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FROM - **RIO DE JANEIRO**

SUBJECT - **NONCAPITAL PROJECT PAPER (PROP)**
Agricultural Research and Extension
INSTITUTIONAL DEVELOPMENT

COUNTRY: **BRAZIL**

PROJECT NO: **512-15-110-247-1** ^{298.1}

SUBMISSION DATE: **July 9, 1970**

ORIGINAL: **X**

PROJECT TITLE: **Agricultural Research and Extension**
Institutional Development

U.S. OBLIGATION SPAN: **FY-70 through FY-74**

PHYSICAL IMPLEMENTATION SPAN: **FY-71 through FY-75**

GROSS LIFE OF PROJECT FINANCIAL REQUIREMENTS:

U.S. Dollars	\$ 1,484,000
Cooperating Country	
Cash Contribution	388,000
TOTAL	\$ 1,872,000

(See Annex A, page 2)

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PAGE **1** OF **7**

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PRPC: M. Fox *[Signature]*
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SUMMARY

The term "campos cerrados" refers to the area of rather dense scrubby vegetation which prevails over much of Brazil's central plateau. The soils there are deep, have good structure, good drainage, and the area receives sufficient rainfall to be quite productive. However, due to soil fertility problems, this area is one of the lowest in crop production in the world. Through the use of limestone - available in the area - and proper fertilization, the area could eventually become one of the higher producing areas in the world. To date, it represents an area of 150,000,000 hectares, roughly equivalent to one fourth of the agricultural area of the United States. These lands will provide room for the settlement of large numbers of people and will be capable of producing abundant food and fiber in the future.

The expertise is available to unlock the door to production in the "campos cerrados". The short range goals of this project are to determine the soil factors which limit crop production in the "campos cerrados", to develop methodology for an economically sound system for making soil treatment recommendations based on information gained from crop response data, correlated with soil analysis, and to use the results obtained from soil investigations as a basis for developing studies in pasture improvement and forage production.

The long term objectives of the project are to expand and upgrade the agricultural research activities of the Ministry of Agriculture for the economic development of the upland savannah of Central Brazil ("campos cerrados"). Under this project adaptive research will be implemented through the institutional structure of the Escritório de Pesquisas e Experimentação (RPE) of the Ministry of Agriculture. The implementation of the project will be through a 3-man contract with the IRI Research Institute. Research activities will include range management, pasture improvement, hay and silage production, soil fertility management, and field crop production.

Educational activities will include the selection of potential recipients of scholarships for graduate training in the United States, on-the-job training, short courses, and seminars. Experienced professionals will be sent to the United States for advanced academic training.

II. SETTING

Major initial efforts to encourage the development of the "campos cerrados" began in 1960 with the founding of the nation's new capital in Brasilia, which lies in the heart of this area.

The rainfall in the "campos cerrados" area-generally ranging between 40 and 60 inches - is considered adequate and the soils are of a texture that permit effective internal drainage. Throughout the area, although underdeveloped, there are many expanding trade centers and growing population areas. The general topography of the area does permit mechanization. Research to date indicates that high yields can be obtained by proper soil management. The prime limiting factors are acid soil and low fertility. Field studies show increases of up to 300 percent in such crops as

corn and cotton where dolomitic lime, phosphorous, nitrogen, sulfur, boron, zinc and molybdenum were added. Where lime plus a complete fertilizer was applied to the soil in the State of São Paulo, production of shelled corn has been as high as 6550 kg./ha. This compares with only 160 kg./ha. where no lime or fertilizer was added.

Under previous contract arrangements with USAID, cooperative studies between IRI Research Institute, and the Ministry of Agriculture's Office of Agricultural Research and Extension (EPE) in the Federal District near Brasilia have produced interesting results. This region produces practically nothing unless lime and fertilizer are applied, but if they are used, a profitable return on investment is possible. Improved grasses and legumes may yield ten to twenty times more than native pastures. There are several legumes that appear well adapted to the area but need further investigations before recommendations can be made. These include: Stylosanthes gracilis, Phaseolus atropurpureus, Glycine javanica, and Centrosema pubescens. Since legumes have the ability to fix atmospheric nitrogen, thus reducing the amount of nitrogen fertilizer required, the development of a tropical legume could be of great economic value.

