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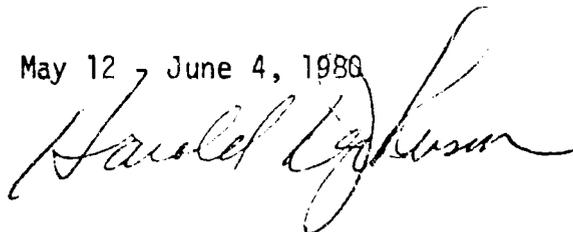
PROJECT: Food and Nutrition - Dairy Development

PROJECT NO: 504-0000

CONTRACT NO: AID/LAC-C-1391

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SUBCONTACTS MADE:

- Orientation, Dwight Steen and Cecil McFarland.
- Richard Lewartowski, E.E.C. Representative/Economic Advisor.
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- Noel Holder, James Smith, Steve Surujbally, LIDCO.
- Victor Nemdharie and Staff, Agricultural Bank.
- Dr. Patrick McKenzie, MOA.
- Henry Cameron, Ministry of Cooperatives.
- Hubert Knight, LIDCO.
- Irwin Telfer, MOA.
- Evan W. Bolle-Jones, FAO Representative, Guyana.

STATIONS, FACILITIES AND AREAS VISITED:

- Moblissa Dairy Farm.
- Farmer of Moblissa Cooperative.
- Intermediate Savannah near Ebini.
- Ministry of Agriculture, Extension and Veterinary Division.
- Kabawer Ranch, Mgr. Dhamiram.
- Abary River Milk Collector and Barge Trip down River.
- Milk Collection Centers at Mahaicony and Mahaica.
- Georgetown Milk Plant.

- Mara Ranch and East Bank Berbice.
- New Amsterdam Coastal Area.
- Mon Repos, MOA.
- East Bank Farmers, MOA.
- Georgetown Farmers, MOA, Ag. Bank.
- West Coast/West Bank Farmers.
- Copra Factory.
- Guyana Feed Mill.
- Mon Repos Agricultural College.

PURPOSES OF CONTRACT:

To design an appropriate Small Dairy Farmer Management System following the review of the following:

- I. General introductory observations and Present Methods of Dairying.
- II. Description of Dairy Areas Visited.
- III. Climate of Guyana.
- IV. Breeds of Cattle.
- V. Pastures, Nutrition and Feeding.
- VI. Milking, Milk Handling and Milk Collection.
- VII. Marketing of Milk and Economics.
- VIII. Educational Program and Services to the Dairy Farmer and Industry.
- IX. Nation's Dairy Development Program and Discussions with GOG, MOA and LIDCO Personnel.
- X. Design of an appropriate Small Dairy Farmer Management System.

I. GENERAL OBSERVATIONS, INTRODUCTIONS AND PRESENT METHODS OF DAIRYING

Dairying is a complex industry and each component of the complex is critical to the success of a dairy farmer. The major components are climate, soil, land tenure, pastures, feed concentrates, cattle, education, financing, equipment, veterinary health and A.I. (artificial insemination) services, governmental support for the farmer, milk collection and markets for sale of meat and milk. Any of these components, if limiting, can affect the success and livelihood of the small dairy farmer.

Dairy farming in an equatorial tropical climate has some advantages such as minimal shelter requirements, year-round grazing, adequate water, etc., however, there are many limitations facing Guyanese farmers which are not experienced by small dairy farmers in temperate climates. A major limiting factor to high milk production in Guyana is the climate. The year-round high temperatures and humidity are above the comfort zone for high producing cattle from temperate zones of the world. The average THI (temperature-humidity-index) is 75 to 76 which is three units above the desirable THI conditions (see Figure 1).

Imported animals react to this climate by becoming hyperthermic, eat less and stay in the shade or pond to keep cool. The result is slower maturity, smaller size, drastically reduced milk production and fertility problems. To overcome this, crosses of the native creole cattle with imported Holstein semen is planned. The percentage of imported Holstein to creole blood which is recommended depends on the limitations of other environmental factors. The principal environmental factors are quality of pastures, prevalence of cattle diseases, availability of protein concentrates and the level of management skills of the dairy farmers. Tropical pastures are low in protein, concentrates are expensive and difficult for farmers to get, and the supplies and services of veterinarians to readily cope with disease control are limited. Also the facilities and experience of farmers to get acceptable quality milk to the consumer is beset with problems as in most developing countries.

Guyanese dairy farmers have initiative, desire and family labor to milk cows and native cattle have demonstrated remarkable ability to adapt and survive in the water pastures. A long-range goal is to combine the superior adaptability to the tropical environment of the creole with the productivity of "European-type" cattle and at the same time improve the management of pastures, nutrition, disease control sufficiently for the cross-bred animal to express its greater ability to produce milk. As the milk potential of the animals is increased by 50% and no more than 75% Holstein blood, depending on the region, the level of management must simultaneously increase.

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A most important feature of critical importance to the Guyanese dairy industry is the high concentration of dairy cattle farmers along the rivers and coastal area. The consumer demand is high for good quality fresh milk. With increased consumer confidence in processed milk, greater educational and technical services, price incentives to farmers, the volume of milk can increase quite markedly in a relatively short period of time.

