AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

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Batch #34

1. SUBJECT CLASSIFICATION

A. PRIMARY: Serials — Y-AL30-5200-GG50

B. SECONDARY: Agriculture--Animal nutrition--Ruminants--Tropics

2. TITLE AND SUBTITLE

Ruminant livestock development programs for the tropics,with emphasis on nutrition and forage production and use; annual report,1972/1973

3. AUTHOR(S)

(101) Fla. Univ. Animal Science Dept.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1973	55p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS

Fla.

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

(Activity summary)

9. ABSTRACT

10. CONTROL NUMBER

PN-AAB-928

11. PRICE OF DOCUMENT

12. DESCRIPTORS

Feeding stuffs
Livestock
Tropics

13. PROJECT NUMBER

14. CONTRACT NUMBER

CSD-3684 211(d)

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

CSD-3684 211(d)
1972-1977
PN-AAB-728

211d ANNUAL REPORT
University of Florida
1 July 1972 to 30 June 1973

A Grant to Strengthen the Capabilities in Ruminant Livestock Development Programs for the Tropics: With Emphasis on Nutrition and Forage Production and Use.

Grantee:

Animal Science Department
Agronomy Department
Center for Tropical Agriculture
Institute of Food and Agricultural Sciences
University of Florida, Gainesville, FL 32611

21ld Annual Report
July 1, 1972 to June 30, 1973

Title: "A Grant to Strengthen the Capabilities in Ruminant Livestock Development Programs for the Tropics: With Emphasis on Nutrition and Forage Production and Use."

Grantee: Animal Science Department
Agronomy Department
Center for Tropical Agriculture
Institute of Food and Agricultural Sciences
University of Florida, Gainesville, FL 32611

Director: H. L. Popenoe, Director Center for Tropical Agriculture
T. J. Cunha, Chairman Department of Animal Science
D. E. McCloud, Chairman Department of Agronomy
Senior Scientist - Joe H. Conrad, Professor of Animal Nutrition and Coordinator Tropical Animal Science Programs.
Senior Scientist - G. O. Mott, Professor of Tropical Forage Crop Management and Coordinator Tropical Forage Programs.

A. Statistical Summary:

Period of Grant: 1 July 1972 to 30 June 1977
Amount of Grant: $500,000, of which $250,000 is to the Department of Animal Science and $250,000 is to the Department of Agronomy.

Expenditures: For current reporting period 1972-1973; Animal Science and Agronomy (Pasture and Forage) - accumulated expenditures, $46,664.55; anticipated next year, $112,500.00.

B. Narrative Summary:

Both the Animal Science and Agronomy Department representatives have participated fully in the activities of the Consortium composed of representatives from University of Florida, Tuskegee Institute, Texas A and M University and Purdue University. The specific activities are spelled out in more detail in the Consortium Annual Report.

Five one-two day information exchange seminars and planning meeting were held in the U.S., attended by consortium representatives and AID advisors.

A six day symposium and visit was conducted in Guyana following the selection of this country as a potential country for a consortium study and preliminary contact with Dr. P. A. Reid, the Minister of National Development and Agriculture and livestock authorities. During these six

days in Guyana, the consortium members conducted a symposium on topics of interest specifically related to the functioning of the consortium and on the available livestock information in Guyana. In addition, visits were made to cattle production operations in the five representative regions of the country.

Both the University of Florida and Tuskegee Institute have had AID contracts in Guyana. The beef cattle and pasture and forage program with the University of Florida has been in operation since 1968 with major emphasis on the development of production parameters through research with beef cattle, pastures and forages at the Ebini Research Station in the intermediate savannahs of Guyana. Since 1968, 51 trips were made to Guyana involving 472 man-days. This research yielded a wealth of data and has provided significant information for assessing the potential for beef production in the intermediate savannahs of Guyana. These data have been summarized in five Annual Reports, three scientific reports presented at the 4th meeting of the Latin American Association of Animal Production and a preliminary report on "Estimated Resource Requirements, Costs and Returns for Five Beef Production Alternatives" based on response data from the trials. In addition, research information from the cattle herds were used in a nutrition study resulting in a Master's Thesis by Noel Holder, Livestock Officer and Director of the Ebini Research Station.

Results of grasses and legume introductions into Guyana and other tropical countries by University of Florida personnel resulted in the release of Transvala Digitgrass, a tropical forage resistant to sting nematode and Pangola stunt virus. The response of pigeon pea and pangolagrass to fertilizer in the Intermediate Savannah soils of Guyana have been studied. Establishment trials with legumes and grasses were carried out at the Ebini Research Station in Guyana.

A series of studies relating to tropical pastures and forages have been conducted. A visiting professor from the University of Queensland directed studies on the effect of temperature on seed production parameters in Stylosanthes varieties. Investigations were conducted on flooding tolerance of bermudas and methods of extending the growing season of Digitaria with gibberellic acid.

Digestibility studies both <u>in vitro</u> and <u>in vivo</u> have been conducted with 14 tropical grasses. Some of the factors studied were the effects of anatomical parameters and stage of maturity on digestibility.

Therefore, the University of Florida is currently in a posi on to furnish nutritional, pasture and forage as well as cattle production information based on research data which can be applied to developing micromodels suitable for evaluating production systems at the herd level and cattle development systems at the country level using macromodels.

The Departments of Animal Science and Agronomy have strong tropically oriented teaching and research programs as well as cooperative research and development programs with other countries. Courses for academic credit during the past year were taught in Animal Production in the Tropics, Tropical Pasture and Forage Science and Tropical Soils. Many of the courses have a strong tropical bias such as Animal Nutrition, Forage

and Pasture Science, Beef Cattle Science, Reproduction in Farm Animals, Dairy Cattle Nutrition and Management, Physiology of Reproduction, Genetics of Animal Improvement and Mineral Nutrition and Metabolism. The fact that nearly all of the Animal Science and Agronomy Faculty have had tropical experience, the semi-tropical conditions of Florida and the large number of students from tropical areas not only make this tropical bias relative but also imperative.

Short Courses, as a means of disseminating the latest information in animal science and pastures and forages, were a frequent occurrence during the past year. The 22nd Annual Beef Cattle Short Course held on May 3, 4 and 5, 1973 was attended by 900 people. There were 64 persons from 16 foreign countries and 68 people from 18 states, other than Florida, in attendance. This was followed by the 7th Annual Latin American Livestock and Poultry Conference on May 7-11, 1973. This conference was presented in Spanish and 247 attended from 22 different countries. Twenty-six Spanish speaking students assisted with the translation and presentation of the information, a majority of which was concerned with beef and dairy production and pastures and forages. Invited speakers from Australia, Costa Rica and Venezuela also presented papers.

The Center for Tropical Agriculture and Tropical Animal Science Programs helped to organize, sponsor and execute the 2nd Annual Central American Beef and Dairy Cattle Short Course in David, Panama March 19 and 20, 1973. Four speakers from the University of Florida faculty participated in this short course which is presented each year in conjunction with the Central American Livestock Exposition.

All of these short courses are again planned for 1974. In addition the First Annual Seminar and Laboratory on Meats Classification, Sanitation and Zoonosis Control in Latin America will be held July 9-27, 1973 at the University of Florida. This event, sponsored by the Department of Animal Science will be given in Spanish to those who are involved in their countries' Livestock and Meats Industries.

Partial travel expenses were paid from 211d funds for Dr. C. B. Ammerman and Professor P. E. Loggins to attend the 3rd World Animal Production Conference in Melbourne, Australia. Expenses were paid for Dr. Ray L. Shirley to attend the 2nd International Symposium on Trace Element Metabolism in Animals at the University of Wisconsin on June 18-22, 1973. These funds were also used to sponsor the attendance of Professors C. B. Ammerman, J. H. Conrad and D. E. Franke as well as Graduate Research Assistants Karl Fick from Honduras, Lauro Muller from Brazil and Raul de la Torre from Ecuador to attend the Latin American Association of Animal Production Meetings on June 25-29, 1973 in Guadalajara, Mexico. Seven research papers were presented by these faculty and graduate research assistants.

During this reporting period the faculty of the Departments of Animal Science and Agronomy have had cooperative research and development cattle and pasture and forage programs with the Ministry of Agriculture in Brazil, INIAP in Ecuador, AID-Ministry of Agriculture in El Salvador, AID-Ministry of National Development and Agriculture in Guyana, Panamerican Agricultural School in Honduras, Central Bank in Nicaragua and AID-Ministry of Education in Vietnam. Faculty members have also visited

and consulted on cattle and pasture and forage programs in Colombia, Costa Rica and Venezuela.

In addition, the AID sponsored project "Survey and Analysis of Feed Production and Animal Nutrition in the Wet/Dry and Humid Tropics of Latin America" has continued to receive and process pertinent nutritional data in preparation for publication of an Atlas of Nutritional Data on Latin American Feeds and a Manual on Nutritional Data on Latin American Feeds. Both of which will be published in English, Spanish and Portuguese.

Numerous scientists from Africa, Australia, Central and South America and Southeast Asia have visited with University of Florida faculty at Gainesville regarding beef and dairy nutrition and production as well as tropical pasture and forage programs. Many of them have also visited one or more of the six research centers in Florida where research programs are in progress with beef and tropical pastures.

C. Detailed Report

1. General Background and Purpose of the Grant

Ruminant livestock convert grass, cereal crop residue, and by-products from processing that have either no value or reduced value in other uses into high quality protein for human diets. These products are prevalent in the tropics and in many cases are produced on land that cannot be used for cereal production. Livestock is both a source of food for the general population and a source of employment for large sub-sectors. In some cases entire societies live directly from livestock.

Livestock plays important roles in economies that range from subsistence to highly developed. As economic development occurs, the demand for livestock products increases, in contrast to the demand for many crops which decrease as consumers can afford better diets. For this reason in some LDC's livestock could become a stable earner of foreign exchange. Finally, progress in crops production, which in the last decade has vastly outstripped progress in livestock production, is freeing up land for livestock grazing and producing surpluses of cereals over human needs which can be used for livestock feed.

This proposal is one of four for activities that would explore the livestock industry from a total systems viewpoint, on the assumption that piece-meal attacks on a complex problem (nutrition, breeding, disease control or credit) have been inadequate.

Primary objective of this set of grants is to strengthen capabilities of four U. S. Universities to identify opportunities for significant livestock development in LDC's, to analyze constraints to and resources for such development, and to design programs to overcome constraints through an integrated, multi-disciplinary team approach.

At the University of Florida this grant will provide funds for cooperating with other consortium members in determining geographical foci for the problems, in identifying the bottlenecks to livestock development and particularly where these fall into the area of animal nutrition, the

funds will be used to find ways to overcome these deficiencies. In this way the University of Florida's competence will be enhanced in working across disciplines and with other universities generally and in working in the area of animal nutrition, with special emphasis on tropical feeds and forages. Current training within the Center for Tropical Agriculture at the University and abroad will be strengthened. An ongoing AID supported program to collect analytical feed and forage data from laboratories in Latin America will be strengthened.

II. Objectives of the Grant

1. Objective Restated

The four Universities already have established institutional commitments to agricultural programs in the developing nations. The Universities have agreed that it is to their advantage, as well as to the benefit of the U. S. Foreign Assistance Program to cooperate in the development of an approach to research and technical assistance focused on ruminant livestock systems for the wet/dry tropics. To achieve this objective within the limitations of available resources, they propose, during the five year period to engage in interdisciplinary and inter-institutional activities such as the following:

1. To develop a staff corps within each University structure that will:

a. Identify viable projects aimed toward understanding management requirements and systems in tropical animal agriculture;

b. Provide for an interchange of staff among the cooperating Universities to develop integrated, functional programs applicable to tropical animal agricultural development;

c. Utilize the expertise of visiting scientists from other universities for special requirements;

d. Develop collaborative workshop activities in specialized disciplines pertinent to tropical animal agricultural development.

2. To provide opportunities for education and training of the manpower required for development of the production potential of animals in wet/dry tropics, including:

a. Orientation of resident instruction for in-depth training on the characteristics of animal agriculture and forage production in the tropics;

b. Establishment of student exchange mechanisms to permit sharing of the strengths of the various institutions and to provide practical experience in the wet/dry tropical environment;

c. Development of courses and research in tropical animal agriculture designed to hasten the training and maturity of U. S. and foreign scientists; and

d. Development of non-degree short courses and training seminars.

3. To develop and maintain active research on animal agriculture in the wet/dry tropics as a team effort.

a. Provide staff experience and competence necessary for effective training; and

b. Provide opportunity for student involvement in research as an essential part of training.

4. To accomodate requests for technical assistance and for consulting services relevant to animal agriculture in the wet/dry tropics:

a. Release of staff for assignments in specialized areas of animal agriculture; and

b. Assignment of qualified students for activities that would contribute to their training.

