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## The Use of Dairy Cull Cows as Foster Mothers<sup>1</sup>

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### INTRODUCTION

The procurement of herd replacements is one of the great handicaps faced by dairymen. Facilities for rearing replacement heifers are often inadequate and among the reasons for making frequent importations of stock ill-adapted to conditions in Puerto Rico and, too often of questionable productive potential.

Most cows and heifers culled because of low production or udder damages go to slaughter thereby wasting this great potential for rearing badly needed dairy replacements. Moreover, Puerto Rico needs more locally-produced beef to reduce importations.

Winks & Edgley mention multiple suckling of calves on dairy cows as a promising alternative for meat production.<sup>3</sup> Both beef and dairy replacements can be managed in one operation wherein fresh dairy culls adopt either a heifer calf intended for dairy replacement, or a bull calf for beef production. The cull cow may be bred to a beef bull for increasing beef quality of the offspring and simultaneously rear a dairy replacement.

These premises led the Agricultural Experiment Station to study the feasibility of using dairy culls for nursing their own calves in addition to adopted ones. This paper reports our results.

### PROCEDURE

Fifty cull dairy cows were randomized into 2 groups of 25 each. Each cow in one group (treatment I) was to wean the adopted calf at 4 months

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<sup>3</sup> Winks, L., and W. Edgley, Multiple suckling of calves on cows grazing tropical legume-grass pasture in North Queensland, Proc. XVIII, Int. Dairy Congress, Vol. 1E, pp. 688, Ramsay & Co. Pty. Ltd., Melbourne, Aust., 1970.

of age but continue to nurse her own to 8 months of age, while each cow in the other group (treatment II) was to nurse the adopted calf and her own to weaning at 8 months of age. One half of the cows in each group were to adopt female and the other half bull calves.

The liveweight of all calves were recorded at birth and at 4, 6 and 8 months of age.

Adoption was effected as quickly as possible after the intended foster mother cow freshened. A 5-day adoption period was allowed when the cow was placed in a small paddock by herself near the small pen in which the two calves were kept together. The cow was let into the calves' pen only at definite suckling periods for both calves. This management made adoption easy. After adoption, the cow and her two calves were returned to the herd.

The pasture allotment per cow and two calves was about  $1\frac{1}{4}$  acres of improved pasture in rotation fertilized at the rate of 1 ton of a 15-5-10 fertilizer per acre per year in quarterly applications. Liming of the soil was at the same rate in a single application, when necessary to keep the pH at about 5.3. Cows and calves had free access to fresh, clean water and mineralized salt at all times.

Adopted calves weaned at 4 months of age were penned together and each fed 4 pounds of a suitable concentrate daily with free access to improved pasture, water and mineralized salt.

The cows were pasture-bred to a Holstein bull although some had been inseminated artificially to beef bulls before the observations were started.

The criteria for eliminating cows from the trials were:

1. Not adopting a second calf after 15 days.
2. Not being pregnant at 180 days after freshening.

Cows were expected to have at least two calvings while in the experiment. All calves were to be disposed of after weaning at 8 months of age.

## RESULTS

The statistical analyses of the data obtained are presented here. The average liveweights of the calves on treatments I and II are shown in table 1, while the average liveweights for own and adopted calves for both treatments are presented in table 2.

The weight gains of the calves, instead of their liveweights, were used for the sake of better statistical analyses. The rate of gain of own calves for both treatments is shown in table 3 and that for adopted ones is shown in table 4. The average weight gains of the adopted calves by age, sex and treatment are shown in table 5 and corresponding data for own calves are shown in table 6. Comparative average weight gains of own calves vs. adopted ones for treatments I and II are shown in table 7. The statistical

analyses of the data showed highly significant differences for birth weight and weight gains at 4 and 6 months of age, and a significant difference at 8 months of age, favoring own as compared with adopted calves for treatment I as well as for treatment II, as shown in table 8.

No significant difference was found between treatments with regards to birth weights or to the individual calf's gains at 4, 6 and 8 months of age.

