AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION

A. PRIMARY: Agriculture

B. SECONDARY: Livestock

2. TITLE AND SUBTITLE

Report on activities in Jamaica, Barbados and Trinidad, January 1974

3. AUTHOR(S)

May, R.D.; McCarl, Bruce; Minden, Arlo; White, T.K.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1974	21 p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS

Department of Agricultural Economics, Purdue University.
West Lafayette, Indiana 46207

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

Appendix E: Purdue University, Dept. of Agricultural Economics, Annual Report, 1973/1974

9. ABSTRACT

The four members of the Purdue 211(d) team visited Jamaica, Barbados, and Trinidad in January, 1974, to collect information on livestock production and marketing systems and to investigate the availability of data useful for determining the potential demand for Guyanese beef. The original trip plan included a week in Guyana for preliminary data collection, but clearance for travel to Guyana was not given and that part of the trip was canceled. In Jamaica, where 10 percent of the farmers have 90 percent of the land, the cattle population is about 250,000 animals. About 20 percent of the beef produced in Jamaica is finished in small, independent feedlots. Fed animals are currently selling at a price of $.43-.45 per pound. Beef is typically purchased by butchers who travel through the countryside to collect cattle for slaughter. Existing slaughter facilities are not modern. The hotel trade imports its meat from the U.S. and Canada. No tax is levied on imported beef. In Barbados, most of the cattle production is dairy. Beef sells in the market for about $.90 per pound. Barbados, like most of the West Indies, will not import beef from Guyana because of the presence of foot and mouth disease in the Rupununi District of Guyana. Most if not all of the hotel beef consumed in Barbados is imported from the U.S. and Canada. Canadian Cane consultants have been developing a machine to separate sugar cane into three components: fiber, wax, and comfith. The comfith is being fed to cattle as a high-energy feed. The machine costs about $35,000 and can produce four tons of comfith per hour. It was estimated that five to ten percent of the cane produced in Barbados could feed out enough beef to meet the current demand. Sugar cane requirements are such that 350 acres of cane could produce enough comfith to feed out 1680 bulls to slaughter weight in 18 months from birth. The comfith is now being used experimentally in both pig and dairy rations. In Trinidad, scientists at the University of the West Indies are planning to put in a large-scale feedlot in Mexico, using comfith as the primary energy source. Trinidad has its own source of urea,

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAB-995	

12. DESCRIPTORS	13. PROJECT NUMBER
Caribbean Livestock	14. CONTRACT NUMBER: CSD-3683 211(d) 15. TYPE OF DOCUMENT

AID 590-1 (4-74)

an additive, from the offshore oil producers. Caroni, Ltd., in Port of Spain, has been working on selective breeding of water buffalo to develop a good blood line for meat production. The water buffalo are very well adapted to production in very wet, low lying areas such as the river valleys of Guyana. Most of the beef currently produced in Trinidad is a product of the dairy industry; the bulls are slaughtered at a very young age. Holsteins are the dominant breed used in Trinidad. In most of the West Indies, the lack of adequate farmer training is a major obstacle to increased livestock production.

APPENDIX E

Trip Report

Participants: Ralph May, Bruce McCarl,
Arlo Minden, Kelley White

Dates: January 20- January 27, 1974

The four members of the Purdue 211(d) visited Jamacia, Barbados and Trinidad for the purpose of (1) aiming familiarity with livestock production and marketing systems in that part of the tropical world, (2) observing and collecting data on beef confinement finishing operations in Jamacia, and (3) investigating the availability of data useful in determining the potential demand for Guyana beef in the Carribean region. This travel was originally planned to include one week in Guyana for preliminary data collection. However, clearance for travel to Guyana was not given and that part of the trip was canceled.

The report which follows summarizes some of the data, observations and conclusions resulting from interviews conducted in the three countries. A partial list of individuals interviewed in the three countries is attached. No attempt is made to associate information with sources in all cases. All prices and values cited are in U.S. dollars and were converted from local currency values using the approximate exchange rates prevailing at the time of the visit.