In the remainder of the report I will describe dairying in the various areas of Guyana, discuss specifically the items as outlined in the contract purposes and objectives and conclude each section with the present constraints and recommendations to help resolve the problems. I will also comment on the present views of the Nation's Dairy Development Program. In conclusion, I will outline my suggestions for an appropriate small dairy farmer management system for the river and coastal areas. Improvements and components of the system will be listed in order of priority.

II. DESCRIPTION OF DAIRY AREAS VISITED

a) Moblissa Dairy Unit and Adjoining Cooperative Dairy Farmers

Moblissa consists of a 1,200 acre farm with 27 proposed cooperative small dairy farmers in the vicinity of the farm. Moblissa has 300 mature Holstein-type cows with 200 in milk, improved pastures, and a modern well managed milking system. Production of the cows range from 1-1 1/2 gallons/day, although the animals are fed mineral supplement and limited quantities of wheat midlings and copra meal. The mostly purebred Holsteins do not tolerate the hot climate and rather than graze they stay in the pond for cooling. The few Sahiwal-Holstein crosses will graze during the day. Regarding breeds for this well managed system, I would recommend 3/4 to 7/8 Holstein Blood and preferably using semen of proven Sahiwal and Holsteins. The calf rearing program is also very good.

The concept of the 50 acre small dairy farms in the Moblissa area is a commendable plan. Georgetown farmers are reluctant to change their community, however, it may be appealing to some of the dairy sons. Land tenure restrictions as I understand them are not conducive and attractive because of sizeable capital commitments and little likelihood of passing the land on to their sons in the future. Eventually the Georgetown farmer will be forced to leave the city as grazing areas are utilized by new construction.

Constraints:

- 1) Only constraints at Moblissa are the need for more high protein concentrates, more cattle of 3/4 to 7/8 Holstein blood;
- 2) Constraints of the small-holder are a need for 100 acres by a good dairy farmer;
- 3) Land tenure of a life-time lease with provisions to give to son when retire, as long as dairying is the major enterprise seems logical;
- 4) Larency of cattle.

b) Mahaica, Mahaicony and Abary Rivers

Numerous farms were visited on the Abary river which were similar to the other rivers. As we rode the Abary milk barge on its daily collection schedule we observed milking procedures, management practices, pastures and the handling and collection of milk. No concentrates or mineral supplements are fed and most water grazing is on bezee bezee grass. There were at least 10-15 farmers in the area of the river we collected that were not selling milk, but are potential producers. Also other areas could be collected if promotional, educational and technical services and supplies were provided.

The creole cattle were surprisingly in good condition, the only capital investment being the cows. It was a memorable experience to observe the creole cattle grazing in deep water and the happy river dairy-men and his healthy well groomed children.

Constraints:

- 1) Lack of drained land available for improved pastures;
- 2) Low level of milk production/cow (2-4 pints/day);
- 3) Lack of proper milk utensils, cans, mineral supplements, molasses, and concentrates for milking cows and growing calves;
- 4) Lack of MOA and LIDCO services and education on the most appropriate dairy practices for the region;
- 5) Larency of cattle.

Note: These constraints can be minimized with high priority of funds and efforts by Guyana and International agencies for dairy development.

c) Coastal Areas

There are high concentrations of creole cattle grazing the water pasture along the coastal area between Georgetown and Corriverton. Most of the pastures are shared by the cattle farmers. Production levels are similar to the rivers except that there are several larger dairy units with stanchon barns. These farmers have the advantage of the major highway to aid in development of a dairy infrastructure.

Constraints:

- 1) Similar to the river farmers with the exception of the available road.

d) New Amsterdam and Mara Area

This area of Guyana is economically depressed and in need of financial benefits from a dairy program. Farmers in the city area are short of pastures due to much land being held by the rice cooperative although not being utilized. More dairying could develop along the Mara road since the land is reportedly not the best rice land. Proposed dairying at Mara Ranch would be a stimulus to dairy development in the region - especially along the Mara road when completed. The coastal area is similar to the others. There are probably 20,000 cows grazing the bezee water grass on the coast and 2,000 along the Berbice river. It is estimated that 70 farmers sell milk. When the Mara road is completed a refrigerated collection should be established at New Amsterdam for transfer to the Georgetown plant.

Constraints:

- 1) No mineral supplements or feed allotments to dairy farmers. Many of the coastal farms milk 1/2 to 3/4 Holstein animals that could readily benefit from the feed;
- 2) The lack of an adequate road to Mara is a severe limiting factor to dairying inland;
- 3) Collecting station at New Amsterdam would induce more cattle farmers to milk cows;
- 4) Larency of cattle.

e) Greater Georgetown Area

The dairy barn and lot is actually the back yards of homes in residential areas. The pastures are vacant lots and road sides and urban pressure is gradually eliminating grazing places. Some of these farmers are very capable, with good dairy "know-how", have the best quality cows in Guyana with the exception of Moblissa. The cows are very small, averaging about 1,000 pounds. The best farmers are milking 15-20 cows and may average 1-1/2 gallons/day. Some of these farmers feed concentrates, brewers grain, wheat midlings and carry in cut para grass and other grasses. Molasses and mineral supplements are used. However, even in Georgetown, the farmers have extreme difficulties in getting sufficient concentrates at a fair price. These farmers sell to the consumers or to a vendor.

