched Jersey herds at Ruakura, one has been maintained purebred while the other has been graded through to Friesian × Jersey crossbred status over 8 years. Stocking rate, grazing and milking management, and genetic merit were comparable throughout for both herds. On average the crossbreds were 16% heavier than their Jersey contemporaries; they also produced 16% more milk, 4.9% more milkfat, 9% more protein and 16% more lactose. However, at the stocking rate employed (4.12 cow equivalents/ha) the Jerseys remaining in the crossbred herd were penalized in liveweight and fat, protein and lactose production compared with their contemporaries in the Jersey herd, so that total herd milk-fat productions and financial returns slightly favoured the purebred Jersey herd.

INTRODUCTION

Few data are available of direct relevance to a comparison of Jerseys and Friesians or Friesian-Jersey crossbreds as dairy producers in the New Zealand pastoral environment. Yet in the 1971-2 season, 34% of all cows were sired by Friesian bulls (NZDB, 1972); many of these cows were crossbreds. The proportion of Friesian crossbreds is now almost certainly higher and the differing volumes of milk produced by Jerseys and crossbreds create transport and plant capacity problems within the milk processing industry.

Wallace (1956) in one year compared low yielding Jerseys with more average yielding Friesians and found the Jerseys to be about 34% less efficient in the conversion of DOM to FCM. In a second year, Jerseys of more normal productive levels were slightly (1.7%) more efficient than Friesians.

In a N.Z. Dairy Board survey of 66 Jersey and 66 Friesian farms in 1953-4, Friesian cows produced 39% more milk than Jerseys, but 1.65% less milkfat (NZDB, 1954). Comparisons of tested pedigree Jersey and Friesian cows are also available (NZDB, 1974), but the relevance of these to commercial, pastoral dairy farming conditions is not clear.

Campbell (1966), in an exercise which specifically excluded maintenance requirements, looked at the theoretical productions from a given amount of feed of cows yielding milks of 3.5, 5.0 and 6.0% milkfat test, akin to Friesians and two qualities of Jersey cows. The lowest testing cows (= Friesians) should yield 24% more milk than 5%-fat-test cows and 41% more than those testing 6%, with lactation fat yields 13 to 18% below and SNF yields 17 to 26% above the higher testing cows. The theoretical reduction in fat yield per cow from Friesians, despite a large increase in milk yield, is not borne out by New Zealand survey data because milk yields from New Zealand Jerseys are lower than the levels predicted by Campbell. Because of this, the expected advantage of Friesians in SNF yield per cow may indeed be greater than Campbell predicted.

Finally, Stichbury (1965), considering the 2-year-old progeny of AB bulls, found an 8.8% increase in fat per cow from Friesian × Jersey crossbreds compared with Jerseys and concluded that this did not result from hybrid vigour, but from the better quality of the Friesian sires available at that time through the Dairy Board's AB service.

EXPERIMENTAL

Five 12.14 ha farmlets were established at No. 2 Dairy, Ruakura, in 1968, to enable comparisons to be made of pastoral dairy farming with various other pastoral systems involving combinations of dairying and dairy beef production (Campbell *et al.*, 1974, 1975). The five herds involved were, at the start, all AB-bred Jerseys balanced for age and genetic merit. Two of these farms were designated as dairy farming controls, the herd on one being maintained as straight-bred Jerseys by the use of the best available Jersey AB bulls, and the other, the crossbred herd, was mated to Friesian AB bulls of similar genetic merit to the Jersey bulls used in the Jersey herd. These were frequently not the best available Friesian bulls, but the intention was to eliminate differences in the selection differential for fat production as a source of variation in the various comparisons. The sires used had to be selected on whatever breeding indices (B.I.) were available prior to mating each year, but subsequent information on daughters may alter these. However, at B.I.s of 121 for the Jerseys and 124 for the crossbred herd (based on updated daughter records) at the start of the 1975-6 season, the herds were genetically quite comparable.

The stocking rate was 4.12 cow equivalents/ha. This included approximately 20% replacements required annually. These were run in conjunction with their respective herds. Paddocks of the farms were intermingled, chequerboard fashion, to give similar soil types to each. Management was retained as constant as possible between herds and both were milked in the same shed by the same milkers, the order of herd milking being regularly rotated throughout the year so that no one herd was consistently milked first or last.

RESULTS

LIVEWEIGHT

Table 1 shows differences in liveweight between contemporaries in the two herds by years (adjusted for age) and age (adjusted for season). The "Base Jersey" comparison is that between the Jerseys remaining in the crossbred herd and their contemporaries in the Jersey herd and shows the effect of the competition between the crossbreds and the remaining Jerseys upon the latter's liveweight and production.