Livestock Production In Jamaica

The cattle population of the island is about 250,000 animals where 90% of the farmers have 10% of the land (small farmers - 10 acres or less) and 10% of the farmers have 90% of the land (mostly in farms of 500 acres or more). Most large ranches feed all of their cattle and would buy other calves if they were available. Cattle usually go into feedlot at 650-700 pounds, at 14-16 months of age and remain in the lot for a minimum of 100 days and are sold at 900-1000 pounds. The conception rate on cattle (with three services) is about 80% with good management and about 60% average over the country. The average death rate between birth and weaning is about 5-10%. Dr. Richards sees this high death rate as a major problem which should be worked on while training the farmers.

About 20% of the beef produced in Jamaica is finished in small, independent feedlots. Grain produced in Jamaica, or imported, is used for human consumption so little is available for cattle feeding. Commercial livestock feeds are produced by Master Mix (Central Soya) Purina, Plumrose and Laurel Feeds. Feedlots use primarily by-products: (1) cocoanut meal, (2) citrus pulp, (3) brewer's yeast, (4) wheat middlings, (5) rice meal and (6) molasses. Jamaica's rice production is very erratic, which results in a supply of rice meal for cattle feeding which is not dependable. Current feedlot use of molasses is being curtailed due to a high export demand for rum. Grasses produced for both pasture and "zero-grazing" feedlot use include: (1) Guinea grass, (2) Pangola grass, (3) coastal Bermuda grass, and (4) Bahia grass.

The supply of by-products available for cattle feeding is rather limited. Recent availability is approximately as follows:

By-Product	Annual Production	
Brewer's grain	2,000 tons	Foreign Origin
Wheat Middlings	11,000 tons	Foreign Origin
Citrus Pulp	4,500 tons	
Cocoanut Meal	6,000 tons	
Sugar Cane Pith	Should be no limit	
Molasses	160,000 tons	

The land bought by the Bauxite companies came with the restriction that the total agricultural output from the land must be maintained at a level at least as great as before mining started. Cattle feeding operations are in existence on mined out land to help meet this restriction through production of beef from these lands.

ALCAN's feedlots are currently selling the fed animals (800-850 pounds) at a price of $.43 per pound. They are getting an average daily gain of 2.4 pounds per day at a feed cost of 23¢ per pound gained. Their concentrate mixture is composed of:

54% Citrus Pulp
20% Brewer's Grain
24% Wheat Middlings
1% Urea
(Molasses is fed free choice)

The comparable cost, if fed on corn rations, would be 25¢ per pound of weight gain. Currently, plans are to start a corn silage feeding program at the ALCAN LOTS using XJ304 with six cwt. of fertilizer per acre. The cattle receive Pangola grass along with the concentrate mix. Fourteen acres of Pangols fert-tilized at a rate of 300 pounds per acre, is maintained for each 200 head of cattle on feed. The annual through-put is 1400 head for their total feeding operation.

Calves that are not fed will be sold as weaners for 43-45¢ per pound. The cattle are kept in lots 50' x 30' which ALCAN charges off at a rate of $2 per head, per year to construction cost. They keep 30 to 40 head of

cattle per lot and it requires two men to care for 180 to 200 head. Most of the beef produced in the lots go to the cities (50% to Mandeville and 50% to Kingston), but it is sold to the butchers who come by regularly. One butcher reported back that his dressing percentage on cattle bought from ALCAN was 54%. Performance in the feed lot has been about the same from dairy bulls as it is for beef-type bulls. There is no price differential in the market between feedlot cattle and grass produced cattle. ALCAN feeds its cattle to speed up finishing (gains are 1-1 1/2 lbs. per day on grass and 2.4 lbs. per day in lot). ALCAN does not use zero-grazing for its lot.

The Ministry of Agriculture has constructed feedlots at Boles which are 50' x 24', at a cost of $400 per head capacity. Each lot holds 12 animals and is about 1/3 under shed and 2/3 in full sunlight.

While in the feedlot at Boles, the cattle are fed molasses, by-products and grass (primarily Pangola). Cattle enter the feedlot at about 450 pounds and are sold at about 1000 pounds. The bulls are not castrated, but receive Vitamin A, black leg vaccine and are wormed when they enter the lot. The annual average daily gain was calculated at 2.2 pounds per day at a concentrate cost of 12¢ per pound of gain, fed at a rate of 1.2 to 1.55 percent of body weight. The rate of gain is better during Nov.-Feb., even though the protein content of the grass is lower during this season (difference is about .5 pounds per day). With high fertilizer (1800 pounds per acre of 21% N), the land will yield about 10-12 tons of dry matter per acre with a protein percentage of 9 to 17. The 'zero-grazing" pastures are irrigated with 2' of water every fortnight.