The best farmers feed about seven pounds of wheat midlings and cracked rice plus 2-1/2 pints of molasses, maybe some brewers grains and sells milk to a vendor for about 35¢/pint or sell direct to the consumer in the neighborhood at 50-60¢/pint.

Constraints:

- 1) Limited concentrates;
- 2) Diminishing pastures;
- 3) Larency of cattle.

f) West Bank and Surrounding Areas

As is seen throughout the coastal and river region of Guyana there is a large concentration of cattle, estimated to be as high as 20,000. Most of the farmers have from 5 to 20 animals and many have good quality, though small, Holstein-type animals. Most producers are landless or cattle are grazing rice land. Almost all of the milk here is sold directly to consumers or to a local vendor. A very small portion of this milk is taken to Georgetown by private vendors. Limitations to milk production are similar to Georgetown in that concentrates are difficult to get and grazing lands are non-existent or minimal for most farmers.

However, there is a 180 acre tract of land near Windsor Forest which is managed by Chief Mohabir. There is more unused rice land and pasture adjacent that could be leased for a major dairy enterprise.

About 600 creole animals are on the land (180 acres) now. With improvements in pasture management, strip-grazing and the construction of barn facilities and pens to separate calves, this could be most effectively used for dairying. The attractive aspect of this unit is that such services as A.I., good bulls, and feed procurement would be practical. The present charge is 75¢/month for a dry cow and \$1.00/month for a milk cow. With no facilities to milk, feed, etc., the milking cows are taken to the farmers home at night. A relatively modest capital investment by the educational and organizational services by the Ministry could very quickly develop a significant supply of fresh milk. I would recommend that high priority be directed to this cooperative enterprise.

Constraints:

- 1) Lack of grazing land and improved pastures (the Windsor Forest "Cooperative" could resolve some of the pasture limitation);
- 2) Concentrates and mineral supplements are very difficult to get at a fair price;
- 3) Larency is a major problem.

III. CLIMATE OF GUYANA

The average temperature-humidity-index (THI) averages around 75 all of the year. (See figure 1). This THI is about 3 units above the comfort zone for a purebred Holstein of high productive capacity. This climate condition would immediately cause a 20% loss in milk for a cow with potential to produce three gallons/day and 25% loss on a six gallon/day cow.

In the humid tropics, the maximum production is usually around two gallons/day or much less, and this is due to the continuous THI elevation, and nutritional limitation causing degenerative problems, smaller mature size, reduced feed intake, hyperthermia, lower milk production, fertility problems and greater susceptibility to diseases.

To avoid these problems crosses of 50 to 75% of Holstein blood on the native creole is recommended. These animals would have a higher THI limit, around 75-76 and be able to utilize lower quality forages and resist diseases better than the purebred Holstein, Brown Swiss, etc.

The THI in Guyana is not a limiting factor for the creole especially under water grazing environments. However, improved environments would increase their productivity considerably.

Constraints:

- 1) High temperature, humidity and radiation levels throughout the year which limits production of Holstein and similar European breeds;
- 2) Shades and night grazing for the purebred is necessary, but this is complicated by the lack of pastures and larency.

IV BREEDS

Most Guyana cattle are predominately creole, with somewhat more Zebu blood in the rural coastal areas. The Greater Georgetown area has considerably more Holstein-type animals although they are small size and except for 15-20 dairies they are in relatively poor condition.

To make a major impact on the volume of milk/cow in the next 5 years, an intensive cross breeding program is essential. Imported semen from +1,000 pound Holstein Bulls is recommended. This is necessary to obtain as much "milking factor" as possible in the crosses and still retain climatic, nutritional and disease adaptability without going too high in Holstein percentages.

For the river and rural coastal areas no more than 50% Holstein is recommended in the present level of environmental management. This requires that cross-bred semen (Holstein-Creole) or (Holstein-Zebu) from animals with some progeny testing be used on the F₂. Mexico Sarh government should have such semen by the time such semen is needed (3 years). The management of good farmers in the Georgetown area, Moblissa and Mara with improved pasture and higher levels of nutrition and management would accommodate 3/4 to 7/8 Holstein blood. In three to five years hopefully proven cross-bred bulls could be available. This type of breeding program combined with a culling and selection program will eventually lead to the establishment of a Guyanese breed, that has both high adaptability and higher production characteristics. This will necessitate a simplified national record keeping program and breeding guidelines available to farmers, A.I. technicians and livestock assistants.

To make a major impact on the quality of dairy animals will require a gradually accelerated A.I. program of A.I. imported semen (purebred and crosses).

Constraints:

- 1) Need more A.I. technicians, vehicles, and small semen tanks; (detailed planning of numbers, etc., is essential if a major dairy improvement project is approved)
- 2) Most dairy farmers should eventually have F₁ animals and 3/4 to 7/8 in on high level management farms.

V. PASTURES, NUTRITION AND FEEDING

Pastures with exception of Moblissa and many of the better farmers in Georgetown supply all of the nutrients the animal has for maintenance and milk production. The native pastures or even improved pastures of Brachiaria, Digitaria, Chloris and Legumes such as Calapogonium and Stylosanthes on well drained land of Moblissa area essentially only provide maintenance of the animal. Antelope grass is utilized on improved water grazing areas where possible. The native grasses in the water pastures is usually bezee bezee or bamboo grass. The establishment of improved pastures and their management is of critical importance for higher production/cow and especially true for 3/4 and 7/8 Holstein animals. The need for higher protein in the grasses is limiting the increased production goals of creole and Holstein-type cattle. To provide these greater protein and energy requirements of growing calves and milking cows the farmers need to be resourceful and utilize any industrial by-product available.