5. To make available institutional physical resources, including office space, laboratories, equipment, and land for accomodation of activities of:

a. Resident staff and students;

b. Exchange staff and students; and

c. Visiting staff and scientists.

2. Review of Objectives

The objective of this grant approach is to improve the capacity of the University of Florida to assist AID, other development agencies and countries in ruminant nutrition and forage production as part of total livestock production and marketing systems. Such capacity will contribute to a systems approach in the design, organization, planning and implementation of research, training and teaching programs. This approach will improve the ability to adapt the system or "package" to tropical environments.

Scope of activities under this grant will include training for regular staff, increase in faculty, experience and research to develop a capability for a systems analysis approach to ruminant livestock development through effective linkages with members of the consortium, LDC institutions and other organizations.

Within this scope of activities, first attention will be given to faculty development, development of work plans with other members (grantees) and defining with more precision areas within the LDC's wherein grant activities will be concentrated.

Contribution of the University of Florida team to the objectives of the 211d consortium "Systems Approach to Ruminant Livestock Development".

The University of Florida has the responsibility of providing information in the area of animal nutrition with special emphasis on tropical feeds and forages which is relevant for the model of ruminant livestock development in the tropics.

The scope of this grant is such that there will not be sufficient funds, nor time to generate production parameters through field research. Therefore, results of research which has already been conducted or is being conducted will serve as the primary source of information. Production parameters from a number of published reports will also be generated. This includes, but is not restricted to:

1. Providing information concerning adapted species and varieties of legumes and grasses for various ecological zones of the tropics.
2. Making estimates from research information concerning the nutrient requirements of various feed (including forage) crops

and their response to fertilizer nutrient inputs into the system.

3. Making recommendations on appropriate grazing management systems to maintain a balance of legumes and grasses in mixed swards.
4. Providing information on cropping systems (including fertilizer inputs and cultural practices) which will produce economical levels of production with a broad spectrum of potential supplemental feeds - corn, sorghum, soybean, peanuts, cassava, etc.
5. Making estimates of the quality of both native and introduced forages and their potential animal production.
6. Providing information concerning the response to mineral supplementation, and protein - energy feeds as supplements in feeding systems on native range and improved pastures.
7. Nutrients and nutritional level are known to effect fertility, calf survival, rate of gain, age at slaughter and economics of production. Making estimates of the direct effects (of various inputs into the system) upon these production parameters will be a part of the responsibility of the University of Florida team.

III. Accomplishments

Objective 1. "To develop a staff corp within each University structure that will:.....".

Dr. Joe H. Conrad, Professor of Animal Nutrition and Dr. G. O. Mott, Professor of Tropical Forage Crop Management have been designated as the two principle senior scientists at the University of Florida to participat in the activities of the Consortium. These two men have participated fully in the activities of the Consortium which are summarized in a separate report "Summary of 211-d Ruminant Livestock Consortium Activities 1972-73"

These men have assisted the Consortium to:

a. Identify viable projects aimed toward understanding management requirements and systems in tropical animal agriculture;

b. Provide for an interchange of staff among the cooperating Universities to develop integrated, functional programs applicable to tropical animal agricultural development;

c. Utilize the expertise of visiting scientists from other universities for special requirements;

d. Develop collaborative workshop activities in specialized disciplines pertinent to tropical animal agricultural development.

Objective 2. "To provide opportunities for education and training of the manpower required for development of the production potential of animals in wet/dry tropics, including:.....".

a) Resident instruction for in-depth training on characteristics of animal agriculture and forage production in the tropics - The following courses have direct application and were taught this past year by professors with extensive tropical experience:

ADP 322 - Principles of Animal Breeding. 5 credits
AL 411 - Beef Cattle Science. 5 credits
AL 527 - Animal Nutrition. 5 credits
ADP 535 - Animal Production in the Tropics. 4 credits
ADP 507 - Reproduction in Farm Animals. 4 credits
AY 536 - Tropical Pasture and Forage Science. 3 credits
AY 647 - Crop Plants in Tropical Environments. 12 credits

FRE 411 - Management of Farms in Tropical Areas. 3 credits
FRE 646 - Agriculture's Role in the Growth of Latin American Nations. 4 credits
SLS 325 - Tropical Soils and Their Environment. 3 credits
SLS 525 - Tropical Soils. 3 credits
VY 663 - Parasitic Diseases in the Tropics and Subtropics. 5 credits

b) Establishment of student exchange mechanisms:

Approximately 35 percent of the graduate students in the Institute of Food and Agricultural Science are from other countries. Twenty-six Spanish speaking students translated and presented papers at the 7th Annual Livestock and Poultry Conference May 7-11, 1973. Three scientists, O. G. Verde, F. R. Fenton and David Timm from Venezuela, Gustavo Cubillos from Costa Rica and L. R. Humphreys from Australia presented papers at this conference.

A cooperative exchange program involving professors and graduate students is in effect with the University of Antioquia, Faculty of Veterinary Science and Animal Science, Medellin, Republic of Colombia.

c) Development of courses and research in tropical animal agriculture.....

A Tropical Agriculture Committee in their report to the Dean of Resident Instruction suggested that new courses be developed in the following areas:

1) Forage - Livestock Feeding Systems
2) Cropping Systems in the Tropics
and 3) Agriculture and Rural Development Administration

In addition to the above suggested courses it was recommended that "Each department review its current course offerings and place more emphasis on application of the information to tropical environments". This committee also studied and suggested improvements in "Tropical Agriculture Specializations" for students to qualify for a "Certificate in Tropical Agriculture" or a "Certificate of Tropical Studies".

d) Development of non-degree short courses and training seminars -

7th Annual Conference on Livestock and Poultry in Latin America was presented in Spanish at the University of Florida during May 7-11, 1973. Fifty University of Florida professors, 5 professors from other countries and 26 Spanish speaking students participated in the writing, translation and presentation of the latest information at this conference. This conference was attended by 248 people with 21 foreign countries represented. No financial assistance was provided from University of Florida funds to participants to attend this conference. However, a considerable amount of University of Florida - IFAS faculty time went into the preparation of the "Conference Proceedings" and the conduct of the Conference.

This conference was preceeded by a Beef Cattle Short Course on May 3, 4 and 5, 1973 in which 900 people attended. Of this total 64 people attended from 16 foreign countries and 68 people attended from 18 states

other than Florida.

Two years ago the Central American Livestock Exposition Committee requested that the University of Florida assist them in the organization and presentation of a Beef and Dairy Short Course. The first one was held in Guatemala City in which over 500 livestock producers paid $25.00 each to attend. The Second Annual Central American Beef and Dairy Cattle Short Course was held March 19 and 20, 1973 at David, Panama. Five University of Florida professors and two members from the Florida Department of Agriculture presented papers and participated in this short course. The excellent success of these short courses has been beyond everyone's expectations and plans are nearly complete for the 1974 short course in Tegucigalpa, Honduras and the 1975 short course in San Jose, Costa Rica.

Department of Animal Science faculty anticipated a need for a seminar in meats because of the Latin American interest in meeting the needs of their countries to improve their beef cattle industry and to meet the U. S. import requirements for their beef. Planning for this seminar started in January 1973 and was greatly assisted by the addition of a new Meat Scientist to our faculty in February through 211d funding. Therefore, the First Annual Seminar and Laboratory on Meats Classification, Sanitation, and Zoonosis Control in Latin America will be held at the University of Florida and presented in Spanish from July 8-July 27, 1973. It is anticipated that 35 participants from 10 countries will attend. In order to develop and present the material at this short course up to 5 man-months of faculty and graduate student time will be required. The participants will be required to pay a registration fee and their own per diem. The primary expense to the Department of Animal Science is their faculty time which can be justified on the basis of full time Meat Scientist whose salary is being paid from 211d funding. Details of this seminar will be outlined in the next 211d Annual Report.

Objective 3. To develop and maintain active research on animal agriculture in the wet/dry tropics as a team effort.

The Departments of Animal Science and Agronomy have had and currently do have major research efforts in a number of countries in the areas of tropical livestock and tropical pasture and forage. During the period from July 1, 1972 to June 30, 1973 the contracts were in effect with the man months of scientific input in livestock and pasture and forage programs as follows:

Country	Contract	Funds	Dates	1972-73 Livestock Related Man Months
Ecuador	INIAP	IDB Loan to GOE	1/71 to 12/75	36
El Salvador	AID	USAID/El Salvador	4/69 to 12/72	24
Guyana	GOG	USAID Grant to GOG	7/68 to 6/73	3
Latin America	AIDcsd-2498	AID Washington	6/69 to 9/73	48
Nicaragua	Central Bank	Central Bank Nicaragua	6/72 to 6/73	0.5
Honduras	Escuela Agrícola Panamericana	Same		0.5

Honduras	Adolfo Midence	Same		0.5
Vietnam	AIDcsd-3594	AID/Washington	1/69 to 12/72	12
Brazil	Brazil	Brazil Ministry of Agriculture	10/72 to 9/77	16
				140

In the Department of Animal Science a large proportion of the faculty have had overseas experience. During the period of this report 7 faculty members affiliated with Animal Science and 3 faculty members affiliated with Pastures and Forages were on permanent overseas assignments. Fourteen of the 28 faculty members of the Department of Animal Science at Gainesville were on one or more short term consulting trips, a majority of which were backstopping activities affiliated with on going contracts. In addition, three of the Animal Science faculty at the Branch Stations were on short term assignments in the tropics.

Partial travel expenses were paid from 211d funds for Dr. C. B. Ammerman and Professor P. E. Loggins to attend the 3rd World Animal Production Conference in Melbourne, Australia. Expenses were paid for Dr. Ray L. Shirley to attend the 2nd International Symposium on Trace Element Metabolism in Animals at the University of Wisconsin on June 18-22, 1973. These funds were also used to sponsor the attendance of Professors C. B. Ammerman, J. H. Conrad and D. E. Franke as well as Graduate Research Assistants Karl Fick from Honduras, Lauro Muller from Brazil and Raul de la Torre from Ecuador to attend the Latin American Association of Animal Production Meetings on June 25-29, 1973 in Guadalajara, Mexico. Seven research papers were presented by these faculty and graduate research assistants.

Students are encouraged to conduct research overseas when satisfactory arrangements can be developed. During the past year the following theses have been completed from research conducted in other countries:

Student	Country	Degree	Major Professor	Date Graduation
Noel Holder	Guyana	M.S.A.	C. B. Ammerman	Aug. 1972
Supplemental Feeding of Beef Cattle Grazing Pangola Grass Pastures of the Intermediate Savannah of Guyana.				
David H. Timm	Venezuela	Ph.D.	G. O. Mott	Aug. 1972
Optimum Enterprise Organizations for Dairy Farms West of Lake Maracaibo, Venezuela.				
Vladimir Cruz	Venezuela	Ph.D.	Koger/Franke	Aug. 1972
Genetic and Environmental Parameters of Production in Brahman Cattle.				
H. C. Schoonover	Guyana	M.S.	G. O. Mott	Dec. 1972
Establishment of Legumes and Guineagrass on the Intermediate Savannahs of Guyana.				
R. Ah Chu	Guyana	Ph.D.	Caldwell/Blue	June, 1973
A Pedological Investigation of Selected Soils in the Intermediate Savannah of Guyana.				
A. V. Downer	Guyana	Ph.D.	Blue	1972
Factors Affecting Fertility of Selected Brown Sand Soils of Guyana.				

Abstracts of research conducted overseas were presented at the following scientific meeting:

Latin American Association of Animal Production at Guadalajara, Mexico June 25-29, 1973

Holder, N., M. Koger, J. R. Dickey and R. de la Torre. 1973. Management Effect on Beef Production in Guyana.

Holder, N., C. B. Ammerman, G. O. Mott, M. Koger and K. R. Fick. 1973. Supplemental Feeding of Beef Cattle Grazing Pangolagrass Pastures on the Intermediate Savannahs of Guyana.

Holder, N., M. Koger, J. R. Dickey and R. de la Torre. 1973. Breed and Lactation Effect on Beef Production in Guyana.

Rios, C., M. Koger, D. Crane and J. R. Dickey. 1973. Factors that Affect the Production of Beef in Honduras.

Cruz, Vladimir, M. Koger, A. C. Warnick, D. E. Franke, C. J. Wilcox and F. G. Martin. 1973. Studies on the Period of Gestation in Brahman Cattle.

A number of other theses and publications have been completed or published which are directly applicable to the University of Florida's competence in tropical animal science and tropical pastures and forages. Some of these are listed below:

Byron, H. T. 1973. Nutrient Value of Water Hyacinth Silage for Cattle and Sheep. M. S. Thesis. Major Professor J. F. Hentges, Jr.