The following results of feeding trials from Boles are summarized from, "Grass and Industry By-Products for Fattening Yearlings," by F. M. Dixon.

Five different levels of Pimola and concentrate were fed as a ration to cattle in confinement. Grass was fed free choice.

Eighty (80) animals were divided into 5 treatment groups of 16 animals each and housed in 24' x 50' feed pens of eight animals each. The initial average weight was 576 pounds. Each animal received 40 days requirement of Vitamin A,D and E by injection prior to entering the lot. The animals were fed only one-fourth of the concentrate ration for the first seven days, until they were used to the ration.

The feeding trial was carried out in two sections: (1) the first 84 days on the first set of rations (Table 1), and (2) the second 42 days on the second set of rations (Table 2).

Table 1. Composition of Diets Fed for First 84 Days of Feeding Trial

Group	Diet	Pimola* (% body wt.)	Concentrate** (% body wt.)	Grass
1	A	1	.4	ad lib
2	B	1	.8	ad lib
3	C	1	1.2	ad lib
4	D	.7***	.8	ad lib
5	E	.7***	1.2	ad lib

* Pimola - 65 parts molasses, 33 parts pith and 2 parts Urea.
** Concentrate - 60 parts Brewers' Grains, 30 parts Wheat Middlings, 9.5 parts ground corn, .5 parts Fish Meal.
*** Urea/Molasses was fed as a supplement in place of Pimola; 2 parts Urea and 98 parts Molasses.

Table 2. Composition of Diets Fed for Last 42 Days of Feeding Trial

Group	Diet	Pimola (% body wt.)	Concentrate (% body wt.)	Grass
1	A1	.4	1.0	ad lib
2	B1	.8	1.0	ad lib
3	C1	1.2	1.0	ad lib
4	D1	1.2*	.8	ad lib
5	E1	1.2*	1.2	ad lib

* Urea/Molasses was fed as a supplement in place of Pimola; 2 parts Urea and 98 parts molasses.

Management Procedure - The diets were fed at 8:00 A.M., with chopped Pangola given at about 9:00. Water and a high phosphate mineral mixture (Mineral

Chum) were available at all times. Animals were weighed every 14 days and adjusted weights of ration were established.

Table 3. Cattle Performance for First 84 Days of Feeding Trial

Diet	A	B	C	D	E
Length of feeding (days)	84	84	84	84	84
Average Initial Weight (lbs.)	580	571	576	574	582
Average Final Weight (lbs.)	708	741	763	750	744
Average Daily Weight Gain (lbs.)	1.53	2.02	2.23	2.08	1.93
Average Daily Feed (lbs. of dry matter)					
Pimola	5.03	5.11	5.25	0	0
Concentrate	2.26	4.60	7.09	4.66	6.95
Grass	8.34	7.47	6.54	9.12	6.25
Urea/Molasses	0	0	0	3.35	3.34
Total Dry Matter Consumed Per Day	15.63	17.18	18.88	17.13	16.54
Feed per 100 lb. Gain					
Pimola	328.8	259.9	235.4	0	0
Concentrate	147.7	227.7	317.9	224.0	360.1
Grass	545.1	369.8	293.4	438.4	328.8
Urea/Molasses	0	0	0	161.0	173.0
Total Ingredients - lb./100 lbs. gain	1021.6	850.4	846.7	823.4	856.9
Cost of feed per 100 lbs. gain*	$14.20	$14.25	$16.40	$10.80	$15.10

* The cost of grass is not included

Table 4. Feed Quality and Cattle Performance During First 84 Days of Feeding Trial

Diet	A	B	C	D	E
Productive energy of diet (calories/lb)	554	607	640	745	755
Crude protein (percent)	11.5	13.6	15.1	14.6	16.0
Average daily dry matter intake per animal (lbs.)	15.63	17.18	18.88	17.13	16.54
Dry matter from grass	8.34	7.47	6.54	9.12	6.25
Percent of dry matter from grass	53.4	43.5	34.7	53.2	37.8
Productive energy intake from diet (calories/day)	4105	5896	8012	6017	7815
Average daily gain (lbs.)	1.53	2.02	2.23	2.08	1.93
Feed conversion (lbs. feed to produce 1 lb. liveweight gain)	10.2	8.5	8.5	8.2	8.6
Cost of feed per 100 lb. of gain*	$14.25	$14.25	$16.40	$10.80	$15.10

* The cost of grass is not included.