The farmers near Georgetown have a greater opportunity to do this and many are using brewers grains, and molasses. Copra, rice bran, and wheat midlings are in short supply for most farmers. The allotment of feeds and the distribution for dairy farmers requires a review by the ministry in view of the greater needs for milk producers in Guyana.

Where-ever possible in coastal and river areas, antelope grass and other water-type grasses is desirable for creoles. Also molasses top-dressed with copra would increase milk production on the top 30% of a creole herd. Rice bran, wheat midlings, fish meal, etc., is also good. Cross-breeds (50% Holstein) require the above and some of the crosses would benefit from considerably more concentrates.

Growing calves, three to nine months of age need a higher quality protein (18-20%) calf feed. This is essential if animals are to mature to normal size. Mineral supplements are recommended for all dairy animals. The moblissa ranch management have the experience to provide advice on rations.

Constraints:

- 1) Program and capital for more improved pastures;
- 2) Availability and distribution of dairy cattle feeds (wheat midlings, copra, rice bran, molasses, etc.);
- 3) The lack of sufficient availability of feeds to the farmer is causing unreasonable feed prices in many cases. Concentrates and mineral supplements was reported frequently to be non-existent in the New Amsterdam region;

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- 4) Greater feed allotments/cow for good quality Holsteins and growing calves;
- 5) Allotments, distribution and pricing of concentrates for dairy cattle warrant review by appropriate authorities.

VI. MILKING, MILK HANDLING AND MILK COLLECTIONS OF SMALL FARMERS

With few exceptions, milking procedures such as washing udders in clean water, checking for mastitis, milking in sanitary pails, teat dipping and pouring milk in sterilized (chlorine rinse) cans are not being practiced. Education, training and services to the dairy farmer are needed badly in this area.

However, the major problem at the present time is that the milk is not cooled until it reaches the plant. This situation is unacceptable and a serious financial loss to the milk plant. Repair and proper maintenance of the Mahaica and Mahaicony collections so that milk may be cooled to 36°F will resolve the critical aspects of the problem immediately. It is recommended that the river milk barges have refrigerated holding tanks and pump directly to an insulated tank truck for delivery to the plant. Any new collecting stations should use diesel or gas generators, for cooling the milk. (See Map).

The high density of dairy farmers along the road and rivers makes collections of even small quantities of milk a realistic operation. The present system of collection of milk by private trucks or barges for delivery to the collection is a sound program. The collectors I have visited with, especially on the Abary River have developed a lot of trust and good public relations with the dairy farmers. As long as his profit margin is reasonable he will recruit more farmers to milk more cows.

Constraints:

- 1) Lack of proper type sanitary buckets and milk cans. The milk collector should have a ready supply of cans, buckets, and chlorine to sell to the farmer;
- 2) A simple screened box large enough for each farmer to store his buckets and cans. (Plans to be available from LIDCO);
- 3) Present major constraint is the inability to cool down the milk. (This is a critical link in the milk handling system and can stimulate, if resolved, or hinder the whole Guyana Dairy Program.

VII. MARKETING OF MILK ECONOMICS

Estimations of total milk marketed to LIDCO in 1979 was 350,000 gallons. It was estimated by LIDCO that the country's present needs are 12 million gallons/year and more than 3/4 of this is being imported as gallon equivalents in milk powder.

Following are some calculations, assumptions and projections to 1985 based on information collected from farmers, milk collectors, and livestock assistants. The major assumption is that national policy and capital input into the system will increase number of cows milked, and production/cow.

The number is 1,540 dairy producers that sell milk in all of the dairy areas except New Amsterdam and its coastal area. Also not included is Mara and Moblissa.

Assuming each farmer has an average of 20 cows, this would be 30,800 cows. If 60% are milking this becomes 18,480 cows. If producing 1/2 gallon/day then 9,240 gallons milk are produced/day or 3,372,600 million gallons/year. This would be available milk to the consumer by private vendors and LIDCO plant. The plant at present processes about 1,000 gallons/day (not including Moblissa) which is about 10% of Guyana's daily fresh milk production.

Assuming that a new educational program, more and better pastures, price incentives, etc., is initiated then number of cows milked may double by 1983 to produce 18,480 gallons/day. If the improved management increases milk volume by 30% then 24,024 gallons/day would be produced. If an average of 4,000 cows were bred A.I. per year this could provide about 20% more milk/day by 1985, or 33,622 gallons/day.

As I indicated earlier this does not include volume or projections from Moblissa, Mara, New Amsterdam Coast or any new collecting sites.

Assuming the plant portion of the fresh milk production increased to 20% - the plant intake would be 6,724 gallons/day plus other sources not included in calculations.

Remember these figures are from approximately 60,000 cows which is only about 20% of the estimated cow population of Guyana. Even so, the milk production/year would be 33,622 gallons/day X 356 days which equals approximately 12 million gallons/year which is the present national requirement for milk.