Calderon, F. 1973. Evaluation of the Nitrogen Fraction of the Cassava Roots and Factors Affecting its Biological Value. M. S. Thesis. Major Professor H. D. Wallace.

Gebre-Meskel, T. 1973. Reproductive and Weaning Performance of Angus, Brahman, Hereford and Santa Gertrudis Crossbred and Straightbred Cattle on Three Clover Grass Pastures. M. S. Thesis. Major Professor M. Koger.

Golding, E. J. III. 1973. Formulation of Hay: Grain Diets Based on Predicted Qualities of Four Bermudagrass Hays for Ruminants. M. S. Thesis. Major Professor J. E. Moore.

Ventura, M. 1973. Forage Intake and Its Relation to the Chemical Composition of the Diet and Some Physiological Factors in Sheep. Ph.D. Dissertation. Major Professor J. E. Moore.

Boyd, F. T., S. C. Schank, R. L. Smith, E. M. Hodges, S. H. West, A. E. Kretschmer, J. B. Brolmann and J. E. Moore. Transvala Digitgrass, a tropical forage resistant to 1. Sting nematode, 2. Pangola stunt virus. Univ. Fla. Circular S-222, April 1973, 16 p.

Chesney, H. A. D. Response of Digitaria setivalua to nitrogen, phosphorus, potassium, magnesium and calcium on Ebini sandy loam, Guyana. 1972. Trop. Agri. (Trinidad) 49:115-123.

Chesney, H. A. D. Yield response of Pangolagrass grown on Trinidad fine sand to Mg and fritted micronutrients. 1972. Agron. J. 64:152-154.

Schank, S. C., J. R. Edwardson, R. G. Christie and M. A. Overman. Pangola stunt virus studied in Pangolagrass and Digitaria hybrids. Euphytica 21 (1972):344-351.

Schank, S. C., M. A. Klock and J. E. Moore. 1973. Laboratory evaluation of quality in subtropical grasses: II. Genetic variation among Hemarthrias in In vitro digestion and stem morphology. Agron. J. 65:256-258.

Schank, S. C., M. Ventura and J. E. Moore. 1973. Laboratory evaluation of quality in subtropical grasses: I. In vitro digestion of entire plant vs. apical meristem portions of Digitaria. Agron. J. 65:217-218.

Schoonover and L. R. Humphreys. 1973. Comparative study of temperature during flowering on seed production of Stylosanthes humilis selections. Crop Sci. (in press).

More details concerning the University of Florida-IFAS inputs and results from the AID/Guyana contract are given in the appendix. A four volume detailed report has been submitted to AID/Washington.

IV. Impact of Grant Supported Activities in Developing Institutional Capabilities:

The University of Florida had an ongoing program in Ruminant Livestock Development and Tropical Pastures and Forage prior to the awarding of the 211d grant to the Departments of Animal Science and Agronomy. Thus the 211d grant has permitted flexibility in furthering the development of these two programs.

The Department of Animal Science has been able to use these funds for developing a stronger and broader Tropical Animal Science Program. It has been able to provide learning and research experiences for both professors and graduate research assistants which were previously not possible. In addition, they have been able to strengthen the meats teaching and research area which is highly essential for a ruminant livestock development program. Furthermore, they have been able to provide the scientific expertise required contribute to nutritional inputs and parameters required for a multi-disciplinary team approach to ruminant livestock development in wet/dry tropical environments.

The Department of Agronomy has been able to use these funds for the strengthening and expansion of tropical pasture and forage management teaching and research programs. It has been able to provide learning and research experience for both professors and graduate research assistants which were previously not possible. A full time assistant has been added in the area of tropical pasture and forage management. The awarding of the 211d funds has made it possible to backstop the program that was already underway and to expand the tropical pasture and forage program. With these funds it has been possible to provide the scientific expertise

required to contribute pasture and forage inputs and parameters required for a multi-disciplinary team approach to ruminant livestock development in wet/dry tropical environments.

V. Utilization of Institutional Resources in Development.

Under Section III Objective 3, six contracts were listed which were in effect during the current reporting period. These livestock development contracts are in Brazil, Ecuador, El Salvador, Guyana, Nicaragua, Vietnam in addition to a Feed Composition contract encompassing all of Latin America. During the past year 140 man months of faculty time have gone into these livestock and pasture and forage programs. In addition a number of man-days have been utilized in short term consulting which was not covered by formal contracts.

In September, 1972, twenty-three of a total of 41 graduate students in the Department of Animal Science were international students from developing countries. These students were from Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Ethiopia, Honduras, Jamaica, Indonesia, Nigeria, Vietnam and Venezuela.

Foreign Visitors to Department of Animal Science and Agronomy (Pastures and Forages) between July 1, 1972 and June 30, 1973.

7/24-8/4	Manee and Bousuthi, Thailand, Directors of Field Research Stations - AID/U. Kentucky
7/26	Zimolink, Colombia, C.I.A.T., Forage Evaluation
8/15-8/16	E. R. Bowen, Guyana, AID Food and Agricultural Officer
8/17-8/29	Guy Richie, Jamaica, In Charge of Livestock Section
8/21-8/25	T. H. Redder, Australia, Beef Cattle Extension USDA/ERS
9/11	Venezuelan Agricultural Group (6), Beef and Dairy Cattle Governmental Affairs Institute (G.A.I.).
9/13	Don Allen, El Salvador, Ranch Investment
9/27	Alex Ramirez, Vet. Prod. Mgr. L. A. - American Cynamid Milton Marchesi, Prod. Dev. Mgr: Brazil
10/2-10/4	Jan Bonsma, South Africa, Cattle Production
10/9-10/12	Mamadou Diallo, Senegal, Dir. Animal Husbandry - G.A.I.
10/18-10/21	Shehadeh Dajani, Israel, Dir. Agr. Ext. and Research - G.A.I.
10/12	Arthur Mattson, Sweden, Animal Nutrition
10/2-10/27	Chan Kai Chih, Singapore, Head of Pig and Poultry Research.
10/2-10/6	Rex Henry, Senegal, Reg. Livestock Prod. Officer - ATN/Dakar

10/15-11/17	Linden Fraser, Joseph Kendall, Joseph Scott, Bernard Young, Guyana, Special 4 weeks Swine Short Course, AID/Guyana
10/20	Francine Broguer, AID Training Officer for West Africa
1/22	John Glenn, Venezuela, Development Bank, Cattle
1/26	Carlos Guterrez, Costa Rica, Director Guanacasta Exp. Sta.
3/6	Adolfo Midence, Honduras, Cattle Production
3/11-3/13	N. T. M. Yeates, New South Wales, Australia, Professor of Livestock Production, Sabbatical
3/18-3/20	A. J. Smith, Scotland, Centre for Tropical Vet. Med.
3/26	H. Frieseche, Switzerland, Hoffman La Roche
3/28-3/29	Wally N'Dow, Gambia, Chief Vet. Officer, USDA/ERS
3/28-3/30	Robert Fritz, Indonesia, Tropical Livestock, AID
4/5	John Dummett, Guyana Development Corporation, Eisenhower Exchange Fellow, Agr. Loans
4/9-4/10	Martin L. Kyomo, Tanzania, Dean Agr. and Forestry, Ford Foundation.
4/16-4/27	G. E. Wittig and W. R. Wittig, South Africa, Tropical Beef Production, USDA/ERS
4/20	Two Indonesians, Tropical Livestock Production, AID/Kentucky
5/3-5/5	Beef Cattle Short Course, 64 people from 16 foreign countries
5/6-5/11	Latin American Livestock and Poultry Conference, 150 people from 21 foreign countries.
5/15-5/16	Nahun Klein, Brazil, Training Officer, Nat. Cattle Project, Min. of Agr.
5/29-5/30	W. F. Y. Mawson, Australia, Sr. Dev. Planning Officer, Overseas Study Tour
6/1	Raimundo Fonseca, Brazil, Sec. Agr. Bahia - G.A.I.
6/8-6/9	Kerry McIntyre, Australia, Director of Animal Nutrition, Hoffman La Roche
6/11-6/14	John Bishop and Luis Tergas, Ecuador, INIAP Research Station, Pichilingue
6/13-6/15	Cyril T. Matthews, St. Lucia, Chief Agricultural Officer, G.A.I.

6/19 Nelson Amaya, Colombia, Senator for Dept. La Guajira, Beef Cattle Production and Graduate Study, G.A.I.

6/21 Jerome H. Maner, Colombia, C.I.A.T.

In summary, over 260 visitors in 37 groups came to the University of Florida to discuss tropical livestock and pasture and forage programs.

VI. Other Resources for Grant-Related Activities:

An extensive program in ruminant livestock development with emphasis on animal nutrition and forage production and use has been underway at the University of Florida for many years. Currently there are eight ruminant nutritionists and four pasture and forage specialists who are devoting at least 20 percent or more of their time in this area. Two professors are devoting approximately full time to this program with only part of the salary being paid from 211d funds.

Out of state tuition is currently $1,400 per year. Approximately ten fee waivers between the two departments are used for graduate students whose research is related to the overall objectives of the program.

Only a fraction of the travel expenses are paid from 211d funds. None of these funds are used to pay travel to consult on contracts with Brazil, Ecuador, El Salvador, Vietnam or the Latin American Feed Composition Project AID/csd-2498.

Equipment, supplies, materials and publication costs are continually being incurred by the animal nutrition laboratory. the forage evaluation laboratory, AID Contract csd 2498, the Departments of Animal Science and Agronomy and the Center for Tropical Agriculture.

VII. Next Year's Plan of Work and Anticipated Expenditures:

Anticipated expenditures for fiscal year 1973-74 are listed in Table 1 and 2.

University of Florida will continue to give full cooperation to the Consortium by generating and supplying cattle production nutritional and pastures parameters to Texas for their micromodeling and to Purdue for their macromodeling. These parameters will need to be generated to apply specific environmental and regional cattle situations since any country will have substantial regional variation. It is hoped that the Consortium will be able to follow through with Guyana. However, if this is not possible another country or region will be selected such as Venezuela, Brazil or a region of West Africa. It is highly essential that a specific country or region be selected in which there is sufficient research data and information infrastructure available so that meaningful data and information can be obtained.

Furthermore, a consortium seminar or workshop should be held as soon as possible which would focus on the current status of the information and progress of the consortium activities and capabilities in designing and executing ruminant livestock development programs in the tropics. This

should be held approximately one year after consortium activities in a specific country or region have been iniated.

Research activities in the Department of Animal Science in the area of ruminant nutrition will continue to be pursued with the same vigor as in the past. In addition, mineral research in certain selected regions and countries will be iniated to determine mineral deficiencies and imbalances which are serving as constraints to more efficient cattle production. Short course activities including the Beef Cattle Short Course, Latin American Livestock and Poultry Conference and Central American Beef and Dairy Cattle Short Courses will be continued.

A new seminar will be initiated entitled First Annual Seminar and Laboratory on Meats Classification, Sanitation, and Zoonosis Control in Latin America. Over 40 people are expected to pay their own expenses to attend this four week seminar on July 9-27, 1973.

In Tropical Pastures and Forages, funds will be used to support partial salary of a professor, and full support for a graduate research associate, a graduate research assistant and clerical support. A consultant, Dr. H. L. Lucas from North Carolina, has been invited to spend one week in January to conduct seminars on forage and livestock systems.

In Ruminant Nutrition, funds will be used to support partial salary of two professors and partial support for two graduate research assistants as well as some clerical support for tropical animal science programs.

Funds for travel will be used for the African Livestock Seminar in Central West Africa and the International Grassland Congress in Russia in June. Other tentative travel includes Tropical Products Institute, Conference on Animal Feeds of Tropical and Sub-Tropical Origin and a Livestock Conference in Colombia.

Funds for equipment, supplies and materials will be used to support and expand the ruminant nutrition and tropical pasture and forage programs in line with the Consortium objectives to strengthen the capabilities in ruminant livestock development programs for the tropics.