Table 5. Cattle Performance for Last 42 Days of Feeding Trial

Diet	A1	B1	C1	D1	E1
Length of feeding (days)	42	42	42	42	42
Average initial weight (lbs.)	694	734	767	734	713
Average final weight (lbs.)	789	838	869	838	821
Average daily gain (lbs.)	2.26	2.48	2.42	2.48	2.58
Average daily feed (lbs. dry matter)					
Pimola	2.34	4.96	7.73	0	0
Concentrate	6.56	6.56	7.25	5.54	7.94
Grass	9.31	7.27	6.53	9.17	7.26
Urea/Molasses	0	0	0	6.84	6.81
Total dry matter consumed per day	18.21	18.79	21.51	21.51	21.81
Feed per 100 lb. gain					
Pimola	103.5	200.0	319.4	0	0
Concentrate	290.3	264.5	299.6	223.4	307.7
Grass	411.9	293.2	269.8	369.7	273.6
Urea/Molasses	0	0	0	275.8	263.9
Total ingredients -lbs./100 lb. gain	850.7	757.7	888.8	868.9	845.2
Cost of feed per 100 lbs. gain*	$11.60	$14.30	$18.00	$13.80	$16.00

* The cost of grass is not included.

Table 6. Feed Quality and Cattle Performance During Last 42 Days at Feeding Trial

Diet	A1	B1	C1	D1	E1
Productive energy of diets (calories/lb)	695	643	610	735	744
Crude protein (percent)	17.14	15.20	13.8	11.8	13.4
Average daily dry matter intake per animal (lb.)	18.21	18.79	21.51	21.55	21.81
Dry matter from grass (lb.)	9.31	7.27	6.53	9.17	7.06
Percent dry matter from grass	51.1	38.7	30.2	42.5	32.4
Productive energy intake from diet (calories/day)	6250	7775	9284	9153	11024
Average daily gains (lbs.)	2.26	2.48	2.42	2.48	2.58
Feed conversion (lb. feed to produce 1 lb. liveweight gain)	8.0	7.6	8.9	8.7	8.4
Cost of feed per 100 lb. gain*	$11.60	$14.30	$18.00	$13.80	$16.00

* The cost of grass is not included.

Factors Limiting Grass Intake:

1. The quantity of feed given before grass is presented.
2. The energy value of the feed.
3. The bulkiness of the feed.

The Tulloch Estates' livestock operation is primarily dairy and Brahman breeding stock production. The Brahman are produced primarily for export and do not perform well in the feedlot. The dairy bulls are the primary source of

feeder animals for the lots. They only feed their own bulls (100-120 per year). The butchers (3 or 4) come by to try to buy the cattle (last group went for $.40 per pound). The dairy heifers are also kept in the feedlot for growing prior to first breeding. They have found that the heifers that are placed in the feedlot grow to a larger size, produce more milk and calve at 2 1/2 years of age (non-fed heifers calve at about four years). The average composition in the feedlot is about 1/2 bulls and heifers and about 1/2 slaughter bulls.

The lots are 32' x 16' and are stocked at a rate of one animal per two feet of trough space, or eight head per pen. The animals enter the lot at 400-450 pounds and were sold, in 1972, at an average age of 17 months and an average weight of 1075 pounds. The average rate of gain is about 2.8 pounds per day. The cattle are dewormed the first week and again the third week after they enter the lot. Most of the slaughter bulls stay in the feedlot for about 10 months and receive 7-10 pounds of feed daily. All slaughter bulls are weighed fort-nightly, and remain in the lot until their rate of gain slows down. The Brown Swiss bulls perform better in the feedlot than the Holstein, but they tend to have more foot problems in the wet climate. Three full time men could handle the labor in the feeding operation. The lots are 1/3 covered and 2/3 open, which seems to be appropriate in this climate.

The grass is produced and harvested (zero grazing) on 39 acres for the lot. Nine cuttings per year are obtained from the pastures fertilized at a rate of 120 # N, 40 # P, and 60 # K. One of the major problems encountered with the feedlot is the availability of by-products to mix a consistent ration. The Estate tries to have two months' supply of feed on hand at all times, and even then they usually are required to change the proportional mix in their feed. Because of the seasonal production, citrus pulp is purchased

once per year (last price was $61 per ton). The mixed feed currently costs $73 per ton.