The average total gains of own and adopted calves from birth to weaning at 8 months of age for both treatments by sex are also shown in table 8. The statistical analyses of these data showed highly significant differ-

TABLE 1.—Average individual weights (in pounds) for own and adopted calves for both treatments

Age	Treatment I			Treatment II		
	Adopted	Own	Difference	Adopted	Own	Difference
Birth	75.20	85.60	10.40	76.76	87.48	10.72
4 months	222.56	269.16	46.60	214.36	291.16	76.80
6 months	304.49	387.04	87.55	294.78	394.80	100.02
8 months	398.39	494.12	95.73	386.44	504.80	118.36

TABLE 2.—Average individual weight differences (in pounds) between own and adopted calves in both treatments

Age	Own			Adopted		
	Treatment I	Treatment II	Difference	Treatment I	Treatment II	Difference
Birth	85.60	87.48	1.88	75.20	76.76	1.56
4 months	269.16	291.16	22.00	222.56	214.36	8.20
6 months	387.04	394.80	7.76	304.49	294.78	9.71
8 months	494.12	504.80	10.68	398.39	386.44	11.95

ences when own males were compared either with adopted males or females and when own females were compared with either adopted males or females. However, no significant difference was found when own males and own females nor when adopted males and adopted females were compared.

No significant differences in total weight gains were found between own male compared with adopted male and own male compared with adopted female, nor between own female compared with adopted female and own female compared with adopted male in treatment I. Similarly, no significant differences were found for gains obtained from either male or female adopted calves regardless of whether they were paired to male or female own calves. The same held in similar comparisons for treatment II.

TABLE 3.—Rate of gain of own calves for both treatments by age

Age	Male with adopted male		Male with adopted female		Female with adopted female		Female with adopted male	
	I <sup>1</sup>	II <sup>2</sup>	I	II	I	II	I	II
4 months	1.45	1.70	1.56	1.94	1.62	1.51	1.48	1.72
6 months	2.11	1.86	2.10	1.72	1.73	1.54	1.94	1.66
8 months	1.88	1.81	1.98	2.11	1.56	1.76	1.76	1.81
Average	1.72	1.76	1.80	1.93	1.64	1.58	1.66	1.73

<sup>1</sup> Adopted weaned at 4 months of age and own at 8 months.

<sup>2</sup> Adopted and own weaned at 8 months of age.

TABLE 4.—Rate of gain of adopted calves for both treatments by age

Age	Male with own male		Male with own female		Female with own female		Female with own male	
	I <sup>1</sup>	II <sup>2</sup>	I	II	I	II	I	II
4 months	1.18	1.10	1.13	1.12	1.24	1.20	1.38	1.20
6 months	1.40	1.47	1.34	1.19	1.30	1.19	1.40	1.30
8 months	1.66	1.48	1.54	1.47	1.43	1.64	1.74	1.54
Average	1.36	1.28	1.28	1.22	1.30	1.30	1.48	1.31

<sup>1</sup> Adopted weaned at 4 months of age and own at 8 months.

<sup>2</sup> Adopted and own weaned at 8 months of age.

TABLE 5.—Average weight gains (in pounds) of adopted calves, by age, treatment and sex

Age	Treatment I			Treatment II		
	Males	Females	Difference	Males	Females	Difference
Birth	76.70	74.16	2.54	76.87	76.50	0.37
4 months	152.33	142.12	10.21	136.19	140.71	4.52
6 months	84.20	79.56	4.64	84.48	71.42	13.06
8 months	101.54	89.24	12.30	90.22	94.86	4.64

TABLE 6.—Average weight gains (in pounds) of own calves, by age, treatment and sex

Age	Treatment I			Treatment II		
	Males	Females	Difference	Males	Females	Difference
Birth	86.44	84.41	2.03	90.42	84.14	6.23
4 months	180.11	187.59	7.48	210.20	196.19	14.01
6 months	126.14	109.72	16.42	109.79	96.62	13.17
8 months	115.81	98.82	16.99	112.38	107.28	5.10

## DISCUSSION

The analyses of the data obtained with 98 calves in treatment I and 90 in treatment II clearly indicate no benefit from weaning adopted calves at 4 months of age compared with weaning them at 8 months, when average gains or liveweights of the individual calves were considered. There was a tendency for the own calves to gain at a higher rate in treatment I, where

TABLE 7.—Average weight gains (in pounds) of own vs. adopted calves by age regardless of sex for both treatments

Age	Treatment I			Treatment II		
	Adopted	Own	Difference	Adopted	Own	Difference
Birth	75.40	85.53	10.13**	76.76	87.48	10.72**
4 months	147.12	183.38	36.26**	137.60	203.66	66.06**
6 months	81.84	118.78	36.94**	80.42	103.64	23.22**
8 months	95.26	108.18	12.92*	91.66	110.00	18.34*

\*\* Significant at 1 percent level

\* Significant at 5 percent level.