TABLE 1: NUMBERS OF COWS, DIFFERENCES IN CARDINAL LIVEWEIGHTS, AND LACTATION WEIGHT CHANGE IN JERSEY AND CROSSBRED COWS (kg ± SE)

	Numbers J	Numbers FJ	Calving Wt. Diff. FJ-J	Mating Wt. Diff. FJ-J	Drying off Wt. Diff. FJ-J	Lactation Wt. Change FJ-J
Years*:						
1972-3	12	14	48 ± 11	54 ± 8	51 ± 10	2 ± 8
1973-4	20	22	42 ± 8	45 ± 8	43 ± 9	2 ± 10
1974-5	25	25	35 ± 9	50 ± 9	53 ± 9	18 ± 5
1975-6	30	32	41 ± 9	53 ± 8	41 ± 8	0 ± 6
Ages:						
2 yr	39	41	31 ± 6	55 ± 6	51 ± 6	19 ± 6
3 yr	27	27	40 ± 8	54 ± 7	46 ± 7	5 ± 6
4 yr	28	33	47 ± 9	47 ± 8	45 ± 9	−2 ± 5
Base Jerseys:						
1973-4	21	20	−17 ± 13	−21 ± 12	1 ± 11	17 ± 8
1974-5	16	16	−20 ± 15	−25 ± 13	3 ± 13	23 ± 9
1975-6	12	10	−38 ± 18	−31 ± 16	−27 ± 16	9 ± 10

*Small numbers in 1971-2 season omitted from "Years" comparison, but included in 2-year-old "Ages" comparison.

The crossbreds were consistently heavier, by 46 kg on average. The Jerseys in the crossbred herd (the Base Jerseys) tended to be lighter than their contemporaries in the Jersey herd, but usually less so at the end of lactation, an effect not accounted for by earlier drying off.

Changes in weight during lactation were usually similar for the two breeds, except that crossbred 2-year-olds gained more than their Jersey contemporaries.

PRODUCTION

Lactation lengths were, on average, identical (247 days), the maximum difference being a four-day longer average lactation for the Jerseys in the Jersey/crossbred contemporary comparison in the 1974-5 season.

TABLE 2: DIFFERENCES IN MILK YIELDS AND MILK CONSTITUENTS BETWEEN JERSEY AND CROSSBRED COWS

	Milk (kg/cow) FJ-J	*Fat % FJ-J*	*Protein % FJ-J*	*Lactose % FJ-J*
Years:				
1972-3	457 ± 155	— 0.44 ± 0.17	— 0.16 ± 0.08	— 0.04 ± 0.05
1973-4	367 ± 114	— 0.47 ± 0.15	— 0.21 ± 0.06	— 0.02 ± 0.03
1974-5	476 ± 97	— 0.56 ± 0.13	— 0.27 ± 0.06	— 0.01 ± 0.03
1975-6	462 ± 106	— 0.69 ± 0.12	— 0.17 ± 0.05	0.02 ± 0.04
Ages:				
2 yr	415 ± 82	— 0.64 ± 0.10	— 0.23 ± 0.04	— 0.02 ± 0.03
3 yr	433 ± 103	— 0.68 ± 0.12	— 0.26 ± 0.05	0.00 ± 0.03
4 yr	429 ± 99	— 0.24 ± 0.13	— 0.09 ± 0.05	0.02 ± 0.03
Base Jerseys:				
1973-4	— 238 ± 120	0.00 ± 0.82	— 0.04 ± 0.06	— 0.03 ± 0.04
1974-5	— 297 ± 135	— 0.05 ± 0.86	— 0.11 ± 0.07	— 0.01 ± 0.05
1975-6	— 470 ± 164	0.11 ± 0.22	0.10 ± 0.08	0.09 ± 0.06

Table 2 records differences in milk yields and its percentages of fat, protein and lactose. Crossbred milk yield was higher in all years and at all ages, the overall difference being 424 kg (16%). The Base Jerseys in the crossbred herd were consistently penalized. Jersey milk was on average 0.53 of a percentage unit higher in fat test and 0.2 of a unit higher in protein than crossbred milk, but the breeds were very similar in percentage lactose.