The dairy herd has an average conception rate of 65 percent. Milk reduction averages 912 gallon per year, with a high of 1440 gallons. Farm prices for milk are:

Fluid milk - 20¢ per quart
Processing milk - 13¢ per quart

Tullock Estates fed two lots of cattle last year for comparison of the available commercially mixed (Mastermix Beef Supplement 12%) feed to the Tullock ration, which consists of 50% beef supplement, 22%, and 50% citrus pulp. The animals were all bulls and a combination of Brown Swiss, Holstein, and Charolais crosses from the milk herd. The bulls were kept on feed for a total of 98 days, from 12/17/72 to 3/25/73.

Results:

	Mastermix (8 animals)	Tullock Ration (10 animals)
Average starting weight	431 lbs.	461 lbs.
Average finishing weight*	638 lbs.	744 lbs.
Total Liveweight gain	1656 lbs.	2830 lbs.
Average daily liveweight gain	2.11 lbs.	2.88 lbs.
Total feed consumed	4800 lbs.	10,500 lbs.
Feed conversion ratio**	2.89 lbs.	3.71 lbs.
Cost of concentrate (@$129.50/ton)	6.5¢ per lb.	3.2¢ per lb.
Cost per lb. liveweight gain	18.79 cents	11.9¢

* Finishing weight refers to weight at end of trial, not the weight at slaughter.

** In terms of pounds of concentrate per pound of liveweight gain.

In addition to the above rations, the bulls received chopped grass daily (harvested from the "zero grazing" land).

Worthy Parks Estates' produces sugar (has it's own mill), citrus, cocoanuts, and livestock (no dairy). Sugar takes first preference on the flat, fertile land. They produce 40 percent of the sugar for their mill, but in recent years the other producers have cut back sugar production, resulting in the loss of good land from the livestock part of the Estate. Since most of the good flat land (900 acres) is in Pangola grass, they are plowing up the Pangola to plant sugar cane. In order to maintain the livestock operation, they are trying to find acceptable land for Pangola on the remainder of the land allocated to livestock production (2600 acres).

The cattle enter the feedlot at 450 pounds and are implanted, wormed three times (every two weeks), and leave the lot at about 800 pounds. The lot produces about three batches of fed animals per year. The cattle gain at about 2.6 pounds per day while in the lot and sell for about 43¢ per pound. Approximately 20 percent of the dry matter consumed is grass, which is fed to the cattle in the lots (zero-grazing). About 400 head are fed out and sold each year from a cow herd of 1500. No cattle are currently purchased for the feedlot. A cross of Brown Swiss-Brahman is being used currently because of the higher milk production (calves are in much better condition at weaning than the Brahman alone). The feedlot requires about four men to supply the required labor. In 1972, the calving percentage was about 78 due to problems associated with an infected bull, but now Mr. Dinnon thinks they are running 87 percent. Mr. Dinnon also stated that their off-take is about 1/3 from all herds. They have five registered Brahman herds and seven commercial herds. They would like to sell more of their registered Brahman stock.

The annual rainfall at the Estate is about 60 inches per year. The wage rate paid to labor by the Estate is $1.65 for boys, $1.99 for men and $2.22 for senior men per day worked.

Most of the finished stock is sold to wholesale butchers who transport the cattle to Kingston for slaughter.

There is a milk processing plant located in Kingston, but a large portion of the milk marketed in Jamaica is delivered in the raw state. It is estimated that there are about 40,000 head of producing dairy cows in Jamaica. The government is importing Holstein cows from Canada, keeping them for one year, and selling them to small farmers who have been trained to care for them. These farmers lease 30-35 acres of land which is promised to them and/or their families as long as development is continued.

Beef is typically purchased by butchers who travel through the countryside to collect cattle for slaughter. The butchers transport the cattle to municipal slaughter plants (Government requires inspection), where the cattle are killed but not cut up. A few large plants have facilities for chilling the meat but most small plants handle the meat warm. Most frozen stew meat is imported from New Zealand. There is a law on the book in Jamaica which prohibits the slaughter of females under two years of age.