VIII. EDUCATIONAL PROGRAM AND SERVICE TO DAIRY FARMERS AND DAIRY INDUSTRY

In general, a project leader for the dairy project plus numerous short-term consultants for pasture development, breeding programs, A.I. refresher courses, dairy management and records training, and reproduction management, would be needed as support from U.S.A.I.D. Selected livestock assistants, should receive short-term special training in the U.S. or in Guyana.

The educational program is primarily the responsibility of MOA, however, some of the milk procurement and sanitation aspects of producing milk would be the responsibility of LIDCO.

The Ministry of Agriculture Livestock Division has approximately 16 livestock assistants and A.I. technicians on the coastal, river, Georgetown, West Bank and New Amsterdam areas. They are in the areas indicated on the map. There are only three veterinarians to serve this total area. I have estimates of 1,540 milk producers from collectors and livestock assistants. 400 from Greater Georgetown, 200 from Mahaica, 40 from Mahaica Coast, 150 from the Mahaicony River, 45 from Branch Roads near Mahaicony, 25 from Mahaicony Coast, 40 from Abary River, 140 from East Bank and Coast and 350 from West Bank and Coast (2 districts). To service these conservative estimates of dairy farmer numbers, it will require a major increase in livestock assistants (also trained in A.I.). (Total 28). New equipment includes three land rovers, 9-12 "Motor Peds," three boats, small semen tanks (15+). LIDCO should have a shipment of buckets and cans (stainless steel or plastic). Sufficient for distribution and sale to all milk producers. Also each producer should be required to have a screened drain rack constructed cheaply by the farmer to hold buckets and cans.

Each farmer should be visited every two months by the livestock assistant and occasionally by a LIDCO field man.

Many livestock assistants have reported that it is difficult for them to travel every day because of lack of ready cash. An advance travel allowance would assure that men are in the field where they can help the farmer.

IX. NATION'S DAIRY DEVELOPMENT PROGRAM
AND DISCUSSIONS WITH GOG, MOA AND LIDCO

Numerous visits and conversations with the officers and staff of MOA and LIDCO were most helpful and beneficial to my study. In general, the approach and plans of the Ministry of Agriculture Livestock Division and LIDCO is most commendable.

New priorities or revised priorities for the Nation's Dairy Program are necessary due to the increased domestic needs of fresh milk.

Policies and programs on allotment of land for dairy pastures is of real concern to dairy farmers. A review of available land use in critical areas may possibly provide some land that is more profitable for dairying if managed properly. It is easy to see the ready benefits of pasture when one reviews milk production levels during the months between rice harvest and planting.

A policy and program review is recommended to determine a more realistic way to provide the dairy farmer with sufficient concentrates at a fair government price.

The general dairy policy of Guyana that the small dairy farmer must be encouraged to produce milk of a higher quality is sound. These small farmers are providing the major amount of the country's milk today. Much is being sold directly to the consumer, but a new dairy program as proposed will increase the volume of milk produced by the small holder and provide more to the milk plant for processing. Simultaneous development of the larger government farms not only will provide more milk for processing, but increase the technology of production which is of benefit in many ways to even the very small farmer.

The country has a major resource in the creole cows and the upgrading of a sizeable portion of the "dairy type" animals will lead the country gradually toward milk sufficiency.

X. DESIGN OF AN APPROPRIATE SMALL DAIRY FARMER MANAGEMENT SYSTEM

The Guyanese cattle and dairy farmer is capable of developing mechanized dairy farm operations, but the present infrastructure dictates the following plan that will utilize the large cattle population and provide a steady cash income. The specific recommendations for a small dairy farm management system will depend on whether the farmer is urban (landless) in Georgetown, or New Amsterdam, Coastal Road Community pasture, or private pasture, a river cattle farmer, or a farmer in the cooperative units (50 acres) such as Moblissa. The infrastructure for the dairy industry in Georgetown and the West Bank is generally established, however, it is very meagre in the rural areas. I will direct my recommendations toward the need of the many small dairy farmers so that he may maximize his resources to produce a product for vending directly to consumers or collecting station and the milk plant. In doing this, I will outline the essentials of a system that is applicable to all dairy farmers and list them in order of priority. The constraints cited earlier will be referred to as the system is described and summarized. The major infrastructure for the production of milk will be provided by the Ministry of Agriculture (MOA) and the collection and processing by LIDCO. The system proposed as follows:

(1) Dairy Education Programs, Services and Equipment

(1a) Personnel

Twelve (12) additional MOA livestock (dairy) assistants are needed to counsel dairy farmers on feeding, milking, health, breeding management and provide A.I. services. These staff would have at least a 2-year Diploma and experiences in milking cattle. They should visit every dairy farm once every two months, organize meetings of dairy farmers in their area to educate the farm families on dairy techniques.

One (1) LIDCO field man is necessary to work with milk collectors, livestock dairy assistants and farmers with difficulties. He would help the farmer obtain approved buckets, cans, storage racks and advise on sanitary procedures to improve the quality of milk.

One (1) AID Extension-Agricultural editor or Dairy Extension Specialist (1-2 years) to prepare a series of dairy farmer guide sheets on all aspects of dairy production. Farmers of different areas will require special information such as the type ration mix, pasture management, etc.

One (1) AID Dairy Project Leader for duration of Project, to provide technical assistance and leadership to meet 5-year goals. He would work closely with Guyanese counterpart and assist the livestock assistants with programs and activities in their areas. Also close coordination is necessary with any FAO ongoing dairy activities.