Table I

Distribution of 211(d) Grant Funds and Contributions From Other Sources of Funding*

Review Period 1 July 1972 to 30 June 1973

(List all grant related activities	211(d) Expenditures				Non 211(d) Funding Amount
	Period Under Review	Cumulative Total	Projected Next Year	Projected to end of Grant	
Salaries for Research and Teaching	41,056.86	-	76,000	345,000	68,000
Tuition and fees	-	-	1,500	6,000	14,000
Travel	5,007.69	-	18,000	80,000	20,000
Equipment	600.00	-	5,000	20,000	10,000
Supplies and Materials	-	-	12,000	49,000	20,000
TOTAL	46,664.55		112,500	500,000	132,000

*These figures are your best estimates

Table II

Expenditure Report
(Actual & Projected)

Under Institutional Grant #AID/csd-211d 3684

Review Period 1 July 1972 to 30 June 1973

Budget Items	Expenditures to date		Projected Expenditures				Total Budget
	'72-'73 Period under Review	Cumulative Total 'same'	'73-'74	'74-'75	'75-'76	'76-'77	
			2	3	4	5	
Salaries	$41,056.86	-	76,000	76,000	76,000	75,943	345,000
Tuition and fees	-0-	-	1,500	1,500	1,500	1,500	6,000
Travel	5,007.69	-	18,000	18,000	18,000	20,992	80,000
Equipment	600.00	-	5,000	5,000	5,000	4,400	20,000
Supplies and Material	-0-	-	12,000	12,000	12,000	13,000	49,000

UNIVERSITY OF FLORIDA FACULTY INPUT

AID-Government of Guyana Contract

Table . Short-term Consultants (July 18, 1968 to June 30, 1973)

Name	Date	No. of Days	Task Order No.
Adams, D. E. Electrical Systems	June 16-22, 1973	7	3
Ammerman, C. B. Animal Science	February 23-March 1, 1969	7	5
	February 5-11, 1970	7	5
	June 9-19, 1970	11	5
	September 20-29, 1970	10	5
	November 19-24, 1970	6	3
	April 15-19, 1971	5	3
	December 14-20, 1971	7	3
	May 16-24, 1972	9	13
	November 12-17, 1972	6	13
	December 10-15, 1972	6	13
Bashaw, E. C. Agronomy	April 30-May 11, 1970	11¼	5
Bates, R. P. Food Science	October 24-29, 1971	6	13
	March 21-26, 1972	6	13
	October 3-13, 1972	11	13
Beasley, Robert Agricultural Engineering	October 8-19, 1971	11 3/4	13
Blue, W. G. Soil Science	July 27-August 6, 1969	11	5
Conrad, J. H. Animal Science	December 14-20, 1971	7	13
	November 12-17, 1972	6	13
Cunha, T. J. Administration	October 25-November 1, 1968	8	3
Davies, C. B. Agricultural Engineering	December 4-10, 1971	7	13
Davis, C. G. Agricultural Economics	March 14-21, 1971	8	13
Dickey, J. R. Animal Science	July 1-8, 1971	8	13
	July 30-August 8, 1971	0	13
	December 9-17, 1971	9	13
	July 16-24, 1972	7	13
Dickinson, J. C., II Administration	September 8-14, 1968	7	1

Name	Dates	No. of Days	Task Order No.
Eddleman, B. R. Agricultural Economics	May 1-4, 1969	3	5
	August 30-September 6, 1970	7	13
	March 14-21, 1971	8	13
	May 16-19, 1971	4	13
	October 24-29, 1971	6	13
	May 14-19, 1972	6	13
Elmbar, E. R. Extension	June 12-24, 1973	13	16
Fiskell, J. G. Soil Science	January 9-14, 1972	6	15
Franke, D. E. Animal Science	June 9-15, 1970	7	5
Geraldson, C. M. Soil Science	July 26-August 16, 1970	22	11
	October 24-29, 1971	6	13
Gillen, M. J. Agricultural Extension	February 3-17, 1972	8 on	16
Glenn, J. C. Animal Science	February 23-March 1, 1969	7	5
	July 22-August 1, 1969	11	5
	December 13-19, 1969	7	5
	June 10-20, 1970	11	5
	September 6-11, 1970	6	5
Greenman, J. R. Agricultural Economics	July 26, August 16, 1970	22	11
Grigsby, S. E. Agricultural Extension	July 28-August 19, 1969	23	6
	July 27-August 21, 1971	26	16
	February 3-14, 1972	12	16
	June 12-24, 1973	13	16
Gull, D. D. Vegetable Crops	February 10-16, 1970	7	5
	January 24-29, 1971	6	15
	March 5-10, 1972	6	15
	March 11-18, 1973	8	15
	April 15-20, 1973	6	15
Halsey, L. H. Vegetable Crops	January 24-29, 1971	6	15
	May 2-7, 1971	6	15
	May 30-June 4, 1971	6	15
	August 29-September 2, 1971	4	15
	March 5-10, 1972	6	15
	May 16-19, 1972	4	15
Herbert, J. H. Soil Science	February 3-20, 1969	18	2

Name	Dates	No. of Days	Task Order No.
Hinson, K. Crop Production	April 30-May 10, 1970	11	5
	June 25-29, 1970	5	5
	August 20-31, 1970	12	5
	February 18-22, 1971	5	13
	May 2-10, 1971	9	13
	July 27-August 3, 1971	8	13
	October 10-18, 1971	9	13
	March 16-24, 1972	9	13
	August 31-September 8, 197	9	13
	March 13-21, 1973	9	13
Hooker, P. Agricultural Economics	October 24-29, 1971	6	13
Koger, M. Animal Science	February 23-March 2; 5, 196	8	5
	July 23-27, 1969	5	5
	December 14-19, 1969	6	5
	February 5-11; 13, 1970	8	5
	December 6-14, 1970	9	13
	July 1-8, 1971	8	13
	June 16-22, 1973	7	13
	December 10-15, 1972	6	13
King, E. E. Agricultural Extension	February 3-17, 1972	13 only	16
	June 12-24, 1973	13	16
Locascio, S. J. Vegetable Crops	January 24-29, 1971	6	15
	May 2-7, 1971	6	15
	May 30-June 4, 1971	6	15
	July 27-30, 1971	4	15
	January 9-14, 1972	6	15
	May 16-19, 1972	4	15
Lorz, A. P. Vegetable Crops	February 10-16, 1970	7	5
McCloud, D. E. Administration	October 24-November 1, 1968	9	3
	June 11-15, 1970	5	5
McCown, J. T. Extension Administration	March 2-11, 1973	10	16
Marlowe, G. A., Jr. Administration	February 10-16, 1970	7	5
	October 24-29, 1971	6	15
Marvel, M. E. Administration	November 12-22, 1972	5	13
	April 12-20, 1973	8	13
Moore, J. E. Animal Science	May 1-5, 1969	4	5

Name	Dates	No. of Days	Task Order No.
Mott, G. O.	February 23-March 2, 1969	8	5
Forages and Pastures	May 1-5, 1969	4	5
Administration	July 27-August 6, 1969	11	5
	December 14-19, 1969	6	5
	January 27-February 9, 1970	14	5
	September 22-29, 1970	8	5
	April 11-19, 1971	9	13
	May 16-24, 1971	9	13
	August 5-9, 1971	5	13
	December 14-20, 1971	7	13
	May 16-24, 1972	9	13
	April 12-20, 1973	9	13
Myers, J. M.	December 14-19, 1969	6	5
Agricultural Engineering	May 18-24, 1971	7	13
Norden, A. J.	June 21-26, 1969	5	5
Crop Production	June 25-29, 1970	5	5
	August 19-24, 1971	6	13
Popenoe, H. L.	April 11-16, 1971	6	13
Administration			
Prine, G. M.	November 16-22, 1969	7	5
Crop Production	June 25-29, 1970	5	5
	May 2-10, 1971	9	13
	July 27-August 3, 1971	8	13
	May 9-15, 1972	7	13
Ross, J. E.	December 15-20, 1971	6	13
Administration	March 26-29, 1972	3	12
	November 12-15, 1972	4	13
Saxena, G. K.	January 9-14, 1972	6	15
Vegetable Crops			
Schank, S. C.	May 1-5, 1969	4	5
Forages and Pastures	December 10-13, 1970	4	13
Schoonover, H.	March 18-June 23, 1972	7 payperiods	13
Forages and Pastures	September 7-16, 1972	9	13
	June 16-22, 1973	7	13
Shaw, L. N.	July 26-August 16, 1970	22	11
Agricultural Engineering	May 18-24, 1971	7	13
Shell, E. W.	May 4-24, 1969	21	4
Fisheries			
Sites, J. W.	January 27-February 4, 1970	8	5
Administration			
Skinner, T. C.	July 18-26, 1971	1	13
Agricultural Engineering			

Name	Dates	No. of Days	Task Order No.
Smerdon, E. T. Agricultural Engineering	July 18-26, 1971	9	13
Straughn, A. A. Agricultural Extension	July 27-August 21, 1971	26	16
	December 3-7, 1972	5	16
	March 2-11, 1973	10	16
Tefertiller, K. R. Administration	October 24-November 1, 1968	9	3
Whitty, E. B. Crop Productior	July 27-August 6, 1969	11	5
	November 16-22, 1969	7	5
	April 4-10, 1970	7	5
	April 30-May 10, 1970	11	5
	January 21-25, 1971	5	13
York, E. T., Jr. Administration	September 8-12, 1968	5	

HLPM-1775

SUPPLEMENTAL FEEDING OF GRAZING CATTLE IN THE INTERMEDIATE SAVANNAHS OF GUYANA

N. L. Holder, C. B. Ammerman
G. O. Mott, M. Koger and K. R. Fick
Ministry of Agriculture, Guyana and
University of Florida, Gainesville

The performance of calves fed different supplements while grazing Pangolograss pasture for 280 days was determined with 204 weanling calves. The calves were weaned from females grazing either improved or native pasture. Bulls and heifers, weighing an average of 322 and 357 pounds initially, were assigned in groups of 8 and 9 respectively, to 10-acre pastures with 2 pastures per sex for each treatment. A complete mineral supplement was provided ad libitum and the six treatments were: (a) pasture only, (b) rice bran, (c) copra meal, (d) rice bran/copra meal (1:1) mixture, (e) molasses-urea (3%) and (f) rice bran/copra meal/molasses-urea (1:1:1) mixture. The sugarcane molasses-urea mixture was fed at a level of 1% of body weight and all other supplements were fed at levels to provide equal total digestible nutrients. The animals weaned form native pastures gained more weight (P .05) than those weaned from improved pastures. There was a highly significant sex difference (P .01) in growth rate with bulls gaining more on all treatments except mola-ses-urea. Significant differences (P .05) were observed in animal weight gains due to treatment. The average gains in pounds for the 280-day period according to treatment were: (a) bulls 1.20, heifers 0.85; (b) bulls 1.44, heifers 1.04; (c) bulls, 1.54, heifers, 1.20; (d) bulls, 1.53, heifers, 1.03; (e) bulls, 0.91, heifers, 0.94; and (f) bulls, 1.59; heifers, 1.38.

ASOCIACION LATINOAMERICANA DE PRODUCCION ANIMAL
FORMATO PARA COMPENDIOS

Titulo: MANAGEMENT EFFECT ON BEEF PRODUCTION

Autor: N. L. Holder, M. Koger, J. R. Dickey and R. de la Torre

Institucion: University of Florida

Seccion en que se prefiere sea incluido: 2a Reproduccion

Si desea utilizar proyector y de que tamaño: 2" x 2"

Beef cattle production under four pasture management programs (1. Improved pasture, 2. Native Range, 3. Native Range and Molasses-urea, and 4. Improved pasture, 6 mos.-Native Range, 6 mos.) was measured at the Ebini Research Station, Berbice River, Guyana. Approximately 60 crossbred (Santa Gertrudis x Zebu) cows have been bred on each program for the past 3 years to Santa Gertrudis and Zebu bulls. Least squares analyses were utilized to evaluate the effects of cow age, previous lactation status of cow, breed of calf-sire and pasture program on 756 pregnancy status records, 390 calf survival records, and 251 calf weaning weight records. Least squares means for the three traits studied were 0.53 ± .02, 0.76 ± .02 and 282 ± 5 lbs., respectively. Pregnancy status was significantly affected ($P < .01$) by cow age, previous lactation status and breed of calf-sire. Cows 5 years or older, non-lactating and exposed to a Santa Gertrudis bull were most likely to become pregnant. Calf survival was affected significantly ($P < .01$) by cow age and pasture program. Calves from cows between 4 and 9 years old on program 1 and 4 had the higher survival rate. Weaning weight (235 days) was signifantly ($P < .01$) affected by pasture program and the interaction of breed of calf-sire and pasture program. Calves nursed on program 1 and 4 were heaviest. Santa Gertrudis sired calves weighed more on program 1, while Zebu sired calves were heavier on programs 3 and 4. No breed differences were indicated on program 2. The independent effects of pasture program on production per cow is predicted as follows: Program (1) 161 lbs.; (2) 60 lbs.; (3) 85 lbs.; and (4) 164 lbs. These combined differences are due to survival and weaning weight, not to pregnancy rate.