Existing slaughter facilities are not modern and are not equipped to utilize the animal by-products. There are plans to construct modern slaughter and by-product facilities to better utilize the available livestock production. Poor slaughter facilities, lack of uniformity, and the erratic supply conditions result in the hotel trade importing their meat from the U.S. and Canada. Local meat consumption is supplied by domestic production and importation of New Zealand beef.

Retail prices for meat are freely determined for cut meat at a supermarket price for steak of about $2.27 per pound and a country price of $1.14 per pound. Cheap cuts are controlled at a price of $.40 per pound. Live cattle prices were controlled until recently at 25-30¢ per pound. When price controls were lifted the live cattle price moved up to a level of 43-45¢ per pound. There is no import tax levied on imported beef.

Barbados Livestock Production

Most of the cattle production in Barbados is dairy with one to two cattle owned by the farmer for milk and many of the calves are slaughtered as early as a few days old so that the milk can be sold. Out of a total cattle population of about 20,000 head, only four or five ranches have as many as 100 head of cattle. All abattoirs are municipally owned and inspection is required for all beef sold. The butchers go around the island to collect culled cows and the few beef cattle. The cattle are sold by sight and on a per head basis. In the market beef sells for about $.90 per pound. Barbados like most of the West Indies' will not import beef from Guyana because of the presence of foot and mouth disease in the Rupununi. A small amount of beef has been shipped to a couple of the islands from Guyana, but it was raised on the coast. Most, if not all, of the hotel beef consumed in Barbados is imported from the U.S. and Canada.

Canadian Cane Consultants have been working with a machine to separate sugar cane into three components: (1) fiber (to be pressed), (2) wax, and (3) comfith. The comfith is being fed to cattle as a high energy feed with the addition of protein supplements. The machine costs about $35,000 and can produce four tons of comfith per hour. Urea, cocoanut meal, linseed meal, rape seed meal and fish meal have been added to the comfith as a protein supplement. The dry season effects on the sucrose content of the cane is creating a visible slow-down in the rate of gain of the animals in the feedlot. It was estimated that five to ten percent of the can produced in Barbados could feed out enough beef to meet the current demand. Sugar cane requirements are such that 350 acres of cane could produce enough comfith to feed out 1680 bulls to slaughter weight in 18 months from birth. Tests are now

underway on using the comfith in both pig and dairy rations. They have been able to add urea to create a 50-60% crude protein mix for beef and a 33 1/3% crude protein mix for dairy.

The following feeding experiment was conducted by the Consultants in Barbados. Since most of the male dairy calves are slaughtered soon after birth, the Consultants bought calves at 2-days of age and fed them on commercial type feed until they reached 200-250 pounds. They entered the feedlot at 200-250 pounds and were sold at 1000-1100 pounds. They were able to feed these calves out at an average cost per pound of gain of 23-25¢. In order to improve the finish on the calves, they added corn to the ration toward the end of the feeding period. Rates of gain were two pounds per day on comfith without corn, and two and a half pounds per day when corn was added to the ration. At completion of this test, they had a trial acution where some of the hotel owners bought some of the beef at 40-42¢ per pound. The auction was tried because they wanted to see the reaction to this selling technique since all regular beef is bought by the butcher on a per head basis.

Comfith CT is the comfith with the leaves ground up in it and is composed of 75% comfith and 25% leaves by weight. The comfith is not easily stored because it must be dried before it can be stored for any length of time. Studies are underway on the possibility of making silage of comfith and storing it in this way.

The University of the West Indies

The group of Purdue Agricultural Economists visited the Barbados and Trinidad branches of the University of the West Indies. We met with scientists working in the livestock production and marketing areas in the West Indian countries. The remainder of this paper is composed of the information obtained during these meetings.

Plans are to put in a large scale feedlot using comfith as the primary energy source in Mexico. Trinidad also plans to experiment with a commercial sized feedlot, feeding comfith, in the near future. Success in the commercial use of comfith is highly dependent on the world market for sugar cane, since sugar production is the most profitable use of the cane and cane land in the West Indies. In addition to the opportunity cost of producing sugar, the inability of comfith to withstand storage for any period of time is a major constraint because the soluble sugar of current cane varieties drops, during the rainy season from 62% to 55%, requiring molasses and corn supplementation during this period. New animal feed varieties could possible be developed to reduce this drop in soluble sugar during the rainy season but the problem still exists of trying to harvest the cane from a wet and muddy field. We need additional information on the performance of cattle on differing sucrose levels in their feed to guide the development of new animal feed varieties of sugar cane. Preston, in Cuba, has done a good study of the effect of sucrose content of molasses on animal performance.