Train six (6) or more Guyana Agricultural College B.S. graduates at the Masters Level in the U.S. on various aspects of dairy production.

Refresher Courses for key Ministry staff and veterinarians or to attend special meetings and workshops in the U.S.

Use short-term AID consultants to conduct special two-week short courses for livestock dairy assistants and other interested staff of colleges. There will be a continuing need for specialists in breeding, fertility, A.I., health and disease control, pasture development and management, animal adaptability and management, utilization of local protein and energy sources for calves and milking cows, etc.

(1b) Special and Operational Needs

Three (3) small 4-wheel drive vehicles.

Eight (8) "Mo-Peds".

Two (2) Motor Boats.

Fifteen (15) small portable liquid nitrogen tanks for semen transfer to farmers.

A major supply store of recommended milk buckets, 3, 5, and 10 gallon milk cans, chlorine for sterilizing milking equipment. These could be distributed and sold by the LIDCO field man or the barge or other milk collectors. It may be necessary to finance these costs via milk payments.

Semen (10,000 vials/year) are needed to make a significant impact on the nation's milk supply. 8,000 vials/year of Holstein proven plus 1,000 lbs. bulls and 2,000 vials/year of semen for 1/2 to 7/8 Holstein cows. This semen should be from bulls with some progeny information. Mexico should have such semen from creole and Holstein and Zebu and Holstein bulls in the near future. It is most important that the livestock dairy assistants and the farmer have breeding programs developed for each farm, type of cows and production levels, etc.

(Note: Assuming there will be 60,000 cows milked, the 10,000 vials recommended would serve 8-15% of the cows/year depending on conception rates).

Insemination supplies for at least six months should be with each livestock assistant.

Mastitis infusions, drugs for emergency treatments should be carried by each livestock assistant since internal parasites and ticks deserve ready care. I would recommend that these be sold directly to the farmer. Rural farmers will not make the effort to find the necessary treatments, etc., until too late.

Three (3) refrigerated milk holding tanks (500 gals.) for the three river barges are needed immediately. At a later date, others may be added.

Two (2) refrigerated milk collection stations, one in New Amsterdam, and one on the West Bank during the 3 or four years of the project. (Gas generators are essential).

Visual aids and supplies for conducting meetings in the fields.

Six (6) carousel projectors (35 mm, 220 v).

Two (2) 16 mm. movie projectors to show films that may be obtained from the U.S. on dairy management.

Availability of several (moderate priced) 35 mm. cameras and Polaroid cameras for "high-lighting" proper milking, feeding, breeding, and management procedures as practiced by better farmers, Moblissa and demonstration farms.

Advanced monthly travel allowances must be arranged in some manner so that livestock assistants will have ready funds to travel to farms as many as four days a week. This is critical to the success of the dairy program.

(2) National Policy and Dairy Cattle Pasture and Feed Programs

(2a) Pastures

Priorities are needed for dairy pastures in the various regions of Guyana. This is essential if milk needs of the country are to be met. Good quality native or improved pastures are indispensable for a successful and economical dairy industry. The allotment of lands which are not being currently used for rice and perhaps even some of the poorer quality rice land should be developed for "cooperative pastures." The grasses and management has been discussed previously, however, an intensive effort by the agronomy and livestock specialists of the Ministry may find legume such as mimosa pudica, or a "grass cow-pea" reported in Puerto Rico. Leucaena properly managed in more drained soil will do well in this climate.

(2b) Protein and Energy Concentrates

As with the pastures, the availability of adequate amounts of feeds at fair government prices is a major concern expressed by all of the better farmers - especially those with improved cattle.

The time required to get small amounts of grain is unrealistic and inefficient use of a good farmer's time. Since A.I. service is beginning again, the greater number of improved cattle must have more concentrates to perform in a profitable manner. As discussed previously, molasses should be fed to all lactating cows preferably "top-dressed" with copra, wheat middlings and rice bran, fish meal or a better protein source, something like "Sow meal" is necessary for optimal growth of growing heifers and higher producing cows. Thus a reasonable allotment of concentrates and better organization in feed distribution to farmers is needed. Perhaps farmers in a district could cooperatively buy the feed at a government-fixed price. Information on the proper feeding of concentrates can be provided for each district and type of farmer (type pastures and type cattle) by the livestock assistants.

(3) Larceny

The mounting losses of high quality dairy cattle is not only a great loss to the farmer, but to Guyana's milk needs. This is especially serious to the farmer with higher producing upgraded Holstein cattle. Also these animals need to graze at night when it is cooler and not be locked up with no pastures. This practice greatly reduces their milk production. It seems that if butchers were required to have a properly dated receipt for every carcass and they were checked twice weekly by patrolling police officers, the incidence of thefts would drop markedly.

(4) To summarize in order of priority the aspects of the dairy program are:

1) Initiate the dairy educational and service programs just described.

2) Provide the capital and operational needs to properly carry out the program.

3) Establish or revise the national dairy cattle pasture and feed policy program that effectively supports the dairy farmer.

