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AN INTERIM ECONOMIC APPRAISAL OF THE NEW MEDIUM-SIZED DAIRY FARM PROJECT IN JAMAICA

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INTRODUCTION

A. Objective

The objective of this paper is two-fold. It seeks:

- (a) to explain the planning and implementation of the project for new medium-sized dairy farms in Jamaica; and
- (b) to make an interim economic assessment of the progress of the first 17 farmers settled.

Section I of the paper discusses the actual planning and implementation of the project. Section II examines the performance of the 17 Rhymesbury farms and includes information on:

- (a) factors which have limited progress;
- (b) individual performance of operators; and
- (c) average performance of operators compared with that projected during the project-formulation stage.

B. Background

In Jamaica there appears to be considerable potential for development of the dairy industry. However, improvements made possible by research findings have not been transformed into expansion,

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owing to limitations of one form or another. Consequently, in 1963 Government placed a high priority on the expansion of the dairy industry and outlined a two-fold Dairy Development Programme designed:

- (a) to improve husbandry practices, and to expand production and increase productivity on existing dairy farms, by rehabilitating pastures and extending the establishment of improved pastures and providing other necessary facilities; and
- (b) to establish a corps of new dairy-men on medium-sized dairy farms set up on lands acquired by Government under its Land Reform Programme.

This paper focusses attention on the establishment of new farms.

A programme for the development of new dairy farms was formulated by local technicians in the then Ministry of Agriculture and Lands and was eventually accepted as a project acceptable for financing by the United States Agency for International Development (US/A.I.D.). It was proposed to establish pastures and equip each farm with a dwelling house, dairy buildings, milking and irrigation equipment and dairy cows (ready to milk) or in-calf heifers. Average cost of farms was J\$ 22,000.^a

A most important feature of the project was that new farmers should comprise carefully selected applicants who would be subjected to one year's training in dairy science and husbandry practices and, thereafter, were required to pass a comprehensive examination set in the various courses given. Repayment was planned to be spread over a period of 25 years on a leasehold-cum freehold basis. However, it was stipulated that farmers could not have complete ownership until after the 15th year. Special emphasis would be placed on the marketing of milk.

^aJ\$ = 10/- sterling = 84¢ U.S. = \$2.40¢ B.W.I.

SECTION I

PLANNING AND IMPLEMENTING THE PROJECT

A multi-disciplinary approach was adopted for the planning and implementation of the project. The

following agencies of the former Ministry of Agriculture and Lands were assigned specific functions:

- (a) Livestock Development Division;
- (b) Agricultural Planning Unit;
- (c) Agricultural Engineering Division;
- (d) Agricultural Credit Board;
- (e) Agricultural Development Corporation

Feasibility studies were conducted jointly by the Agricultural Planning Unit and the Livestock Division and it was determined that an average farm size of about 25 acres was required if the project was to prove attractive in terms of its income-generating potential.

Two training centres each with a demonstration dairy farm with residential accommodation for a total of 60 trainees were set up in areas which showed promise of becoming major dairy producing regions. Each centre was organized into a main commercial unit milking about 130 cows daily, and a medium-sized unit (stimulating the prospective allottee's farm) milking 20-25 cows per day. Trainees were required to perform all operations on these farms. Each farmer would receive a farm of average size of about 25 acres. Of this, 2 acres would be used for the farm house, farm buildings and a holding yard for cattle, while at the same time leaving space for accommodating supplementary enterprises such as vegetables, food crops and poultry. Each farmer was entitled to 1 animal unit per acre, thus the maximum number of cows any farmer received under the scheme was 23.

The Criteria for selection of participants in the training course were:

- (a) Age: 18 - 30 years;
- (b) a previous education ranging from the 3 year Diploma of the Jamaica School of Agriculture to a sound basic primary education; and

- (c) suitable experience and background in agriculture.

A heifer-rearing project was tied in with the training programme and under this project which was administered by the Agricultural Development Corporation 1,000 heifers were acquired and reared annually for allotment to farmers. The breeds of dairy animals were Jamaica Hopes and Holstein-Freisians.

In March 1968 settlement of the first 17 farmers began at Rhymesbury. This property situated on the Vere Plains on the southern side of the island was the site for the first 30 farms. The region is served by the Mid-Clarendon Irrigation Scheme and is characterised by heavy soils, a mean annual rainfall of 40"-50" and temperatures ranging from 66-87° F.

The allocation of farms to trainees was based on the overall performance of individual trainees during the period of training. Selection for settlement on farms depended on aptitude, interest, and performance during the training period.