ASOCIATION LATINOAMERICANA DE PRODUCCION ANIMAL
FORMATO PARA COMPENDIOS

Título: BREED AND LACTATION EFFECT ON BEEF PRODUCTION

Autor: N. L. Holder, M. Koger, J. R. Dickey and R. de la Torre

Institucion: University of Florida

Seccion en que se prefiere sea incluido: 2a Reproduccion

Si desea utilizar proyector y de que tamaño: 2" x 2"

Beef cattle reproduction and weaning records collected at the Ebini Research Station, Berbice River, Guyana, during the past 4 years were analyzed to evaluate the effects of cow age, previous lactation status, breed of cow and breed of calf-sire. Management system was also included in the least squares analyses for the purpose of holding these effects constant while evaluating the previously mentioned. Compounding of year of record and management system negates the validity of either effects, thus year was excluded, while its effects are partially expressed in management. Twenty eight hundred pregnancy status records, 1532 calf survival records and 923 weaning weight records (235 days) were analyzed. Least squares mean estimates were 0.46 ± .02; 0.78 ± .02 and 299 ± 5 lbs. for pregnancy rate, survival rate and 235-day weaning weight, respectively. Cow age, previous lactation status, breed of calf-sire and management systems had highly significant ($P<.01$) effects on all traits measured. Breed of cow had a significant effect on pregnancy rate only. Cows 4 years and older, non-lactating, crossbred and exposed to a Santa Gertrudis bull tended to have a higher pregnancy rate and produce more beef per cow. Specific production tables will be presented showing the magnitude of the various effects.

Título: FACTORES QUE AFECTAN LA PRODUCCION DE CARNE EN HONDURAS

Autor: C. Ríos,* M. Koger, D. Crane y J. Dickey

Institución: Escuela Agrícola Panamericana y Universidad de Florida

Sección en que se prefiere sea incluido: Genética y Reproducción

Si desea utilizar proyector y de que tamaño: Si, 2 x 2

Toros Angus, Brahman, Charolais y Holstein han sido apareados anualmente con aproximadamente 50 vacas cruzadas (Bos indicus - Bos taurus) durante los últimos tres años, a fin de evaluar el efecto del semental sobre la producción de vacas de tipo similar y para producir animales cruzados de reemplazo de cada raza y compararlos con Cebú puras de la misma edad. El siguiente es un reporte de la primera fase del proyecto. Análisis de cuadrados mínimos de 589 registros de producción de 3 años (1970-1972) revelan efectos significativos de año y raza del semental, para porcentaje de preñez, supervivencia, peso al nacimiento, peso a 205 días y calificación al destete. Interacciones significativas de año x raza del semental fueron observadas para porcentaje de preñez y peso al nacimiento. Efectos debidos a sexo y edad de la madre fueron significativos solamente para peso al nacimiento y peso a los 205 días. Porcentajes de preñez y supervivencia no fueron afectados por edad de la madre. Promedios de los sementales Angus, Brahman, Charolais y Holstein, respectivamente, fueron para % de preñez: 91.4, 85.4, 56.4 y 88.3; % de supervivencia: 95.0, 94.1, 95.3 y 95.6; peso al nacimiento, (kg): 26.3, 31.0, 32.3 y 32.4; peso a 205 días, (kg): 186.4, 194.5, 207.7 y 200.4; calificación al destete: 9.9, 10.1, 9.8 y 8.8. Producción por vaca calculada a partir de estas estimaciones de preñez, supervivencia y peso a 205 días fueron: 161.8, 156.3, 111.6 y 169.2 kg, respectivamente, para cada raza.

"ESTUDIO DEL PERIODO DE GESTACION EN BOVINOS BRAHMAN"

*Cruz Vladimir, Marvin Koger, Alvin C. Warnick, Donald E. Franke, Charles J. Wilcox, Frank G. Martin. Univ. del Zulia, Maracaibo, Venezuela y Univ. de Florida, Gainesville, Fla. U.S.A.

Se analizaron 1424 gestaciones de acuerdo con dos modelos lineales por el método de Cuadrados Mínimos. El primero incluyó el efecto del mes en que finalizó la gestación y los efectos del sexo y padre del becerro; el segundo modelo incluyó además la edad de la vaca. La media no ajustada para la duración de la gestación fué de 291.3 $\pm$ 4.8 días. El mes de nacimiento resultó significativo ($P < .075$) en ambos análisis; Octubre tuvo la constante menor con 290.4 $\pm$ 0.5 días, mientras que Marzo fué el que presentó la constante mayor con 292.1 $\pm$ 0.6 días; siendo su diferencia, 1.7 $\pm$ 0.8 días, significativa ($P < .01$). Los machos fueron llevados en el útero, 1.6 $\pm$ 0.3 días más que las hembras. El efecto del padre del becerro fué significativo ($P < .05$) en ambos análisis, sin embargo el estimado del coeficiente de herencia, obtenido por correlación intra-toro fué de 0.05 $\pm$ 0.04. El efecto de edad de la madre como variable continua lineal corregida por los factores mencionados no resulto significativo, -0.005 $\pm$ 0.051.

Title: "SUPPLEMENTAL FEEDING OF GRAZING CATTLE IN THE INTERMEDIATE SAVANNAHS OF GUYANA"

Participants:

University of Florida Facult

C. B. Ammerman
G. O. Mott
M. Koger

Government of Guyana

Noel Holder
C. G. Edwards

Principal Accomplishments:

Experiment 1: Supplemental Feeding of Cattle Grazing Pangola Digitgrass Pastures

The growth of grazing cattle on the Intermediate Savannahs of Guyana is frequently restricted by periods of inadequate nutrient intake due to seasonal variation in the rainfall pattern and the resulting effect on forage quality and quantity. The result is that animals may be 4 to 5 years of age before a suitable slaughter weight is reached or adequate size is attained to make satisfactory breeding animals. Information is needed to determine the economic and nutritional feasibility of using locally available by-product feeds (mainly sugarcane molasses, rice bran and copra meal) as supplements for grazing animals intended for slaughter or use in the breeding herd.

An experiment was performed, involving the use of 96 bulls and 105 heifers, newly weaned, with the following objectives:

a) to determine the influence of feeding supplemental energy and nitrogen in the form of locally available by-product feeds, on performance of bulls and heifers grazing Pangola Digitgrass pastures, and

b) to conduct initial investigations into potentially profitable beef-forage-concentrate systems.

Supplements were assigned as six treatments to animal groups (16 bulls or 18 heifers per group) as follows:

1) Pangola digitgrass (control, no supplement except for minerals).
2) Pangola digitgrass + rice bran fed at 0.96% body weight.
3) Pangola digitgrass + copra meal fed at 0.80% body weight.
4) Pangola digitgrass + rice bran and copra meal (1:1) fed at 0.87% body weight.
5) Pangola digitgrass + sugarcane molasses containing 3% urea fed at 1% body weight.
6) Pangola digitgrass + rice bran, copra meal and molasses-urea (1:1:1) fed at 0.91% body weight.

These levels of feeding were used with the intention of equating the energy intake of all animals consuming supplement. The relative performance of bulls and heifers was investigated as was the effect of origin of animals, since some were weaned off of native savannah with relatively light weights at the start of the experiment while others were weaned from improved pastures.

Analysis of the growth data (Table 1.) revealed highly significant differences between treatments, with liveweight performance from highest to lowest being in order of treatments: 6, 3, 4, 2, 1, 5. The molasses-urea treatment was significantly lower than the control in the bull groups and not significantly higher than the control with the heifers. The poor performance of animals on the molasses-urea treatment is considered due, in part, to technique used in feeding this supplement, with the animals being permitted to consume their daily allowance in a short time rather than over a longer period of time during each day. Rather low utilization of the available carbohydrates and urea was, therefore, obtained along with a possible reduction in the performance of bulls and little improvement in the performance of heifers.

Although nitrogen levels in the other supplements were unequal, the ranking of the performance of animals did not relate to the level of nitrogen in the feeds, suggesting that all feeds supplied adequate nutrition. However, there appeared to be a negative relationship between the ranking of the feeds, performance-wise, and the amount of fat in the feeds. Ether extract determinations revealed rice bran as having a particularly high fat content (22%).

There was a significant sex difference in performance, with bulls growing considerably faster than heifers, with the exception of the molasses-urea treatment where growth rates were the same. In general, the effect of other supplements was to magnify differences in growth rate between bull and heifers. Animals weaned off of native savannah performed significantly better than those weaned off of improved pasture, demonstrating compensatory growth. There was no interaction between origin and treatment in either sex. However, within origin, animals of higher weaning weight performed better than those of lower weaning weight, demonstrating, perhaps, a superior genetic growth potential within a given environment.

Chemical determinations done on forage samples (Table 2) revealed a relatively high lignin content, relatively low organic matter digestibility, crude protein content and low levels of phosphorus, copper, calcium and in some instances zinc. There was considerable variations between pasture areas in terms of their chemical composition, indicating that a thorough classification of the soils of the improved pasture area should be done to reduce pasture variability in future experiments. There were significant changes in the chemical composition of the forage over the 280 day period.

All animals were given free choice access to a complete mineral mixture during the trial, and there were significant differences in mineral consumption between treatments in the bull groups but

TABLE 1. INFLUENCE OF FEED SUPPLEMENTS ON THE PERFORMANCE OF SANTA GERTRUDIS AND SHORTHORN × SANTA GERTRUDIS BULLS AND HEIFERS ON PANGOLA DIGITGRASS PASTURES

Supplement	No. of animals 1/	Initial wt. 10-27-1970 lb.	Final wt. 8-3-1971 lb.	Total gain lb.	Increase over control lb.	Average Daily gain lb/day	Increase over control lb/day	Growth index, control=100
BULLS								
1. None	16	348.8	670.9	337.1		1.20		100
2. Rice Bran 2/	16	355.9	759.8	403.9	66.8	1.44	0.23	119
3. Copra Meal 3/	15	382.3	814.7	432.4	95.3	1.54	0.34	128
4. Rice Bran/Copra Meal mixture 4/	16	348.8	777.4	428.7	91.6	1.53	0.32	127
5. Molasses-urea (3%) mixture 5/	16	381.6	638.7	257.1	-80.0	0.91	-0.28	76
6. Rice Bran/Copra Meal/ Molasses-urea 6/	16	345.6	793.2	447.6	124.0	1.59	0.44	132
HEIFERS								
1. None	18	322.4	562.8	240.4		0.85		100
2. Rice Bran 2/	18	311.0	602.6	291.6	51.2	1.04	0.18	121
3. Copra Meal 3/	18	341.3	678.0	336.7	96.3	1.20	0.34	140
4. Rice Bran/Copra meal mixture 4/	18	324.7	613.1	288.4	43.0	1.03	0.17	119
5. Molasses-urea (3%) mixture 5/	17	311.4	576.7	265.3	24.9	0.94	0.08	110
6. Rice Bran/Copra Meal/ Molasses-urea mixture 6/	17	320.7	709.3	388.6	148.2	1.38	0.52	161

1/ Average age of animal within each treatment was 10 months.

2/ Rice bran fed at 0.96% of body weight.

3/ Copra meal fed at 0.80% of body weight.

4/ Rice bran/copra meal mixture (1:1) fed at 0.87% of body weight.

5/ Molasses-urea (3%) mixture fed at 1.00% of body weight.

6/ Rice bran/copra meal/molasses-urea (3%) mixture (1:1:1) fed at 0.91% of body weight.

TABLE 2. COMPOSITION AND IVOMD OF PANGOLA DIGITGRASS PASTURES BY 28-DAY PERIODS[1/]

28-Day period	IVOMD[2/] %	Nutrient: Dry matter %	Ash %	Lignin %	Crude protein %	Ca %	P %	Mg %	K %	Na %	Fe ppm	Mn ppm	Zn ppm	Cu ppm
1 (Oct. - Nov. '70)	41.49	91.49	6.28	8.36	5.6	.270	.155	.092	1.47	.158	556	608	96	4.58
2 (Nov. - Dec. '70)	39.35	91.26	7.09	8.25	5.4	.302	.168	.106	1.36	.191	529	606	103	2.42
3 (Dec. - Jan. '71)	41.63	91.18	7.69	8.01	5.8	.310	.162	.100	1.97	.197	640	574	106	4.74
4 (Jan. - Feb. '71)	41.53	91.48	6.80	8.84	5.4	.218	.146	.092	1.80	.205	515	477	105	4.18
5 (Feb. - Mar. '71)	34.45	91.69	5.48	8.91	4.1	.258	.126	.074	.86	.111	717	585	97	3.07
6 (Mar. - Apr. '71)	34.89	91.47	5.92	8.67	4.6	.270	.140	.080	.98	.114	623	552	103	3.21
7 (Apr. - May '71)	33.67	91.71	6.85	9.36	5.7	.282	.150	.080	1.18	.145	833	532	114	2.95
8 (May - June '71)	23.34	91.61	8.53	12.37	6.3	.234	.182	.088	1.65	.210	1118	478	120	2.54
9 (June - July '71)	34.82	90.23	6.38	8.74	5.3	.222	.140	.080	1.08	.130	1506	489	124	2.20
Overall average	36.13	91.34	6.78	9.08	5.4	.262	.152	.088	1.37	.162	781	544	107	3.32

1/ Individual values represent the average from five pasture areas. All composition values except dry matter are expressed on a dry matter basis.

