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# **An overview of a CARDI livestock development project in Dominica**

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During 1985-86 CARDI introduced their "cut and carry" system to eight small farms in the Roseau Valley, Dominica. The purpose was to improve dairy production and train farmers and extension officers in better cattle management. After one year, all farmers had established elephant grass of which they were feeding lactating cattle up to 55 kg fresh weight daily. This was supplemented daily with a high phosphorus mineral and coconut meal plus legumes and crop wastes when available. Other improved practices included housing, artificial insemination, testing for mastitis, synchronized breeding, record keeping, correct milking practices and systematic use of acaricides and anthelmintics. These practices resulted in increases in lactation length from 170-175 days to 238 days and lactation yields from 525-613 litres to 952 litres. A 194 day decrease in calving interval was also recorded.

**Keywords:** Livestock production systems; Milk production; Dominica

## **Introduction**

The government of the Commonwealth of Dominica has given high priority to increasing local milk and beef production as one of their agricultural diversification strategies. This emphasis has been due to the inability of local production to satisfy demand, resulting in an increase in the cost of imported meat and dairy products from EC\$ 6.0 million in 1978 to EC\$ 10.5 million in 1984.

Local milk and beef production were valued at EC\$ 40,000 and EC\$ 680,000 respectively in 1978 (Archibald et al, 1981). These low levels have been attributed to a number of constraints including poor genetic stock, lack of improved forages, poor herd management, praedial larceny and losses due to stray dogs and strangulation (Henderson and Gomes, 1979; Harricharan et al 1980; Morley, 1983; Archibald et al 1981). In order to alleviate some of these constraints the Caribbean Agricultural Research and Development Institute (CARDI) introduced and tested an improved livestock management system for small farmers in Dominica. This work began in 1983 under the aegis of the CARDI/USAID Farming Systems Research and Development Project.

The livestock management system was based on a cut and carry (zero grazing) feeding system and integrated management of herd, forage, housing, water collection and distribution. Robin and Clarke (1985) showed that as a result of the improved system, milk production increased, collection and distribution of pen manure was easier, labour use decreased and losses of animals through larceny, wild dogs or strangulations were reduced. Based on these successes the improved technology was transferred to dairy farmers of the Roseau Valley

through a project financed by the Canadian International Development Agency (CIDA). The objectives of the project were:

- to train the farmers in better cattle management practices.
- to increase milk production per lactation from 400 to 500 litres.
- to increase the lactation period from 150-175 days to 200-210 days.
- to improve the genetic make-up of the native cattle with the introduction of improved bulls.
- to increase herd size of the selected farmers.
- to train staff of the Ministry of Agriculture in small dairying practices.
- to improve the general health of the cattle through regular deworming and spraying to control internal and external parasites.

This paper summarizes these activities and compares the farmers before and after the improved system was implemented.

### Methodology

Eight farmers in the Roseau Valley were selected to take part in the project, following a review of farm profile data of 60 farmers. The farms were located at Trafalgar, Morne Prosper, Black and Fond Cani which are 3 - 10 km from Roseau, the capital. The areas were 120 m to 450 m above sea level, with mean minimum and maximum temperatures of 21°C and 32°C respectively. Other characteristics of the areas are slopes of 20 to 60 degrees with moderate to high erosion and mean annual rainfall of 2,000 mm to 4,000 mm. The soils were alluvials and oxisols with good drainage and water-holding characteristics.

The first activity of the project was the initial characterization of the dairy operations of each farm with respect to milking methods, herd management, labour input, levels of production, breeding and selection, feeding and watering practices and income and expenses. Collection of such data continued throughout the project, and provided a basis upon which it could be evaluated.

Project personnel visited each farm weekly and advised on, and assisted in the implementation of improved dairy management practices. The veterinary unit of the Ministry of Agriculture provided assistance with animal health matters. Two field days and a workshop were organized in which project farmers, extension officers, and other farmers in the Roseau Valley participated.

Pure stands of elephant grass (*Pennisetum purpureum*) were established on all eight farms. Stem cuttings were planted at a spacing of 0.3m by 0.3m. NPK fertilizer (16:8:24) was applied at 200 kg/ha one month after planting and top dressings of NPK 20-0-20, urea and triple super-phosphate were subsequently applied.

Demonstration plots of the forage legumes Stylo (*Stylosanthes hamata*), Glycine (*Neonotonia wightii*), Siratro (*Macroptilium atropurpureum*) Leucaena (*Leucaena leucocephala*) and Desmodium (*Desmodium intortum*) were established on one of the farms.