Most cattle and swine feeds in the West Indies comes from by-products of sugar and imported grains. Molasses and bagasse (pith with sugar removed) are the by-products of the sugar industry used here. In Jamaica, Pimola (a mixture of bagasse, molasses and urea) is used as a cattle feed. Trinidad has its own source of urea from the offshore oil producers here. The by-products

of the brewers in all of the West Indian countries is dried and fed to livestock as brewers grain. Wheat middlings and bran are available as a by-product of the bread industry. Locally produced cocoanut meal is also utilized as a livestock feed. Citrus pulp, a by-product of juice production, is available once per year and must be dried and stored if it is to be a viable part of a feed ration on a year-round basis. Granda is now in the process of experimenting with silage made from citrus pulp as a year-round feed source. Rice stubble is not usually grazed in Trinidad. It is thought that Guyana would have substantial quantities of rice bran because of their relatively large acreage of rice production.

CIAT is carrying on tropical legume research this year in Beleize and Antigua. Pangola is used for grazing throughout the West Indies and no problems have been experienced yet with the stunt virus around Trinidad. Oaks went to Africa and brought back several species of tropical grasses to Puerto Rico for breeding and development of good grasses for the Caribbean. Townsville Stylo would be a good forage to harvest but it is poor to mix with other grasses or even establish alone for grazing. High levels of management are required for legume production as a harvested crop and it is impossible to manage legumes when used for grazing.

A very important research area that has been neglected is the determination of the energy content of tropical grasses. In 1957, P. N. Wilson introduced Pangola grass to the West Indies. Pangola's acceptance was based on its agronomic characteristics with little knowledge or emphasis on its nutritional value for livestock production.

Caroni, Limited, in Port of Spain has been working on selective breeding of water buffalo to develop a good blood line for meat production. They have been using a feedlot to finish the bufallo and have produced slaughter animals

that have a dressing percentage slightly less than cattle. The water buffalo are very well adapted to production in very wet, low lying areas such as the river valleys of Guyana. Most of the beef currently produced in Trinidad is a product of the dairy industry and the bulls are slaughtered at a very young age. Holsteins are the dominate breed used in Trinidad. The conception rate of dairy cows is very low in Trinidad (about 50%) with the current AI processes. The calving interval is estimated to be about 15 months. Trinidad has a law that requires government approval for the slaughter of any cows which results in only slaughter of very old cows. Bull calves are usually slaughtered at about 18 months of age, at a weight of 400 to 500 pounds. These young bull calves could be bought (if a market existed) by a feeder and finished to a heavier weight. Due to the lack of vast land areas, most of the West Indian countries will be required to produce livestock on a very intensive basis.

Edmond has done some research in Trinidad on production and utilization of maize silage in livestock production. Collas utilized small vacuum kits store pre-wilted Pangola grass for a small number of cows. Since protein supplement is required during the dry season, Dr. Williams feels that farmers must go to silage or some stored forage to survive. The small islands must aim at one cow per acre in order to produce their own dairy products and meat. Some hay is now being used at Barbados and Anti ua for feeding during the dry season. It is believed that maize can produce 40 tons of silage per acre, per year in the West Indies.

Jamaica, Guyana and Belize are the only countries in the trade group that have land areas large enough for beef cattle production. Guyana has the problem of foot and mouth disease in the Rupununi (there was an outbreak reported at Lethem in December, 1973), which has resulted in the islands

refusing to import Guyana beef. Some islands have recently accepted Guyana beef that was produced on the coast. Some of the small islands could possibly be self-sufficient in beef, but in order to do this they would generate a very bad balance of payments problem due to the reduction in production of exportable goods. In most of the West Indies, the lack of adequate farmer training is a major obstacle to increased livestock production. Jamaica has a very good farmer training program and also has well trained personnel working in the Ministry. North American technology and management has taken over rapidly in the poultry industry (vertically integrated) but has not been accepted in the production of other livestock. Foreign control over the stock feed industry along with government controls over the prices has been, and continues to be seen as a problem for the livestock sector. An example was cited: "A Colombian ship loaded with soybeans had to sit at the docks for an extended period of time because none of the foreign controlled feed companies could get permission to purchase the beans." Self-sufficiency in the production of meat is a more difficult goal due to the increase in demand resulting from the ever-increasing per capita income. In Trinidad the division of Extension and the University does not lead to the best farmer training program. The extension section is completely independent of the University and vice versa. Only the Minister can direct the government Extension staff to release any information given out by the University. Much of the research either stops short of completion, or the results are not transmitted to the farmers. Dr. Williams thinks that there could be some potential use of single cell protein (methane) in Trinidad livestock production.