2/ *In vitro* organic matter digestibility.

not with the heifers. The level of iron in the forage was negatively correlated ($P<.05$) with free mineral intake. There was a significant difference in the mineral consuption over 28-day periods.

The conversion rates for supplements suggest that, with the exception of rice bran and molasses-urea (treatments 2 and 5), supplemental feeds were economical into the early part of the long wet season. Agter Jyly, continued feeding proved uneconomic.

Experiment 2: Supplemental Feeding of Molasses With and Without Urea to Cattle Pangola digitgrass pastures.

In a previous trial at Ebini in which the readily available crop by-products -- rece bran, copra meal and molasses -- were investigated as possible protein-energy supplements for growing-fattening beef cattle grazing Pangola digitgrass, it was observed that molasses containing 3% urea fed at a rate of 1% weight decreased liveweight gains of animals below that obtained in control groups. Molasses has been used in many parts of the world as a source of energy in urea-containing rations for beef cattle, and results have indicated a positive response by ruminant livestock. However, there are data indicating (1) that poor quality roughages which are low in nitrogen and high in lign cellulose complex will not support effective urea utilization and (2) that urea nitrogen is better utilized when offered in combination with starch rather than molasses as a carbohydrate source.

In the light of the results obtained in the previous trial and in view of the fact that molasses is one of the most readily available and least expensive crop by-product available in Guyana feeding livestock, it was considered desirable to further investigate molasses-urea supplementation at Ebini using both restricted and unrestricted levels of molasses feeding with and without urea as a nitrogen source. Ninety bulls of weaning age drawn from each of four breed types --Brahman, Santa Gertrudis, Brahman x Santa Gertrudis and Charolais x Santa Gertrudis -- Were used in the trial. The animals were used in the trial. The animals were allocated into ten similar groups of nine animals each, and each group was placed in ten acre pastures of Pangola digitgrass (Digitaria decumbens Stent). Each pasture was fertilized with 300 lbs per acre of 15-15-15 two months prior to the start of the 280-day trial. The stocking rate was held constand and animals were weighed every 28 days. Water was provided ad libitum and a complete mineral mixture was available "free choice" throughout the period of the experiment.

Supplemental feeds were assigned as five treatments to animal groups on pasture as follows:

(1) Pangola digitgrass Pasture (Control, no supplement).

(2) Pangola digitgrass + Molasses, restricted at 4 lb/head.

(3) Pangola digitgrass + Molasses, ad lib.

(4) Pangola digitgrass + Molasses containing 3% urea, restricted at 4 lb/head daily.

(5) Pangola digitgrass + Molasses containig 3% urea, ad lib.

TABLE 3. INFLUENCE OF FEED SUPPLEMENTS ON THE PERFORMANCE OF WEANLING BULLS GRAZING PANGOLA DIGITGRASS PASTURES OVER THE EXPERIMENTAL PERIOD

Treat No.	Supplement	No. of[d] Animals	Initial Wt. 13-10-71 lb	Final Wt. 18-7-72 lb	Total Gain lb	Increase over Control lb	Average Daily Gain lb	Increase over Control lb	Growth Index Control - 100
1.	None (Control)	18	321.94	566.55	234.61[c]	-	.84	-	100
2.	Molasses - 4 lb/day	18	323.61	571.41	247.80[bc]	13.19	.88	.04	105
3.	Molasses *ad lib.*	17	300.55	527.77	227.22[c]	-7.39	.81	-.03	96
4.	Molasses-urea - 4 lb/day	18	318.88	618.20	299.32[d]	64.71	1.06	.22	126
5.	Molasses-urea *ad lib.*	18	318.33	587.77	269.44[b]	34.83	.96	.12	114

[a,b,c] Means bearing different superscripts are significantly different ($P<.05$).

[d] Average age of animals within each treatment was eleven months.

TABLE 4. EFFECT OF BREED ON THE PERFORMANCE OF WEANLING BULLS SUPPLEMENTED WITH MOLASSES WITH AND WITHOUT UREA ON PONGOLA DIGITGRASS PASTURE

Treatment		Breed Type			
		Santa Gertrudis	Brahman	Santa x Brahman	Santa x Charolais
1. Pangola digitgrass (Control)	Initial Wt.[a]	309.37	305.00	317.50	402.50
	Final Wt.	505.00	567.50	582.50	685.00
	Total Gain	196.00	262.50	265.00	282.50
	ADG	.70	.94	.95	1.00
2. Pangola digitgrass + Molasses (4 lb/head daily)	Initial Wt.	286.25	402.50	332.50	367.50
	Final Wt.	490.00	665.50	630.00	625.00
	Total Gain	203.75	260.00	297.50	257.50
	ADG	.73	.93	1.06	.92
3. Pangola digitgrass + Molasses *ad libitum*	Initial Wt.	297.86	350.00	285.83	310.00
	Final Wt.	490.71	622.50	543.33	545.00
	Total Gain	192.85	272.50	257.50	235.00
	ADG	.69	.97	.92	.84
4. Pangola digitgrass + Molasses-Urea (4 lb/head)	Initial Wt.	296.87	412.50	325.80	292.50
	Final Wt.	575.62	692.50	667.50	620.00
	Total Gain	278.75	280.00	314.70	327.50
	ADG	1.00	1.00	1.22	1.17
5. Pangola digitgrass + Molasses-Urea (*ad libitum*)	Initial Wt.	272.50	415.00	335.80	352.50
	Final Wt.	528.10	702.50	625.00	675.00
	Total Gain	225.60	287.50	289.20	322.50
	ADG	.91	1.02	1.03	1.15

[a]Weights in pounds.

TABLE 5. EFFECT OF BREED ON THE PERFORMANCE OF BEEF CATTLE GRAZING PANGOLA DIGITGRASS PASTURES ON THE INTERMEDIATE SAVANNAHS OF GUYANA - WEIGHT GAINS BY 28-DAY PERIODS (13-10-71 through 18-7-72)

Breed Type	Initial Wt.	Accumulated Weight Gain Over 28-Day Periods (lbs)									
		1	2	3	4	5	6	7	8	9	10
Santa Gertrudis	292.44	321.66	334.10	345.9	371.15	390.64	444.49	462.95	488.82	516.76	518.59
Acc. Wt. Gain		29.22	41.66	53.46	79.71	99.20	152.05	170.51	196.38	224.32	226.15[a]
Santa x Brahman	319.5	353.66	371.17	390.83	424.50	450.5	506.50	533.50	562.33	581.50	610.66
Wt. Gain		34.16	51.67	71.33	105.00	131.00	187.00	214.00	242.83	262.00	291.10[b]
Santa x Charolais	325.5	357.0	376.50	398.50	433.50	459.50	513.50	539.00	566.50	581.00	606.50
Wt. Gain		31.50	51.67	71.33	105.00	131.00	187.00	214.00	242.83	262.00	281.00[b]
Brahman	396.50	418.50	438.50	452.00	486.00	520.50	596.50	569.50	606.00	627.50	673.00
Wt. Gain		22.00	42.00	55.50	89.50	124.00	173.00	209.50	231.00	250.00	276.50[ab]

[a,b,c] Means bearing different superscripts are significantly different ($P<.05$).

Unrestricted feeding was performed using "lick-feeders" and feeds were supplied daily throughout the experimental period regardless of the wet or dry seasons. The experiment commenced October 13, 1971 and was terminated July 18, 1972.

In this study only the effect of supplemental feeding upon gain per animal was measured. Since the influence of supplement upon the carrying capacity of the pasture was not determined, the production of liveweight gain per acre could not be accurately estimated. The liveweight increase of animals as affected by supplemental feeding on pasture is summarized in Table 3.

Supplementation with restricted levels of molasses-urea was observed to be significantly better ($P<.05$) than with molasses alone and in all cases where a restricted level of feeding was implemented, performance was superior to unrestricted supplementations. It is of interest to note that ad libitum feeding of molasses unfortified with urea resulted in gains below that obtained in control groups. It is also noteworthy that in only one treatment (molasses-urea at 4 lb/head daily) were average daily gains in excess of 1 lb per day.

The results from molasses and urea suggest that the principal limiting factor in animal gains on pasture on the Intermediate Savannahs is protein rather than energy. It is possible however, that the low rate of nitrogen applied to pastures in the present trial might account for the nitrogen response shown. It has been stated that heterosis in the crossbred calf exhibits much of its advantage in the preweaning period. However, conflicting results have been reported on the relative post-weaning performance of crossbred and straight bred calves. In this trial the relative post-weaning initial weights of bulls were in the order 396.50, 325.50, 319.50 and 292.44 pounds for the Brahman, Santa-Charolais, Santa-Brahman and Santa Gertrudis purebreds respectively. The final weights of the animals showed that the crossbreds had outgained the purebreds and it seems reasonable to assume that the crossbreds utilized feed more efficiently than the purebreds.

The results of the trial suggest again that the Santa-Brahman crossbred might be the most useful breed type on the Intermediate Savannahs. However, the performance of Charolais crossbreds is noteworthy and further investigations should be made on this breed type. (Tables 4 and 5).

Publications:

1. Holder, N. L. 1972. Supplemental Feeding of Beef Cattle Grazing Pangolagrass Pastures on the Intermediate Savannahs of Guyana. Thesis for Degree of Master of Science of Agriculture. University of Florida.

2. Holder, N. L., C. B. Ammerman, G. O. Mott, M. Koger and K. Fick. 1973. Suplementacion de Ganado en Pastoreo en las Sabanas de Guayana. IV Reunion, Asociacion Latinoamericana de Produccion Animal. P-47

Significance to Government of Guyana:

The studies have assisted in identifying locally available by-product feeds as potential supplements for grazing cattle. They have assisted in further identification of "problem areas" in nutrition in the production of cattle on the intermediate savannah. The work has provided training in experimental procedures and research techniques for personnel at the Ebini Station.

Benefits to U.S. Agriculture:

The information derived from the feeding studies and laboratory analyses contributes to the total nutritional knowledge and basic understanding of nutrient interactions. It aids in identifying conditions (nutritional, environmental, etc.) under which supplemental feeds may be of economic value under grazing conditions. It assists in making more effective use of molasses and other by-product feeds under somewhat similar conditions in the United States.

Title: MANAGEMENT - BREEDING PROGRAMS FOR BEEF PRODUCTION IN THE INTERMEDIATE SAVANNAHS OF GUYANA

Participating Members:

University of Florida: M. Koger, C. B. Ammerman, J. C. Glen, J. R. Dickey, H. F. Boyd and B. R. Eddleman.

Government of Guyana: Noel Holder and Colin Edwards.

Progress and Principal Accomplishments:

The basic objective outlined in Work Plan 70-1 was to simultaneously evaluate four (4) Pasture - Management Programs and five (5) cattle breeding systems, utilizing the same facilities for the two studies. The produce of these breeding herds were to serve also as experimental animals for grazing trials, nutrition studies and other investigations requiring the use of growing animals.

Due to shortage of improved pastures, inadequate fencing and impending reduction in duration of the contract, the breeding program later was reduced to include the first phase only of the origina outline. That is, rather than enter the crossbred females into a 2-breed rotation, the plan was reduced to test the performance of different groups of first cross females by mating all groups to comparable bulls. Also, it was necessary to defer one phase of the management studies dealing with different methods of growing replacement females.

In total, however, this work plan yielded a wealth of data providing significant information for assessing the potential for beef production in the intermediate savannahs of Guyana. These data have been summarized in five annual or Progress reports, three scientific reports at the fourth meeting of the Latin American Association of Animal Production and a preliminary report on "Estimated Resource Requirements, Costs and Returns for Five Beef Production Alternatives based on response data from the trial. In addition, produce from the herds were used in a nutrition study resulting in a Master's Thesis by Noel Holder. These publications are shown in the reference list attached. A summary of principal results is shown in tables 1-10 attached.

Significant Findings for Guyana:

1. Improved pastures can be grown successfully in the intermediate Savannahs.
2. Further studies are needed to develop refinements and evaluate the most economical fertilization rates, manage-

3. Growth response of cattle to improved pastures was excellent.
4. Inherent fertility of current stocks thus far appear to be marginal for improved pastures. Breeding programs to reduce lactational anestrus is needed to improve the response to improved environment. This parallels experience in Florida.

Benefits Derived for U.S. Agriculture.