The advisory and development staff of the Livestock Development Division had the responsibility for guiding these farmers through their early periods of establishment and particularly in bringing to light any problems affecting farmers. For this purpose a resident livestock officer was attached to the Rhymesbury Scheme.

As settlement began the Rhymesfield Co-operative was initiated with the joint assistance of the Ministry of Agriculture and Fisheries (MAF), which was created from the former Ministry of Agriculture and Lands, and of the US/A.I.D. In addition, arrangements were made by MAF to provide specific facilities for artificial insemination and veterinary services in the area, to accommodate the project.

SECTION II

ECONOMIC APPRAISAL

A. Methodology

It was realised from the outset that constant evaluation and assessment were necessary to ensure the success of this project and that necessary records would have to be provided by farmers to facilitate this end. To achieve this, two methods of approach appeared practicable:

- (a) promotion of a rigid system of record-keeping (revenue and expense accounts, daily milk records) and an analysis of these at the end of the year would provide the basis of appraisal; and
- (b) conduct of one-day checks on production, costs and returns.

Method (a) has the following advantages:

- (i) it eliminates bias since the farmer's operation is examined as a whole entity at the end of the year;
- (ii) it encourages good record-keeping thereby facilitating assistance from Farm Management specialists.

However, in view of the fact that this method tends to be time-consuming and requires a great deal of supervision it was decided to guide farmers in keeping daily records and to request the Agricultural Planning Unit to carry out one-day checks on production costs and returns on a monthly basis. Method (b) has the following advantages:

- (i) ease of data collection. Only a few questions need be asked and since they are based chiefly on the current day's situation, they can be answered quickly and accurately. In view of the shortage of supervisory personnel this factor was of great importance.

Intermediate checks made during the periods prescribed for these one-day checks helped to ensure that proper records were being kept and that the farmers themselves were using their records as a means of doing some assessment of progress on their own;

- (ii) it serves as a management extension tool. Information was collected from the farmers and was analysed and returned to them quickly in a manner which enabled them to see their individual performance relative to their neighbours' at a particular time. This introduced an aspect of competitive learning, which promoted desirable changes; and
- (iii) it gives a moving picture of conditions on the farm over the year, allowing a more thorough assessment of performance.

It should be pointed out, however, that if not carefully used, this method could introduce bias. Because of this, care was taken to collect information on a normal day's operation during each month. On the check-day, which was always during the first week of the month, each farm was visited and information was collected on that day's costs and returns. The following data were collected:

- (a) the day's total milk production (obtained from daily milk records);
- (b) the total number of cows, milking and dry;

- (c) the quantity of concentrates fed to cows for the day;
- (d) the day's total labour costs;
- (d) milk price (previous fortnight's for those selling to the condensery);
- (f) current problems affecting the farm - e.g. cows bred and difficulties in settling them.

In this section of the paper it is proposed to use data collected from one-day checks on production costs and returns for the period February - September, 1969, as a basis for:

- (a) defining the constraints which hampered performance;
- (b) assessing the individual performance of operators; and
- (c) comparing the actual performance of the average farm with the projections made during the formulative stages of the project.

B. Constraints

Performance was handicapped by a number of factors. Therefore, an assessment of progress is meaningless without reference to factors which caused a slower take-off than anticipated in the formulated project and also those which affected progress once farmers had been settled. Some of these were due to local conditions while others were due to additional constraints imposed by the U.S./A.I.D. The following are some of the more important factors which limited progress:

- (a) the lag between training and settlement, (3 years) which arose largely from teething problems, administrative difficulties, problems in meeting a number of limitations set by the US/A.I.D. itself and some of the usual effects which are associated with multi-disciplinary projects which are not under the control of a project manager. A project Co-ordinator was appointed, but the post has changed hands continuously and even with the best intentions a project co-ordinator and a project manager do not perform the same functions. However, the non-provision of a project manager must be viewed within the context of available staff;
- (b) problems associated with the delay in the provision of a domestic water supply, which not only limited the availability of water for the animals, but prevented the sanitary production of milk. Indeed, an

outlet on the fluid milk market is claimed to have been lost as a result of this. These problems arose largely due to inability to obtain adequately trained staff for which provision was made in the estimates;