Feeding, watering and water storage, resting, exercise, milking and general storage facilities for three cows and two calves were established on each of the four farms. Housing units of free stall,

or tie stall design were constructed of roundwood, and the exercise areas were fenced with live *Gliricidia* (*Gliricidia sepium*) poses. The farmers actively participated in the design and construction of the housing units and the Ministry of Agriculture assisted financially.

Three pure bred yearling bulls, one Holstein, and two Jamaica Red Polls were imported from Barbados, and located at the Ministry of Agriculture central stock farm for acclimatization. Interim breeding services were provided by a local Jersey bull and by artificial insemination using imported semen.

In addition to the training and service components, the project provided a variety of inputs including coconut meal, high phosphorous mineral supplements, anthelmintics, fertilizer, herbicide, breeding calendars, milk scales, neck chains and tags.

## Farm status prior to project

### Reproduction and breeding

At the start of the project, individual herd sizes ranged from four to eleven, with an overall total of 43 animals. The average length of the open period was 335 days, resulting in an extended calving interval and contributing to a shortage of potential herd replacements. Data on herd composition (Table 1) showed that only one herd had a 2 - 3 year old heifer, and four herds had heifers aged between 12 and 24 months. The average age at first calving was 39 months and the majority of the cows were over 68 months old but had borne three calves or less.

Table 1 Herd composition by age and sex on 7 project farms at January 1986

Farm No.	1		2		3		4		5		6		7	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Birth to 12 months	2	0	4	0	0	1	0	1	2	1	3	2	1	1
12-24 mths	0	1	0	2	1	0	0	0	2	0	2	2	0	2
24-36 mths	0	0	0	0	0	1	0	0	0	0	0	0	1	0
> 36 mths	0	3	0	4	0	2	0	2	0	3	0	6	0	3
Total	6		10		5		3		8		15		8	

The low breeding efficiency may be attributed in part to a belief expressed by the farmers that cows had to 'rest' for at least 100 days after calving, and also to a reliance on secondary heat signs, the absence of pregnancy testing and the occasional lack of available sires.

All the above factors, together with the high cost and scarcity of heifers on the open market, led to a shortage of replacement females. This scarcity made it impossible to do any selection based on milk yield, while the use of scrub or creole bulls reduced the possibility of improving the genetic stock.

Calves were born and consumed colostrum without any assistance. The farmers did not place iodine on the navel, dehorn, remove extra teats, or castrate bull calves. Generally, calves and their dams were kept together continuously for seven to nine days before milking commenced. Most farmers allowed calves to suckle both during and after milking and the udders were not stripped.

### **Milking practices and lactation**

Little attention was paid to sanitation. The udders were washed with cold rain water, which appeared to distress the cows and may have affected the let down reflex. Teat dipping was not practiced. Mastitis was identified, but the farmers were not familiar with its diagnosis and its incidence was not quantified. The average length of lactation was 150-175 days and milk production ranged from 525 to 615 litres per cow per lactation.

### **Marketing**

Five farmers sold more than 50 percent of the milk produced, 8 to 18 percent was used in the home, and the remainder was consumed by the calves. The milk was sold in 750 ml 'whiskey' bottles at a price of EC\$ 1.67 to EC\$ 2.00 per litre. The primary constraints to marketing were the identification of regular customers, and the distribution of milk.

### **Nutrition**

The majority of farmers grazed their animals for limited periods, approximately four hours per day, three days per week, and the animals were usually tethered on natural pastures or along the roadside. Zero grazing was occasionally practiced in the dry season. Variable quantities of coconut meal, mineral mix and trace mineral salt were fed to the animals. Only one farmer supplied mineral mix to lactating cows.

The farmers provided water free-choice or periodically. Only one farmer with a stored supply consistently watered lactating cattle free-choice. For periodic watering, the animals were supplied once or twice per day depending on the weather, and were usually taken to water.

### **Main project achievements**

The major achievements are summarized in Table 2. During the one year project period, the total number of animals increased to 55, with an individual herd size of three to fifteen animals. The calving interval was reduced by decreasing open days and lactation length and average milk production were both increased.

Project farmers were introduced to improved milking practices, and were taught the diagnosis of mastitis. Locally manufactured strip cups were provided in order to facilitate mastitis testing. The farmers were assisted in developing a strategy for marketing their milk, and the Roseau Valley Dairy Association was formed. The calving interval was reduced, and the genetic merit improved, by the use of a Jersey bull provided by the Ministry of Agriculture, and an artificial insemination programme based on imported Holstein and Jersey semen.