1. Preliminary response data has been obtained indicating that the intermediate savannahs of Guyana are a potential resource for production of beef for the Carribean area and world meat market.
2. A cordial and harmonious relationship between scientists of the United States, Guyana was established.
3. Another research institution has been launched thus expanding the source of research information on food production for an expanding population.
4. Expertise of U.S. scientists in tropical agriculture has been enhanced.

Title: ECONOMIC POTENTIAL OF CROP AND LIVESTOCK PRODUCTION IN THE INTERMEDIATE SAVANNAHS

Participants:

University of Florida Faculty

Paul J. Hooker
B. R. Eddleman

Principal Accomplishments:

The objective of this study was to define production units for the Intermediate Savannahs of Guyana, involving all or some combination of corn, peanuts, soybeans, Vigna peas and beef cattle, that minimize required annual capital while attaining specified income levels. Enterprise budgets for crops and alternative beef cattle systems were developed with the limited information available from crop and livestock research in Guyana by University of Florida personnel as well as budgets prepared for similar areas of Florida and interviews with Guyana equipment dealers and agriculturists. These budgets were employed in a linear programming model to determine a crop system and crop-livestock system that satisfied the objective. Subsequently, price assumptions were relaxed[1] to determine alternative systems that satisfied the objective under different price and/or productivity assumptions. The results of this process indicated that slight changes in the productivity per acre or price of soybeans, peanuts and corn result in production units that contain any one of the three in conjunction with Vigna peas, which were highly stable in the solution, and beef cattle.

Assumptions regarding investment in alternative beef systems were varied to create systems involving use of unfenced native range for the cow-calf herds. The results indicated that, if native range need not be fenced, cow-calf operations will be conducted on combination of native range and improved pasture rather than on improved pasture alone as in the original problem solution. Calves are fattened to slaughter weight on improved pasture unless the price of feeder calves increases from G$0.30 per pound to G$0.37 per pound, at which price they will be sold as feeders (assuming slaughter price remains $0.30 per pound).

The productive potential of the available grasslands of the Intermediate Savannahs in terms of return to management, overhead

[1]The effect of varying prices in the linear programming model is to alter the net revenues (per unit of enterprise) which enter the income equation. Net revenues may be altered by productivity changes as well so that a given change in net revenue may be interpreted as the result of a productivity change or a price change, even when effected by the latter.

costs and owner equity (in excess of 9.5 percent of annual capital) as well as crop and livestock was indicated for development by 78 production units involving crops and livestock on improved pastures or, alternatively, 22 production units involving crops and livestock with cow-calf operations using some unfenced native range. In addition, the annual labor requirements for skilled and unskilled workers and the annual and total capital required was estimated for the two development schemes. The crop-livestock systems developed in this study required approximately six full-time workers per unit: one working manager, one skilled equipment operator and four unskilled laborers.

If the estimated price and productivity relationships employed in this study can be realized, the Intermediate Savannahs can make a significant contribution toward reducing and/or eliminating imports of corn, peanuts, soybeans, peas and beef similar to the import levels attained in 1970. Additional quantities of some commodities especially peas and beef, can be produced and used for expanding domestic per capita consumption or for export. Sufficient income will be generated to repay total required capital in four to six years after full production is attained. Labor requirements are approximately 468 full-time employees (including working managers) for the 78 units involving beef on improved pasture alone and 132 full-time employees (including working managers) for the 22 units involving beef utilizing some unfenced native range.[2]

Although this study concludes that the Intermediate Savannahs of Guyana can be profitably developed, given the price and productivity information on which these conclusions are based the success of such development depends to a large extent on factors external to this study. The nature of the developing farm units is likely to be critical. Unless a production unit can be directed by a skilled manager with a minimum of bureaucratic control, the unit is likely to be unprofitable and result in failure. Unless competent, timely technical assistance is provided, at least during the early stages of development, then development efforts are likely to prove unfruitful. If satisfactory tenure arrangements are not provided to private investors, they are unlikely to be willing to risk their capital in order to develop production units in the area. Finally, unless financially, sound investors can be attracted to the area on a long-term basis, the area is likely to remain undeveloped since government efforts to run agricultural production units are likely to be unsuccessful, based on experience in Guyana and other developing countries.

Additional work consisted of developing technical enterprise budgets for production of four vegetable crops -- tomatoes, cabbage, carrots and onions -- on coastal clay soils and on sandy soils in Guyana. These budgets were prepared in consultation with Florida Agricultural Experiment Station personnel in the Vegetable Crops Department and with Ministry of Agriculture research personnel in Guyana who are working on vegetable crops research.

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[2]These estimates are for farm labor only and do not include employment generated in ancillary industries.

All production systems for the four crops were considered on the basis of soil types, and crop yields and input requirements were specifically designed to represent productive capacities of the particular soils. With non-mechanized methods of production utilizing substantial amounts of farm labor, returns to farmer-owned resources were found to be fairly high. On clay soils, returns over operating costs (i.e., returns to land, farmer and family labor, management and risk) varied from $2,584 (Guyanese) per acre for tomatoes to $4,598 per acre for carrots. On sandy soils, these per acre returns ranged from $1,645 fo tomatoes to $3,580 for carrots.

These preliminary results indicate that these four vegetables appear to be good crop alternatives for many farms in the areas suitable for vegetable production. However, due to a rather small domestic market, only small total acreages of the four crops considered would be required to meed tomestic needs.

A final work effort consisted of development of a pre-feasibility report on agricultural sector analysis in Guyana. The report covered the principal components of identifying sub-sectors and interrelations among these sub-sectors, development of project and/or policy sets, description and programming requirements of the agricultural sector and data availability. Specific attention was given to the potential role of livestock in the country's agricultural development and the livestock industry was viewed as a system. Descriptions of the various components of the livestock system was made and potentials for improvements at various levels of four principal sectors -- factor product supply, production, processing and marketing, and consumer demand -- were identified.

Publications:

1. Glenn, J. C., M. Koger, C. B. Ammerman, W. G. Blue, E. B. Whitty, B. R. Eddleman and G. O. Mott. August 1969. Task Order #5 Report 11. Operational Program for the Development of the Ebini Livestock Station on the Intermediate Savannahs.

2. Marlowe, G. A., B. R. Eddleman, C. M. Geraldson and R. P. Bates. December 1971. Vegetable Crop Production Potential, Conference Report.

3. Boyd, F. T., J. M. Dickey and B. R. Eddleman. October 1971. Estimated Resource Requirements, Cost, and Returns for five Beef Production Alternatives.

4. Eddleman, B. R., G. A. Marlowe, C. M. Geraldson, S. J. Locascio and L. Halsey. December 1971. Estimated Resource Requirements, Cost, and Returns for Four Vegetable Production Alternatives on Coastal Clay and Sandy Soils.

5. Hooker, Paul J. June 1973. The Economic Potential For Beef Cattle, Grain and Legume-Seed Production in the Intermediate Savannahs of Guyana.

6. Hooker, Paul J. October 1972. A Pre-Feasibility Report on Agricultural Sector Analysis in Guyana.

7. Hooker, Paul J. October 1972. The role of Livestock in a Country's Agricultural Development.

Significance of Findings for GOG:

The results from this research indicates that the Government might encourage some of the larger, domestic, agriculture-oriented firms (such as Bookers, Ltd. or Sandbach-Parker, Ltd.) to set up pilot farms in the Intermediate Savannahs. The budgets developed in this study can be used, with necessary and appropriate modifications, to generate dynamic farm plans that schedule farm development over time. However, the Government of Guyana may have to consider furnishing these pioneering developers with incentives such as long-term leases or outright freehold title to the required land and freedom from import duties on agricultural inputs. In return, the Government should expect these pioneering developers (providing they are successful) to share their newly-acquired technical expertise with later, perhaps less well-qualified settlers. In addition, the normal process of labor turn-over should produce qualified managers and skilled laborers for later crop-livestock developments. If a spirit of friendly cooperation between Government and private enterprise can be developed, then the production potential of the Intermediate Savannahs will be realized.

Policy makers concerned with planning for agricultural development in Guyana continuely need information that can be useful for planning farm size and in evaluating returns from alternative enterprises and production on farms. They must frequently re-evaluate their plans when technologic and economic conditions change. The reports containing the detailed enterprise budgets provide information that can be useful in evaluating profitability of farm organizations and changes in these farm organizations in the Intermediate Savannahs region. The information on enterprise budgets contained in these reports is presented in such a manner that adjustments in input-output data (yields, prices, costs, input requirements, etc.) can readily be made and the resulting estimates applied to a specific situation.

References

1. Task Order #5 Report 1. Research and Development at the Ebini Livestock Station. (J. C. Glenn, M. Koger, C. B. Ammerman and G. O. Mott) March 1, 1969.

2. Task Order #5 Report II. Operational Program for the Development of the Ebini Livestock Station on the Intermediate Savannahs. (J. C. Glenn, M. Koger, C. B. Ammerman, W. G. Blue, E. B. Whitty, B. R. Eddleman and G. O. Mott) August 1, 1969.

3. Supplemental Feeding of Cattle Grazing Pangolagrass, Work Plan 69-1. (N. Holder, C. B. Ammerman, M. Koger, J. C. Glenn and G. O. Mott) September 30, 1969.

4. Work Plan No. 70-1. Cattle Breeding, Ebini. (N. Holder, J. C. Glenn, M. Koger and C. B. Ammerman) October, 1970.

5. Work Plan No. 70-1. Annual Summary of Beef Cattle Performance at Ebini. (N. Holder, M. Koger, J. C. Glenn and C. B. Ammerman) December, 1970.

6. Report on Annual Planning Conference for Beef Cattle Breeding Project at Ebini for year 1970-71. (M. Koger) January 21, 1971.

7. 1971 Data Summary for Beef Cattle Breeding Project. (J. R. Dickey and M. Koger) July, 1971.

8. Estimated Resource Requirements, Costs and Returns for Five Beef Production Alternatives in the Intermediate Savannahs of Guyana. (H. F. Boyd, J. R. Dickey and B. R. Eddleman) October, 1971.

9. Annual Report of UF-GOG Contract Program. (N. L. Holder, C. B. Ammerman, G. O. Mott and M. Koger) April 28, 1972.

10. Annual Progress Report, Work Plan No. 70-1. (N. Holder, Colin Edwards, M. Koger, C. B. Ammerman, J. H. Conrad, J. C. Glenn and J. M. Dickey) May 1, 1972.

11. Summary of 1972 Data from the Beef Cattle Management and Breeding Project. (J. R. Dickey and M. Koger).

12. Supplemental Feeding of Beef Cattle Grazing Pangolagrass Pasture on the Intermediate Savannahs of Guyana. (N. Holder)

13. Management Effect on Beef Production in Guyana. (N. Holder, M. Koger, J. M. Dickey, R. de la Torre) 4th ALPA meeting.

14. Breed and Lactation Effect on Beef Production in Guyana. (N. Holder, M. Koger, J. M. Dickey and R. de la Torre) 1973, 4th ALPA meeting.

15. Supplemental Feeding of Beef Cattle Grazing Pangolagrass Pastures on the Intermediate Savannahs of Guyana. (N. Holder, C. B. Ammerman, G. O. Mott, M. Koger and K. R. Fick) (Proc. 4th LAPA Conf., Guadalajara, Mexico) June, 1973.

Table 1. Least Squares Analyses of Variance For Birth Rate, Calf Survival and Weaning Weight.

Source of Variance	Birth Rate df	Birth Rate M.S.	Calf Survival df	Calf Survival M.S.	Weaning Weight df	Weaning Weight M.S.
Total	755	---	389	----	250	----
Lactation Status (B)	2	11.78**	2	1.17**	2	21,943**
Sire Breed	1	2.13**	1	.05	1	3,017
Pasture Programs (P)	3	.26	3	2.81**	3	202,614**
B x P	3	.38	3	.33	3	17,854**
Remainder	745	.22	379	.16	239	3,451

** Probability value < 0.01

Table 2. Pregnancy Rate (%) by Sire Breed and Pasture - Management Program.