- (c) absenteeism was a definite problem at the beginning, but by the middle of the period under review all operators were resident on the farms. Of the 17 farmers being assessed, 11 were full-time operators while 6 had other forms of employment;
- (d) prior to the full establishment of irrigation facilities, pasture establishment on some farms was handicapped by low rainfall and this in turn affected the time when farms could be handed over to operators;
- (e) fertility problems, especially among Holsteins, severely affected the net returns to some operators e.g. Operators E, C and O, Fig. III;
- (f) irrigation failure was perhaps one of the most frustrating experiences. This occurred during the drought, between the months of July and August. Data collected during the month of August revealed that on the average farm, yield per cow had fallen by 15% below that of the previous month;
- (g) poor drainage plagued some farms during the rainy season. Swampy lanes restricted the movements of animals and made sanitary milking very difficult. Indeed, marked decreases in milk yields were obtained by farmers during these periods. Another consequence of poor drainage was liver-fluke infestation. Operator D's performance was severely affected by this problem;
- (h) the original proposals and the resulting projections excluded the employment of hired labour, since the development of a "family farm" was envisaged. The fact is, that although 10 of the 17 farmers were married, some wives were employed off the farm. The farm children were also mostly in the infant stage and this hindered even those wives who were on the farm from sharing fully in the farm-activities. Consequently, all operators generally employed one full-time hired man.

The most important consideration in an evaluation or assessment of this nature is to attempt to pin-point areas of weakness and use these as

a basis both for extending this project and for improving the planning of other projects. This has been the case with the Jamaican experience in which critical analysis of phasing and implementation have helped considerably in proposals for extending the project.

C. Individual Assessments

In this location all farms have very similar physical conditions. Nevertheless, there was a very marked variation in the performance of individual operators. This variation is largely a consequence of differences in standards of management. In discussing levels of performance, therefore, an attempt will be made to highlight these variations and to discuss their causes.

(a) Net Returns and Profitability

The ranking of individual operators which was based on net returns showed considerable variation from month to month (Table I). Nevertheless, some

TABLE I. RANKING OF FARMERS BY PERFORMANCE - RHYMESBURY
FEBRUARY - SEPTEMBER, 1969

Operator	Feb.	March	April	May	June	July	August	Sept.
A	13	8	8	10	6	9	13	15
B	17	15	10	8	2	6	7	12
C	6	11	13	4	9	17	16	16
D	14	13	7	13	1	1	9	6
E	10	16	14	15	17	10	17	17
F	1	2	2	2	4	5	5	1
G	15	17	16	17	16	16	3	8
H	11	14	12	9	3	3	12	7
I	8	10	17	16	11	13	15	13
J	4	6	4	3	12	7	2	9
K	2	3	1	1	10	2	1	2
L	5	9	3	5	8	4	6	3
M	16	12	11	14	14	15	10	14
O	3	5	5	6	5	14	11	4
P	12	1	15	7	15	11	8	5
Q	7	4	9	11	7	12	14	11
R	9	7	6	12	13	8	4	10

farmers e.g. F, J, K and L ranked consistently high while others e.g. E and M ranked consistently low. The monthly variation in the ranking of individual operators is explained by their vulnerability to changing conditions. Operator P's ranking, for example, during the months of February to April is illustrative of the sensitivity of performance to

changing circumstances. In the month of February he ranked 12th, largely because he earned the lowest milk price. In March his movement to first place is explained by a switch to the more lucrative fluid milk market, accompanied by an increase of 2 lb. in daily yield per cow over that of the previous month. His movement down to 15th position in April is attributed to a 53% drop in yield per cow below that of the previous month. This resulted from the deterioration of pastures, caused by the delay in installation of irrigation equipment.

While further examples could be taken from the performance of other farms to illustrate the effects of both external and internal circumstances upon profits, such a general approach cannot pinpoint the causes of variation as accurately as an examination of the individual components of net incomes.

(i) Components of Costs

Fig. I shows the total costs and the components of these costs which individual operators incurred in producing a pound of milk. In the average situation, feed costs amounted to 55%, labour cost 35% and capital cost 10% of total costs. Labour costs varied per cow from 9¢ to 17¢ per operator for those farms, and capital cost ranged from 3¢ to 6¢ per cow. The under-utilization of labour and capital caused these variations and changed with the fuller stocking of farms as pastures improved. It appears that the more reasonable approach to affecting savings both in capital and labour costs lies in increasing the stocking rate to the optimum for this size-group of farms. (The estimated cost per quart of producing milk when the herd became stabilized at about 9-10 years was 7¢ taking into consideration sale of calves and heifers).

An important item of costs is concentrates. The rate of feeding concentrates varied widely from 2.3 lb. to 7 lbs. per cow per day (Table II). Fig. II reveals a positive relationship between the rate of concentrate feeding and mean net returns per cow. This suggests that within this range it is advisable to increase the rate of concentrate feeding to at least 7 lbs. It is possible that still further increases in feeding of concentrates might be profitable.