The nutritional status of the animals was improved by the establishment of a cut-and-carry system utilizing the introduced forages. The system allowed an increased intake of better quality forage (up to 55 kg per day), while reducing labour input by decreasing the number of cattle grazed and tethered. Four of the farmers cut and fed Elephant grass periodically to all their cattle but used it primarily as a dry season forage bank. Two fed *ad lib* to lactating cows and calves and one farmer fed Elephant grass *ad lib* to all his cows.

**Table 2** Summary of major project achievements

	Pre-Project	Post-Intervention
Total number of cattle on 7 farms	43	55
Average number of days open	335	141
Average calving interval (days)	502	421 <sup>1)</sup>
Services	100% Creole	58% Creole 26% improved 16% A.I.
Days dry	340	87
Average length of lactation (days)	150 - 175	238
Planted pasture (ha)	0	1.82
Milk production per cow per lactation (litres)	525 - 613	952

1) Projected, based on breeding dates

During the project the farmers began feeding from 0.9 to 2.8 kg of coconut meal plus 85 g of the introduced high phosphorus mineral supplement per day to lactating cattle. Also six of the farmers fed coconut meal and trace mineral salt to their calves. Consequently, the Ministry of Agriculture has made the high phosphorus mineral supplement available to all interested farmers.

The free-stall and tie-stall units introduced, incorporated a storage tank made up of four recycled 248 litre oil drums welded together end to end, which collected water from the roof. As a result, more farmers provided water free-choice and thus increased the frequency of watering. In addition, these units facilitated better animal security, easier collection of manure, improved sanitation and faster acceptance and implementation of other components of the introduced technology.

## Economic Analysis

A comparative economic analysis of the milk production system before and after adoption is presented in Table 3. Before adopting the improved system, returns were EC\$ 912 per year, material units were zero and labour costs were EC\$ 2,691. Thus returns were negative (-\$1,779). After adoption of the technology, the farmers milked up to four cows and the amount of milk produced per cow increased. Total returns increased to EC\$ 4,863 per year while total costs were EC\$ 2,838, providing net returns of EC\$ 2,025 or EC\$ 506 per cow per year. Table 4 shows establishment costs for the improved system.

**Table 3** Annual costs and returns (EC\$) for milk production before and after adoption of the Improved Livestock Management System

Budget Element	Before Adoption	After Adoption
Milk Revenue <sup>1)</sup>	912	4,863
Operating Costs (Materials)		
Concentrate	-	408
Vet. medicine	-	-
Salt Lick	-	20
Fertilizer	-	148
Repair and Maintenance	-	12
Total material costs	-	588
Labour <sup>2)</sup>		
Cutting forage and feeding	-	797
Tethering, grazing and watering	2,578	-
Milking	113	638
Cleaning pens	-	239
Repairs and maintenance	-	40
Total labour costs	2,691	1,714
Total operating costs	2,691	2,302
Capital cost per year	-	536
Total costs	2,691	2,838
Net returns	(1,779)	2,025
Total cost per animal per year	2,691	710
Net returns per animal per year	(1,779)	506

1) Returns from milk at \$1.67 per litre.

2) All labour costed at \$2.50 per hour.



**Table 4 Costs (EC\$) of establishment of pen, watering system and forage plot**

Item	Costs
Building <sup>1)</sup>	
Materials	1,029
Labour <sup>2)</sup>	618
Total building costs	<u>1,647</u>
Watering system	
Materials	110
Labour	82
Total watering system costs	<u>192</u>
Forage Plot	
Materials	114
Labour	726
Total Forage Plot costs	<u>840</u>
Total Capital costs	2,679
Capital cost per animal per year <sup>3)</sup>	134
Material cost per animal per year	63
Labour cost per animal per year	71

- 1) Building includes exercise area. 2) Labour costed at \$2.50/hour.  
 3) Assuming a life of five years.

### Conclusions

A number of constraints continue to limit production on the project farms. These include the following:

- (1) absence of marketing channels and infrastructural facilities to get milk from the farm to the consumer.
- (2) lack of available animal replacements at reasonable prices.
- (3) inadequate technical support from the extension services.
- (4) reliance on natural pastures of low productivity and nutritional value for feeding calves over six months of age and growing and dry animals.
- (5) farmer reluctance to adopt all components of the 'Livestock Management System'.
- (6) limited availability of land.
- (7) limited credit facilities and the need for collateral of the kinds requested.
- (8) inability to obtain dairy farm supplies.

Despite these limitations, the objectives of the project were satisfied, and its success is evidenced by the request of the Government of Dominica to establish a similar scheme in the Soufriere area.

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