Differences in the yields of milk constituents are presented in Table 3. The crossbreds produced slightly more fat per cow than their Jersey contemporaries (7 kg or 4.9%) but the Base Jerseys

TABLE 3: DIFFERENCES IN YIELDS OF MILK CONSTITUENTS BETWEEN JERSEY AND CROSSBRED COWS (kg/cow)

	Fat *FJ-J*	*Protein* *FJ-J*	*Lactose* *FJ-J*
Years:			
1972-3	11.57 ± 8.28	11.32 ± 5.04	20.96 ± 7.37
1973-4	8.14 ± 6.46	8.22 ± 4.12	17.50 ± 5.59
1974-5	8.17 ± 5.90	8.47 ± 3.47	22.66 ± 4.82
1975-6	3.92 ± 6.32	7.87 ± 3.46	18.80 ± 4.62
Ages:			
2 yr	5.67 ± 5.07	8.66 ± 2.90	19.58 ± 3.94
3 yr	2.15 ± 5.47	6.49 ± 3.37	20.18 ± 4.93
4 yr	14.41 ± 5.53	9.80 ± 3.24	18.06 ± 4.45
Base Jerseys:			
1973-4	— 12.06 ± 7.61	— 9.84 ± 4.53	— 12.65 ± 5.87
1974-5	— 16.97 ± 8.61	— 13.90 ± 5.13	— 14.59 ± 6.65
1975-6	— 20.92 ± 10.42	— 9.86 ± 6.21	— 15.60 ± 8.05

in the crossbred herd were penalized so that whole-herd fat productions have consistently been very similar (163.8 and 161.5 kg fat/cow being the 5-year averages for the Jersey and crossbred herds, respectively). It is worth observing that in years of good pasture growth, 1974-5 and 1975-6, when feed limitation was probably less than in some earlier years, the crossbreds still showed no real advantage in fat production.

Protein yield from the crossbreds was consistently higher (8 kg/cow, or 9.0%) as was lactose (19 kg/cow, or 16%).

Estimates of pasture dry matter (DM) availability, net production, disappearance following grazing and percentage utilization have been made since the 1973-4 season (using the pre- and post-grazing difference technique). After making due allowance for the young stock, the overall conversion of pasture DM to milkfat for the 3 years combined has been 21.4 kg DM/kg fat for the Jersey herd, and 22.1 kg/kg for the crossbred herd — an apparent 3% advantage in efficiency for the Jerseys. But considering the unreliability of pasture measurement, it would be unwise to place too great a reliance on this difference.

DISCUSSION

The data appear partly to support the belief of Stichbury (1965) that the expectation of achieving hybrid vigour for milkfat production should play little part in the decision to crossbreed.

Application of a fat + protein − cartage pricing formula

to the weighted average per cow yields, and employing 1975-6 values for fat, protein and cartage costs (kg fat × 85.764c + kg protein × 78.656c − litres of milk × 0.272c), shows that the crossbreds would have earned $12.74 more per cow than the Jerseys. This is equivalent to 6.5% of the gross earnings for milk products of a Jersey cow; yet the crossbred cows were, on average, 16% heavier than the Jerseys. If the stocking rate of the Jerseys could be raised, so that total liveweight carried was the same on the Jersey as on the crossbred farm, without too greatly penalizing the per cow production of the Jerseys, this could be a more profitable alternative. However, the progressive nature of the decline in both milk and fat yield of the Base Jerseys suggests that increasing competition for feed may indeed be the factor depressing their production, as the total weight per hectare of the crossbred component of the herd rises. If this is so, then raising the stocking rate of the Jersey herd by this 16% liveweight differential, or part of it, might be expected to depress the Jerseys' production similarly, unless there exist other inter-breed competitive factors of greater subtlety.

It has already been suggested that too great an emphasis should not be placed on the 3% difference between the breeds in DM intake per kg milkfat produced. Of greater interest is the relatively low intake of both herds per unit of milkfat. If 25 kg DM/kg milkfat be accepted as an average figure (Hutton, 1971) the No. 2 Dairy cows may be about 13% more efficient than average cows, but whether this can be attributed to a genetically controlled advantage in feed conversion efficiency, or simply to good milking management and general husbandry, is uncertain.

However, the financial outcome for the highly stocked dairy farmer is quite clear. Because of the lowered production from the Base Jerseys in the crossbred herd, it does not seem to matter whether payment was made on the basis of fat alone or on the basis of the values for fat, protein and cartage given earlier; gross income from milk products has been higher from the Jersey herd except for one season (1974-5) when milkfat yields were the same for both herds and the crossbreds' protein yield gave them a 23 cent/cow/annum advantage. In most seasons the increased per cow milkfat recepits of the Jersey herd would also have more than compensated for the higher value of the crossbred bobby calves, leaving a higher value for cull cows as the only possible economic advantage. But the culls during these transitional years were most likely to come from the Base Jersey group in which liveweight was, if anything, penalized.

Thus, unless such a farmer can make a profit from rearing crossbred weaners or has a crossbred beef enterprise on land unsuitable for dairying, the economic value of crossbreeding is uncertain during this transition period.

Whether the balance of advantages will ultimately favour the crossbred herd, once the final Base Jerseys have been culled, remains to be ascertained.

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