(ii) Components of Returns

As illustrated by Fig. III net returns were influenced by production factors including the number of cows per farm, the percentage of dry cows, and the average daily yield per cow (milking).

The mean total number of cows per farm ranged from 15 to 24 (Fig. IIe) and the mean percentage dry cows varied from 13 to 36% (Fig. IId) per farm. Eleven of the 17 farms had averages of more than 20% dry cows. Mean total monthly output of milk

TABLE II. MEAN CONCENTRATES FED PER COW PER DAY PER OPERATOR

Code	Mean Concentrates per Cow per day (lb).
A	3.1
B	2.3
C	4.2
D	6.2
E	5.0
F	7.0
G	3.5
H	4.9
I	4.6
J	4.7
K	5.4
L	5.8
M	3.5
O	5.0
P	5.0
Q	4.4
R	4.2
	4.7

ranged from 4, 100 to 12, 800 (Fig. IIc). Mean daily yields per cow (milking) showed marked variation ranging from 15 to 23 lb or 6-9 quarts (Fig. IIb).

It is observed that those operators with a larger number of cows, a lower percentage dry cows and higher daily yields per cow earned higher net returns. The effect of each of these factors on net returns may be illustrated by the following examples. Operator E's very low margin of \$17 per month is caused jointly by the small size of his operation (15 cows) and his very high mean percentage of dry cows (36%). Similarly, operator M's relatively low margin (\$38) per month results largely from very low milk yields (15 lb. per cow per day). Operators F and K enjoy the highest margins and they are among those operators with a larger number of cows. They also had satisfactory levels of percentage dry cows and enjoyed higher daily per-cow yields than other operators.

There was not much variation in prices. Mean prices ranged from 3.6 - 4.2¢ per lb. (Fig. IV). Nevertheless, the range in prices was large enough to permit a near doubling of profits between farmers obtaining lower prices and those obtaining higher prices taking into consideration quantities of milk produced. Fourteen of the 17 farmers sold milk only to the condensery while 3 shared in both the fluid milk and the condensery market.

D. Projected Versus Actual Average Performance

Since the feasibility study projected the year to year performance of the average operator, an evaluation of progress necessarily demands a comparison of the actual and predicted performance, assuming, of course, that the predictions were soundly based. As the period under review covers part of the first and second year's operation, the average predicted performance for those years ($\frac{\text{yr. 1} + \text{yr. 2}}{2}$) on a monthly basis will be

compared with the actual performance. To this end, the items of projected and actual performance presented in Table III will be discussed.

TABLE III.

Items	Projected	Actual
Size of farm	25 acres	23.5 acres
Number of cows per farm	23	21
% of dry cows (monthly)	20	24
Daily milk yield per cow in milk (monthly)	20.8 lb. (8 qrt.)	19 lb (7.3 qrt.)
Milk price per qrt. (Imperial)	10¢	10¢
Operational Cost per month	\$213	\$210
Gross Revenue from milk less operational costs per month	\$157	\$134

It is observed that in the actual situation the average farm is 1.5 acres smaller and has 2.0 cows less than that projected. It exceeds the predicted percentage dry cows by 4% and its average daily milk yield per cow is 1.8 lb less than that of the projections. In looking at prices, we find that the actual price equals that projected. The actual mean monthly prices, as illustrated in Fig. V falls between the condensery total possible price and the standard condensery price, and the seasonal trend is somewhat similar to those two prices. This suggests that performance in terms of prices earned from the condensery was quite good.

Actual gross monthly revenue from milk, less operational costs was \$23 less than that predicted. However, had the average farm carried the same number of cows as that projected. (this is correlated with pasture conditions and other factors), and if management has approximated that assumed in the projections, actual gross monthly revenue from milk less operational costs would be at least \$146 (\$11 less than that projected).

Fig. VI illustrates that actual mean gross monthly revenue from milk, less operational costs, exceeds that projected for year 1 but falls slightly below the average of years 1 and 2. The curve

describing monthly gross revenue from milk less operational costs, shows marked decreases in the months of May and August. This is explained by the fact that the rains in April to May resulted in reduced milk yields during that period owing to muddy conditions which restricted the movement and grazing of animals. The failure of the irrigation system between July and August caused a sharp reduction in milk production and this explains the decrease in gross revenue at this time. Another factor which forced yields downwards was the removal of subsidies for livestock except pigs, which led to a reduction in the amount of grain fed to cows and a consequent reduction in milk yields.