TABLE 8.—Average total gains and differences (in pounds) of own and adopted calves from birth to weaning at 8 months in both treatments by sex

Gains				Difference
Own male	Own female	Adopted male	Adopted female	
426.92	397.98	—	—	28.94 n.s.
426.92	—	322.76	—	104.16**
426.92	—	—	309.51	117.41**
—	397.98	322.76	—	75.22**
—	397.98	—	309.51	88.47**
—	—	322.76	309.51	13.25 n.s.

\*\* Significant at 1 percent level.

n.s. Not significant.

the adopted calf was weaned at 4 months of age leaving the own calf alone with its dam until weaning (table 6). Overall weight gains were slightly greater for adopted calves weaned at 4 months as compared with those kept with the step-brother until 8 months of age (table 5). However, none of these gains were statistically significant.

Own calves tended to have greater gains from 4 to 6 months of age when they showed the highest rate of gain, whereas their rate of gain decreased from 6 to 8 months of age regardless of treatment or sex (table 3). The highest rate of gain for all adopted calves occurred from 6 to 8 months of

age regardless of treatment or sex (table 4). None of these differences were statistically significant.

The analyses of variance applied to average total gains of own calves, regardless of whether they were paired to a male or female adopted calf, showed no significant difference for either treatment I or II. The highest difference obtained (39.04 pounds) in treatment I was in favor of own males with adopted females as compared with own females with adopted females. The least difference obtained (7.78 pounds) favored own females with adopted males as compared with own females with adopted females. Three out of six comparisons made favored the combination of own male with adopted female, while two comparisons favored the combination of own male with an adopted male.

The analyses of variance applied to weight gains of adopted calves for treatment I showed no significant difference in the sex comparisons. In other words, weight gains of adopted calves were not affected by the sex or the own calf to which they were paired. The highest differences shown, 45.93, 41.45 and 28.19 pounds, favored the combination of an adopted male paired to a female own calf.

The analyses of variance for treatment II, where paired adopted and own calves were weaned at 8 months of age, showed no significant difference attributable to the sex of either calf of a pair. Two of the three largest differences shown for total weight gains of own calves (83.12 and 47.75 pounds) favored the combination of an own male calf and an adopted female.

Conversely, the analyses for total weight gains of adopted calves in treatment II showed no difference in favor of pairing own males with adopted females. The highest difference (20.13 pounds) favored the combination of own female with adopted male over that of own male with adopted female, and was followed closely (19.91 pounds) by the pairing of own female with adopted female over that of own male with adopted female.

Own calves outgained adopted calves in both treatments (table 7). Highly significant differences were found at birth, 4 and 6 months of age and a significant difference at 8 months. Some of the greater differences in average weight gains in favor of own calves may be the result of crosses between Holstein cows and Brahman bulls. These crossbred-calves outgained straight Holstein calves among all instances of own calves. At 8 months the average Brahman crossbred was heavier than the straight Holstein by an average of 109.47 pounds (512.83 vs. 403.36). The analyzed results show that adopted calves paired to own Brahman crossbreds averaged 242.83 pounds of gain at 8 months while adopted calves paired to own straight Holstein averaged 324.29 pounds at the same age. Comparative aggressive-



ness of the crossbred calves may be contributory to the weight differences observed in relation to adopted Holstein calves.

Adopted calves on treatment I, weaned at 4 months, were 11.95 pounds heavier (398.39 vs. 386.44) than those on treatment II, weaned at 8 months, but this difference was not significant. The heavier weight can be ascribed to the daily feeding of 4 pounds of concentrate per calf. This supplemental feeding undoubtedly gave them a better opportunity for greater gains over the adopted calves weaned at 8 months of age on milk and pasture, and additionally in not having to compete for food with a larger step-brother.