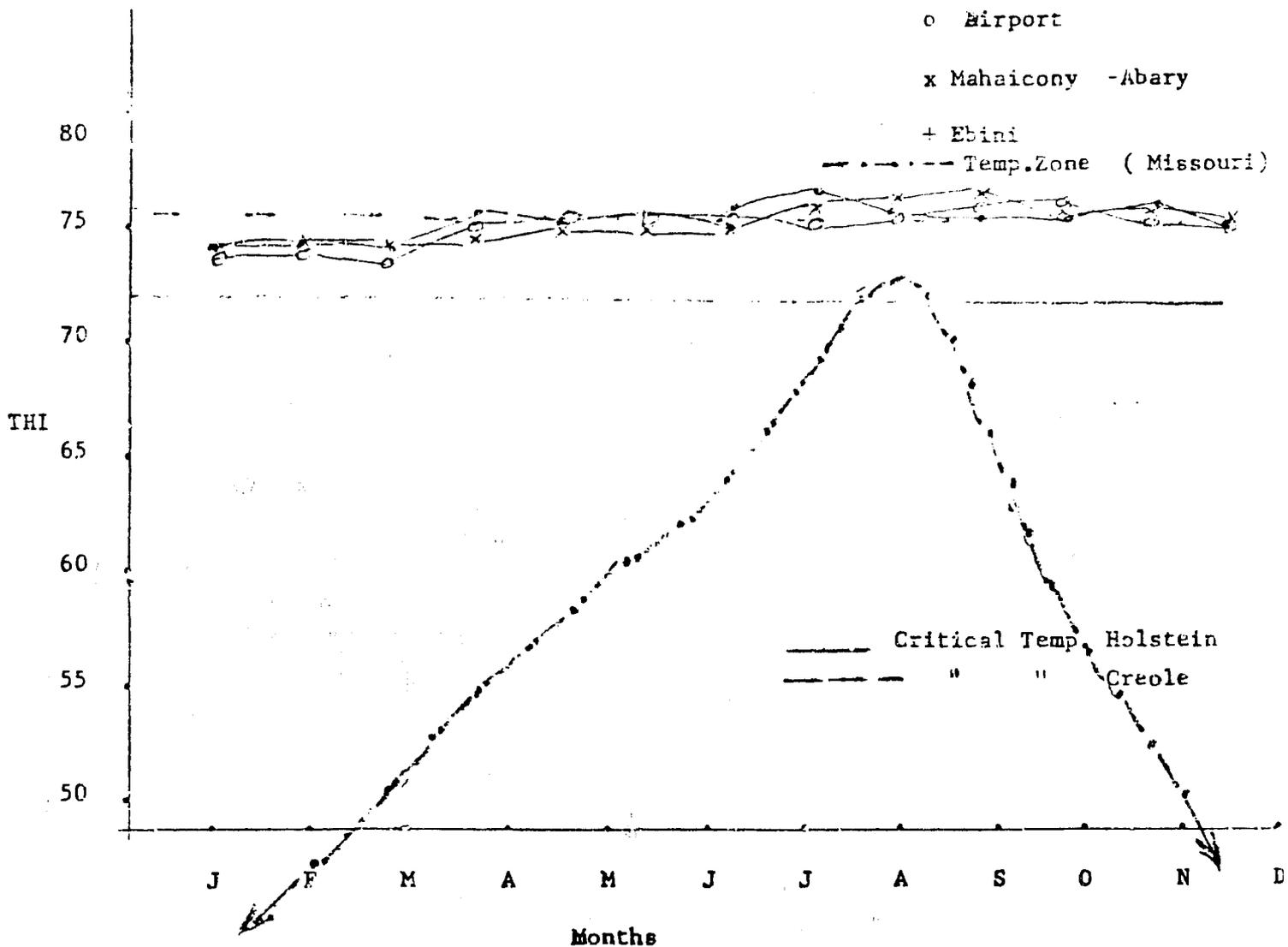
4) Minimize the larceny of cattle.

With the above aspects of the dairy farm management program underway, the first step for all farmers would be:

- 1) Livestock assistant and LIDCO field man insure that all dairy farmers selling milk are using recommended milk buckets, and milk cans.
- 2) Chlorine is used to rinse utensils.
- 3) Properly diluted chlorine may be used for teat dip.
- 4) Assist in constructing a screened rack to store cans and buckets.
- 5) Have a molasses tank with rain shelter or lick wheel. (Plans are available).
- 6) Initiate a pasture program for each farmer, whether it is only an acre or so of high quality grass (para) for calves for a river farmer, use of antelope grass for river farmer or the approved varieties on better drained pastures.
- 7) Provide the A.I. services to the better dairy farmers and work with individual farmers on the best breeding program for their cows.
- 8) Initiate a farm record system - a simple card system, to record breeding and calving dates, type semen or bull, milk production once a month, etc. Provide ear tags.
- 9) When a farmer is ready for a milking barn, provide plans similar to the Moblissa units. However, the river farmers may need a less expensive barn - recommend use local wood stock or poles, etc.