Our discussions have shown that in spite of the constraints, actual average performance has compared very favourably with the predicted performance. Based on the projections, the financial rate of return to capital investment would be 23%. While it is not possible at this point in time, to arrive at the actual rate of return to capital, it seems reasonable to expect that in the years ahead it will follow closely to that projected.

In this as with most cattle projects the balance available to the farmer i. e. the difference between revenue and expenditure is low during the first few years due to heavy capitalization. In order to counter this situation and to ensure that farmers obtained a reasonable level of income, a phased repayment schedule was instituted which enabled farmers to obtain a net income of \$1400 during the 1st year and which gradually increased in subsequent years. This was achieved by a moratorium on repayment of certain capital items during the first five years of the project. In addition, farmers did not begin to make any repayment during the early months of settlement due to the incomplete provision of certain capital assets. It was predicted that the herd would become stabilized at about the 9th to 10th year and on the basis of actual performance it is likely that these targets will be met.

Performance of farmers was carefully watched, particularly in relation to certain conditions of the project which permit the dispossession of a farmer who is operating on a sub-standard basis. In this sense it was regarded as essential that all farmers would be resident on their farms.

SUMMARY AND CONCLUSION

The Jamaican experience has shown that careful planning is the hallmark of success of a project of this nature. To this end there was full recognition of the need for a multi-disciplinary approach which would accommodate:

- (a) careful selection and training of prospective dairy-men;

- (b) determination of size of enterprise which has an income-earning potential which would prove attractive to the most probable operators of these farms;
- (c) provision of services e.g. artificial insemination and veterinary;
- (d) adequate supervision, particularly in husbandry practices;
- (e) promotion of adequate marketing arrangements including Dairy Co-operatives;
- (f) proper phasing of repayment schedules; and
- (g) continuous assessment of progress.

Individual performance showed marked variation. The number of cows per farm varied from 15-24, depending partly on the rate of pasture establishment. The percentage of dry cows ranged from 13% - 36%.

The rate of concentrate feeding varied from 2.3 - 7 lb. per day. There was a positive correlation between the rate of concentrate feeding and net returns; and it appears that given certain conditions feeding of concentrates up to at least 7 lb. proves to be economical.

Gross monthly revenue from milk, less operational costs ranged from \$17 - \$183. Net return per farm was illustrated to have a positive relationship with the number of cows.

In comparing actual and projected performance, the actual average farm was 1.5 acres smaller and had 2 cows less than the projected average farm. In the actual average situation daily milk yield per cow was 1.8 lb. less; mean % of dry cows was 4% more; and mean gross monthly revenue - less operational costs was \$23 less than that projected.

As far as the present project is concerned, data brought together in this report show that there is considerable scope for an expansion both of production and net returns on most farms. The gap between the least successful and the most successful operator is large; and even on the best of farms there is scope for improvement. The constant watchfulness of the resident Livestock Officer will help considerably in this direction. Operators who fail to perform satisfactorily are likely to have their farms taken away and in turn receive compensations for any improvements made by them.

Sensitivity analyses carried out on variations listed above indicate that on the whole the project

is an economically sound one. With the passage of time and the improvement of husbandry practices these variations are likely to diminish in scope. It is apparent that some farmers will be able to stabilize their herds on schedule, while others who are having fertility and other problems may take a longer time. These variations in performances pin-point the necessity for not being over-optimistic in formulating the project.

The main areas in which this over-optimism could arise are:

- (a) carrying capacity of the farm;
- (b) number of cows being milked;
- (c) calving rate;
- (d) average daily yield of milk;
- (e) variations in costs of inputs;
- (f) level of management and degree of acceptance of recommended practices; and
- (g) variations in milk process, depending on market outlets.

The most difficult period of adjustment was during the initial stages and this has been overcome. In spite of the many difficulties which obtained at the outset, the average level of performance attained compared very favourably with that projected. These farms have the capacity to generate adequate incomes and to increase the national output of milk. In view of this and of the lessons learnt in the administration of this project, and initiating new ones on a more successful basis.

APPENDIX

Grazing Cost

The determination of grazing cost has, presented some problems. As farmers had not reached their full stocking rate it was not possible to arrive at an accurate determination of grazing cost and hence an arbitrary estimate has been used for all farms.

Labour Cost

This includes the cost of hired labour plus the imputed value of the operator's labour, exclusive of charges for his managerial functions.

Capital Cost

The capital cost of farms, including land, varied. Originally some items of capital cost for individual farms were imprecise and so a standardized average cost situation was used. Capital