Each calf on supplemental feeding consumed 480 pounds of concentrate to put on the additional 11.95 pounds of body weight. If animals had been sold by weight at 8 months at \$28.80 per hundredweight on the hoof (\$18.00 per arroba)<sup>4</sup>, those on supplementary concentrate feeding would have been worth \$114.74 each, while those without supplementation would have been sold for \$111.29. The difference of only \$3.43 is not enough to pay for the feed consumed, not mentioning the additional expenses incurred in building special sheds and feed bunks, and in the extra labor required to care for these animals.

A total of 84 cows were used in this trial, 42 of which freshened at least twice. Average calving interval was 415.90 days between first and second calvings, 374.52 days between second and third, and 379.53 days between third and fourth, for an overall average calving interval of 395.24 days.

Nine cows that never freshened are comprised in the total of 23 that showed reproductive failures. Eighteen were eliminated because of udder problems or other physical unfitness for the experiment, or because of death. Only one cow was eliminated because she failed to adopt a second calf. The average number of days on trial for this group of cows was 326.54, with an average of 135.88 days that they remained idle during the time of the study.

These data show that cull dairy cows can satisfactorily rear both their own and an adopted calf to 8 months of age.

#### SUMMARY

A trial to determine the feasibility of using a cull dairy cow to rear her own calf and an additional adopted one was conducted at the Corozal Substation of the Agricultural Experiment Station, Mayagüez Campus, of the University of Puerto Rico. The data indicates these dairy culls can rear both calves satisfactorily to 8 months of age.

The two groups in the experiment were subjected to two different treatments: (I), weaning the adopted calf at 4 months of age and feeding 4

<sup>4</sup> An arroba is equal to 25 pounds.

pounds of concentrate, supplementary to grazing, for the subsequent 4 months while leaving their own calf with the dam until 8 months of age; and (II), nursing of the cow by both calves until weaning at 8 months of age.

The analysis of the data indicates no benefit from weaning calves at 4 months of age. Although the adopted calves weaned at 4 months of age were 11.95 pounds heavier at 8 months than those that continued to nurse their foster mother until 8 months of age, costs of concentrate feeding and extra labor requirements more than offset the extra weight gains.

The statistical analyses of the data for weight gains showed a significant difference in favor of own calves over adopted ones at all ages. The sex of calf had no effect on any of the weight gain comparisons. The rate of gain of the adopted as well as the own calves is presented.

There were no adoption problems. The average calving interval for cows that freshened at least two times was 395.24 days. Twenty three cows showed reproduction failures, nine of which never freshened.

#### RESUMEN

La Estación Experimental Agrícola del Recinto Universitario de Mayagüez llevó a cabo en la Subestación de Corozal un estudio para determinar si es posible que una vaca desechada de un hato lechero pueda criar un becerro adoptivo en adición al suyo. Los datos obtenidos indicaron que estas vacas pueden criar satisfactoriamente los dos becerros hasta los 8 meses de edad.

El experimento comprendió dos tratamientos: en el tratamiento I se destetó el becerro adoptivo a los 4 meses de edad, complementándose el pastoreo durante los 4 meses siguientes con 4 libras de alimento concentrado por día por animal. El becerro propio continuó con la madre hasta los 8 meses de edad. En el tratamiento II ambos becerros fueron criados por la madre hasta los 8 meses de edad.

El análisis estadístico de los datos obtenidos indicó que el destete del becerro adoptivo a los 4 meses no es ventajoso. Aunque al término de 8 meses para ambos casos estos becerros pesaron 11.95 libras más que los adoptivos que continuaron con la vaca nodriza durante igual período, el peso adicional no compensa los gastos adicionales incurridos en la compra de alimento, comederos y mano de obra requeridos por estos becerros.

A los 4, 6 y 8 meses de edad, las ganancias en peso de los becerros propios fueron significativamente superiores comparadas con las de los adoptivos. El peso al nacer también resultó significativamente superior a favor de los propios. El sexo del becerro no afectó las ganancias al hacerse las comparaciones pertinentes. Se presentan los datos de tasas de ganancia diaria tanto de los becerros propios como de los adoptivos.

No se experimentó dificultad alguna respecto de la adopción por parte de la vaca nodriza. El intervalo entre los partos en el caso de las vacas que parieron por lo menos dos veces fue de 395.24 días. Veintitrés de las vacas, nueve de las cuales nunca parieron, tuvieron problemas reproductivos.