FIGURE 1

BEST AVAILABLE DOCUMENT



$$\text{Temperature Humidity Index (THI)} = .55 t_{db} + .2 \times t_{dp} + 17.5$$

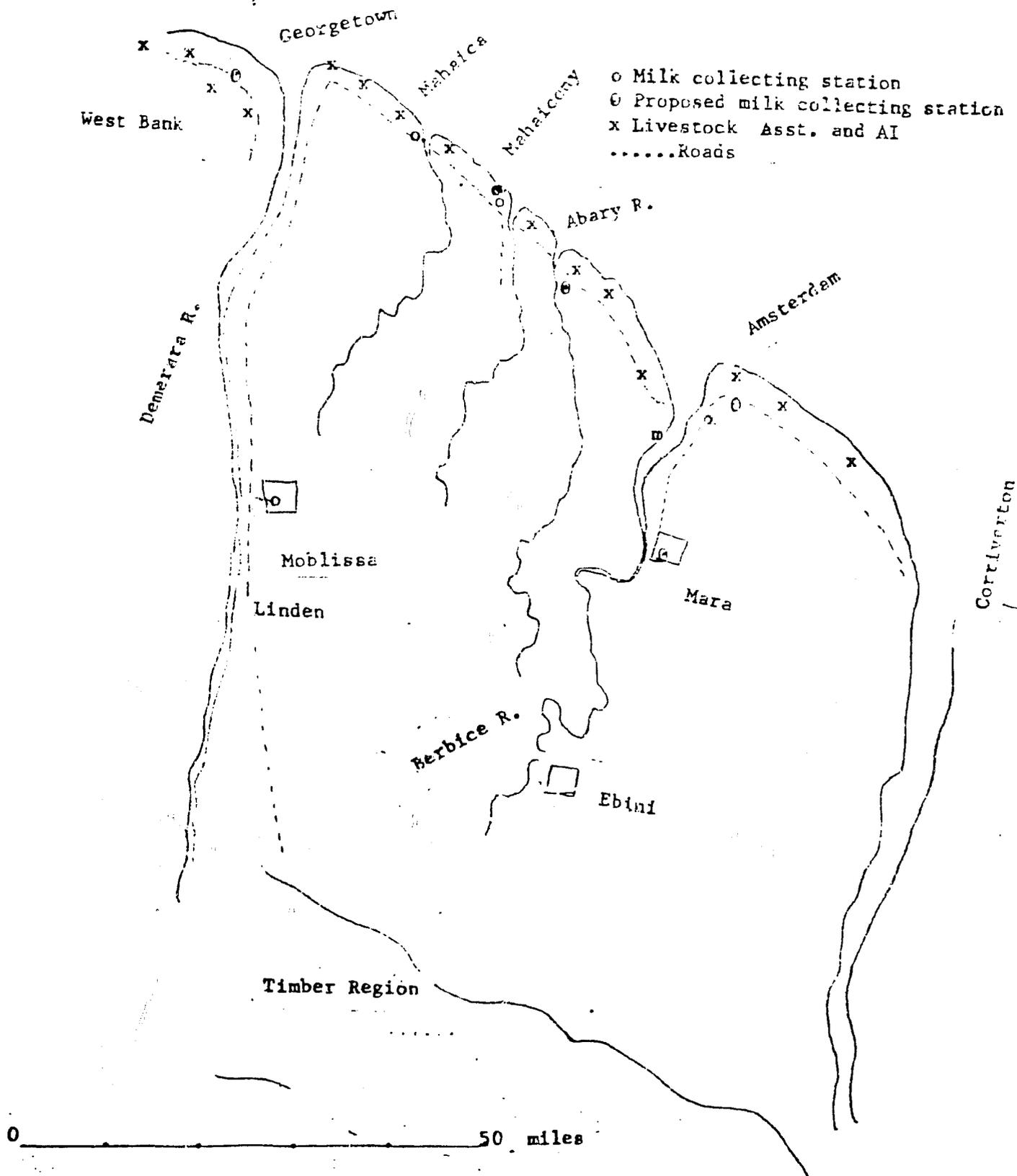
t_{db} = dry bulb (F)

t_{dp} = dew point (F)

Ref. H.D. Johnson, JD Sci. 59, 1603-1617 (1976)

Guyana data; Caribbean Meteorological Institute, Husbands, St. James Barbados, W.I.

MAP OF
GUYANA
Coastal and river dairy areas



MAP. Coastal, River, Moblissa, Mara, West Bank Dairy Areas

BEST AVAILABLE DOCUMENT

CAPITAL (US \$)

Items	YEARS					\$
	1	2	3	4	5	
Small 4-wheel drive vehicles	2	1				
"Mo-Peds"	4	2	2			
Small motor boats	2					
Small portable liquid nitrogen tanks	15					
Milk buckets	10,000	5,000	5,000	5,000	5,000	
<u>Purchase Items for ReSale</u>						
3-5 & 10 gallon cans	5,000	2,500	2,500	2,500	2,500	
3 Refrig. milk-holding tanks (55 gal. for barge)	X					
Proposed refrig. milk collection sts.			X West Bank		X Amsterdam	
Semen	10,000 vial (\$100,000)	10,000 vial	10,000 vial	10,000 vial	10,000 vial	\$500,000 ⁺
Insemination supplies	\$200 x 15 = \$3,000	" \$3,000	" \$3,000	" \$3,000	" \$3,000	\$15,000
<u>Purchase for ReSale</u>						
Mastitis, drugs for sale by Livestock Asst.						
Visual aids (carousel projectors)	6	6	6	6	6	\$2,000
16 mm movie projectors	2					\$1,000
Extension: public supplies	5,000	5,000	2,000	2,000	2,000	\$16,000
Advance Travel Funds			Revolving Funds			

BEST AVAILABLE DOCUMENT