The Crown Lands Dairy Development scheme is to give a farmer 20 acres of land which is to be divided into paddocks for one month cycle, year-round grazing for 20 dairy cows. Each cow is to receive four pounds of concentrate per gallon of milk produced, regardless of the amount or quantity of grazing available. Production tends to vary between three gallons per day during good grazing to one gallon per day during the dry season. The paddocks are fertilized with sulphate ammonia (one to two applications) and some P and K are added. Approximate rates are as follows: (1) P - very little used, (2) K - land not very responsive, so little is used, (3) N - 200 pounds per acre, per year. Experiments in Puerto indicate that grass is responsive to N up to 800 pounds per acre, per year. The N is usually applied during the early part of the wet season which is probably wrong because it is eroded from the soil and gives very little response. Adequate N is used during the establishment (first year) but is probably cut back to save money in later years. Cows are milked twice per day and the average production has been 1.8 gallons per day. The problem of short lactations probably exists but is not reported because the cows are milked as long as any milk can be squeezed out. No irrigation is used but could possible be tried. One problem is that the soil is very non-permeable, so that rain results in flooding.

Butchers or dealers drive around and buy the animals by the head, take them to the municipal abattoir, and pay the slaughter fees to the abattoir and slaughterman. The slaughtering is done with hand equipment and the carcasses are inspected but not to USDA standards. The meat must be sold to the consumer within one day after slaughter. Meat is meat so that no premium is paid for quality meat. Imported beef (New Zealand) sells for $1.25-$1.50 per pound, whereas locally produced meat is sold at the controlled price of

75¢ to 90¢. A black market does exist for locally produced meat. The profits made from the black market are usually received by the butchers or dealers. A typical dealer would buy ten animals per day and sell the meat on his own stalls in the market. The live price for cattle is about $.30 - $.33 per pound. Very little of the offal from the slaughter of beef cattle is utilized and the skinning is so poor that the hides are of little value.

Most of the islands are in good shape with respect to diseases. Guyana, Trinidad and Belize have some problems with rabies in cattle. Guyana's primary problem with respect to exporting of beef is the presence of foot and mouth disease. Dr. Williams feels that tick-spread diseases are among the worst problems facing the cattle producers in the Caribbean.

About 65% of the meat consumed in the West Indies is imported. The only meat product ot be produced in any sizable amount is poultry, and it is produced from imported feed grains. With a continual increase in disposable income, the demand for meat (especially beef) has been on a continual increase.

The biggest problem with livestock production in most of the islands is the imported feed industries. In Trinidad there is no potential for development of a beef for export, two barriers exist to them supplying the Caribbean with beef: (1) foot and mouth disease, and (2) inadequat transportation facilities.

Individuals Interviewed During West Indies

Trinidad

Dr. K. Archibald - Livestock Science

Dr. S. C. Birla - Agricultural Economics

John Cropper - Agricultural Economics

Professor David Edwards - head of Agricultural Economics

L. Liverpool - Agricultural Economics

Dr. P. O. Osuji - Livestock Science

Dr. Holman E. Williams - head of Livestock Science

Mr. E. F. Unsworth - Livestock Science

Jamacia

Don Turner - Tulloch Estate

Brian DaZidon - AICAN Jamaica

George Dinnon - Worthy Park Estates

F. M. Dixon - Ministry of Agriculture

Dr. L. E. McLaren - Ministry of Agriculture

Dr. J. A. Richards - Ministry of Agriculture

Barbados

Mr. John M. Mayers - University of the West Indies, Barbados

C. K. Lanrie - Canadian cane consultant

Dr. Caspar Warnaars - Canadian cane consultant

Lionel A. James - Canadian cane consultant