Pasture - Management Program	Sire Breed: Zebu	Sire Breed: Santa Gertrudis	Program Average
1. Improved	51	56	53
2. Native Range	41	54	47
3. Native Range + Molasses-Urea	51	59	55
4. Improved (6 mo.) + Native Range (6 mo.)	46	64	55
Breed Average	47	58	52

Table 3. Calf Survival (%) by Sire Breed and Pasture-Management Program

Pasture - Management Program	Sire Breed		Program Average
	Zebu	Santa Gertrudis	
1. Improved	90	81	86
2. Native Range	46	65	57
3. Native Range + Molasses-Urea	69	66	67
4. Improved (6 Mo.) + Native Range (6 Mo.)	92	95	94
Breed Average[NS]	74	77	76

Table 4. Weaning Rate (%) by Sire Breed and Pasture - Management Program

Pasture-Management Program	Sire Breed		Program Average
	Zebu	Santa Gertrudis	
1. Improved	46	45	46
2. Native Range	19	35	27
3. Native Range + Molasses Urea	35	39	37
4. Improved (6 Mo.) + Native Range (6 Mo.)	42	61	52
Breed Average	35	45	40

Table 5. Weaning Weight (kg) By Sire Breed and Pasture-Management Program

Pasture-Management Program	Sire Breed		Program Average
	Zebu	Santa Gertrudis	
1. Improved	147.0	171.0	158.8
2. Native Range	101.6	105.7	103.9
3. Native Range + Molasses Urea	109.8	101.2	105.2
4. Improved (6 MO,) + Native (6 Mo.)	147.4	141.1	144.7
Breed Average	126.6	129.7	127.9

Table 6. Summary of Production Performance by Pasture-Management Program

Pasture-Management Program	Production Trait		
	Weaning Rate (%)	Weaning Weight (kg)	Production Per Cow (kg)
1. Improved	46	158.8	73.0
2. Native Range	27	103.9	28.1
3. Native Range + Molasses Urea	37	105.2	39.0
4. Improved (6 Mo.) + Native Range (6 Mo.)	52	144.7	75.3

Table 7. Effect of Age of Cow. All Groups.

Trait	Age of Cow (yr)			
	3	4	5-8	9+
Birth rate, %	25	50	55	57
Survival rate, %	70	72	84	76
Weaning rate, %	19	36	46	43
Weaning weight, kg	111	117	126	126
Production/cow, kg	21	42	58	54

Table 8. Effect of Lactation Status During Breeding Season on Subsequent Production.

Trait	Lactation Status	
	Lactating	Non-Lactating
Birth rate, %	19	57
Survival rate, %	74	74
Weaning rate, %	14	42
Weaning weight, kg	117	121
Production/cow, kg	16	51

Table 9. Effect of Sire Breed on Pre-weaning Performance.

Trait	Breed of Bull			
	Zebu	Charolais	Hereford	Santa Gertrudis
Birth rate, %	47	47	44	56
Survival Rate, %	79	87	83	78
Weaning rate, %	37	41	37	44
Weaning weight, kg	132	133	125	131
Production/Cow, kg	49	54	46	57

Table 10. Effect of Breed Composition of Cow on Production Performance

Trait	Breed of Cow				
	Pure Zebu	Grade Zebu	Pure SG	Grade SG	Miscellaneous crosses
Birth rate, %	39	41	46	51	53
Survival rate, %	82	82	76	78	72
Weaning rate, %	32	34	35	40	38
Weaning weight, kg	128	117	121	123	122
Production/Cow, kg	41	39	42	49	47

Title: "FORAGE IMPROVEMENT AND MANAGEMENT"

Participants:

University of Florida Faculty

G. O. Mott
S. C. Schank

Government of Guyana

Noel Holder
Colin Edwards

Principal Accomplishments:

Grass improvement: The Ebini Research Station had an intense interest in the improvement of grasses for the Intermediate Savannahs prior to the initiation of the contract between the Government of Guyana and the University of Florida. In the mid 1960's the Oakes collection of Digitaria species was introduced and the more promising species and lines were increased. During the period 1969 through 1972 the University of Florida scientists had an opportunity to study portions of this original collection in Florida, Guyana, Guadaloupe, Venezuela, Surinam and Puerto Rico. It was discovered that five of the P. I numbered lines in this collection were all the same grass and were giving outstanding performance in each of the above countries as well as in Central and South Florida. Data on this grass was rapidly accumulated during this period and by mutual agreement of the countries who contributed information concerning the performance of this grass, it was decided to release it under the cultivar name "Transvala"

A copy of the release circular is a part of this report which contains more detailed information.

Grazing Management Studies: Pastures had been established in late 1972 and early 1973 to continue the evaluation of Transvala digitgrass and to compare it with other grasses, under different management systems and with and without an associated legume. Maintaining legumes in grass/legume swards in the tropical areas of the world is one of the most critical problems in pasture management since the grasses are usually very agressive.

The first phase of this research is to study the response of tropical legume/grass associations to defoliation by the grazing animal. The yields of the mixtures will be measured in terms of animal grazing days/acre, dry matter yields of the mixtures and the component species. The legume/grass combinations and the grazing management systems are listed in Table 1.

The second phase (See Figure 1) is to study the response of the grazing animal when consuming different species of grasses and legume/grass combinations. For this study two grasses - Transvala digitgrass and Hamil Guineagrass-have been established in 5-acre pastures alone and in combination with Centrosema pubescens, Siratro, or Calapo. Three levels of nitrogen are also included in the study to compare with the production of legume/grass associations. The gain/animal carrying capacity, and gain/hectare will be measured in this experiment. The results from these trials will furnish valuable information concerning the adaptation of these grasses and legumes to the environment of the Intermediate Savannahs and also their response to grazing and animal production capacity. No results were yet available at the termination of this contract.

Significance of findings for Guyana

A new grass "Transvala" similar in growth habit to "Pangola" has been discovered which is resistant to Pangola Stunt Virus (PSV). This grass is widely adapted in the Caribbean area and has been released as a new cultivar. It is productive in this region when adequately supplied with fertility and no doubt will replace Pangola as PSV spreads into other regions. The study of legume/grass association will give some indications as to the management systems which will be required to maintain the legumes in the sward and increase the production of the pastures.

Benefits to U.S. Agriculture:

The opportunity to study forages over a broad spectrum of environments has enabled the University of Florida scientists to become more aware of the factors effecting the growth of forages and their response. Transvala is well adapted to Central and South Florida and if PSV should every be introduced into the Pangola pastures a new variety is now available to take its place.

Publications

Schank, S. C. August 1972 Assessment of field resistance to Pangola stunt virus (PSV) of Digitaria introductions in Surinam and Guyana

Schank, S. C., J. R. Edwardson, R. G. Christie and M. A. Overman. 1972 Pangola stunt virus studied in Pangola-grass and Digitaria hybrids. Euphytica 21:344-351

Hurrkar, E. S., A Tjong-Allung, I. G. Duldern, S. C. Schank, N. L. Holder, and C. G. Edwards. 1973 Assessment of field susceptibility for Pangola stunt virus (PSV) of Digitaria introduction in Surinam and Guyana. Tropical Agriculture 50: In press

Boyd, F. T., S. C. Schank, R. L. Smith, E. M. Hodges, S. H. West, A. E. Kretschmer, Jr., J. B. Brolmann and, J. E. Moore. April 1973 Transvala digitagrass. A tropical forage resistant to 1. Sting nematode, 2. Pangola stunt virus. IFAS University of Florida Circular S 222

Holder, N. L. 1972 Ebini Livestock Research Station Annual Report

Mott, G. O. 1973' Forage and livestock production on the Intermediate Savannahs of Guyana 7th Annual Conference on Livestock and Poultry in Latin America

Table 1

Treatments in Legume/Grass Association Trial

Effect of Defoliation by the Grazing Animal

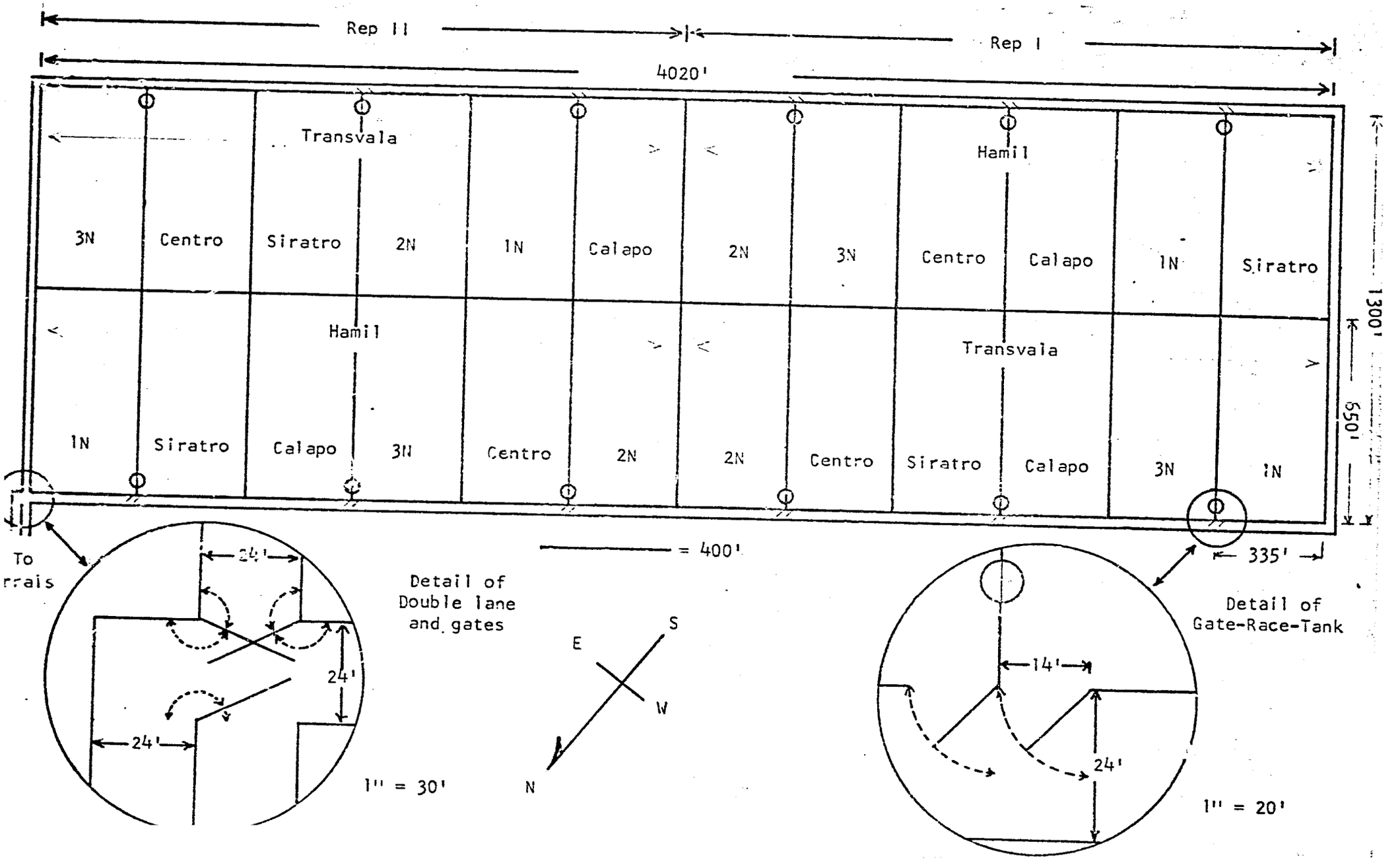
Treat No.	Grass*	Legume*	Management Grazed-Rested	Plot No. Rep I	Plot No. Rep II
1	Digitaria	Indigofera	7-21	23	6
2	Digitaria	Indigofera	7-49	8	22
3	Digitaria	Calapo	7-21	9	4
4	Digitaria	Calapo	7-49	18	2
5	Digitaria	Centro	7-21	19	13
6	Digitaria	Centro	7-49	11	15
7	Digitaria	Siratro	7-21	12	14
8	Digitaria	Siratro	7-49	20	9
9	Digitaria	Kudzu	7-21	3	20
10	Digitaria	Kudzu	7-49	14	3
11	Digitaria	Stylo	7-21	4	17
12	Digitaria	Stylo	7-49	17	24
13	Panicum	Indigofera	7-21	5	8
14	Panicum	Indigofera	7-49	15	5
15	Panicum	Calapo	7-21	2	11
16	Panicum	Calapo	7-49	13	12
17	Panicum	Centro	7-21	7	18
18	Panicum	Centro	7-49	21	23
19	Panicum	Siratro	7-21	16	10
20	Panicum	Siratro	7-49	1	21
21	Panicum	Kudzu	7-21	24	7
22	Panicum	Kudzu	7-49	22	16
23	Panicum	Stylo	7-21	6	19
24	Panicum	Stylo	7-49	10	1

* Indigofera hirsuta (Indigofera)
Calapogonium mucunoides (Calapo)
Centrosema pubescens (Centro)
Phaseolus atropurpureus (Siratro)
Pueraria phaseoloides (Kudzu)
Stylosanthes guyanensis (Stylo)

Digitaria decumbens (Transvala)
Panicum maximum (Hamil)

Figure 1

Grass/Nitrogen/Legume Grazing Trial

Ebini Research Station 4/18/71

Guyana