The problem of forage during the dry season may be partially solved with legumes, as some have the desirable feature of remaining green and being acceptable to livestock during the dry season. In addition they have a higher protein content than do grasses. With respect to grasses, the most promising are species of Digitaria and Brachiaria. They are fairly drought resistant and productive under conditions of poor soil fertility.

Where economics doesn't justify the immediate development of an area, partial development, plus the feeding of mineral supplements to cattle would increase beef production. The increase would be two-fold through increased gains and increased calf crop percentage. The second stage of this development would result in light cattle being moved to the improved pasture areas to be finished on improved pasture. These cattle would be slaughtered at an earlier age and more capacity would be generated on the less productive cow ranches by their earlier removal. This increased capacity would either go to increased production through more cow numbers, or the numbers will remain lower to allow the native range to "come back", where there has been over-grazing. To justify the additional expense for lime and fertilizer, one only needs to consider that when a cow has one calf every two years and interest is thirty percent, there is somewhere between twenty-five and thirty dollars invested in that calf before he is born, in interest alone. That figure can be lower.

The real opportunity will be for the smaller grower that will have the operation that will allow him to make maximum use of his investment by both high production and a rapid inventory turnover.

Good marketing potential exists in the Northeast of Brazil where a beef production deficit has to be supplied by imports of jerked beef from Central and Southern Brazil and by cattle on the hoof from Bahia, to the extent of approximately 500,000 cattle per year.

Brazil's 84 million head of cattle provide the population with an annual beef production estimated at 13 Kg. per capita. (Assuming that ten percent of the cattle are dairy and that the average dressing percentage of beef carcasses is 50 percent). Given a nutritional need for 50 Kg. per capita and a consumer preference of 75 percent beef, the result is a deficit of 24 Kg. per capita per year. Thus there is an immediate need to increase production 185 percent without considering the growth in population.

It must be remembered that the low slaughtering rate is a result of the late age at which the animals are sent to the abattoirs - usually four to five years in Brazil. Whereas, in countries where stock farming is really efficient and productivity is high, cattle are slaughtered at an early age and the slaughter rate is high. In the United States, for example, steers are prepared for slaughter at one to two years. It should be noted that the meat yield per animal slaughtered does not give a clear indication of the level of efficiency and productivity of the livestock industry unless it is related to the age or state of development of the stock slaughtered and correlated to the unit of pasture required for its production.

The Ministry of Agriculture operates a network of twenty soil test laboratories which were organized, equipped, and trained, by the North Carolina State University soil-test contract (CSD-287). These laboratories are now prepared to do large scale soil and tissue analysis, and some of them are already performing this service.

Over large areas, however, the soil-test service lacks field information with regard to the effects of fertilizer applications on yield, which is necessary in order to make realistic fertilizer recommendations based on laboratory analysis. Some of this work is in progress and includes pot studies as well as field plot work. The proposed contract will greatly expand this effort and vastly increase the utility of the soil test service.

A most imminent problem is that Brazil suffers from a severe shortage of trained personnel in all disciplines of agricultural science. Short and long-term training in Brazil, as well as graduate training abroad, are needed in order to speed the correction of this deficiency. Large numbers of competent professionals will be needed in the future to cope with the ever increasing technological advances as progress exhilarates.

This project will be strengthened by research conducted under the pending Agricultural Research Loan. Under both projects, professors and researchers will be provided scholarships to the U.S. for advance studies in agricultural research fields not available in Brazil. The two projects will be complementary in the development of the "campos cerrados" since activities under the pending Agricultural Research Loan will essentially concentrate on crops other than those indicated in this PROP. This project will be further strengthened by the expanding agricultural credit program in this area, as well as the rest of Brazil. In addition to substantial annual increases in funds available for agricultural lending, technical assistance is being provided to an increased number of farmer borrowers each year. A special program of the Central Bank providing loan funds at special terms for the financing of "modern inputs" such as improved seed, fertilizer and lime as indicated by soil analysis, etc. will be of major importance to the success of this project.

III STRATEGY AND COURSE OF ACTION

USAID assistance to the project will be carried out by means of a contract with IRI Research Institute, under the terms of which three U.S. specialists will be maintained in Brazil to carry out the work in collaboration with their Brazilian counterparts. The men selected for this assignment have all had previous Brazilian experience and are already familiar with the problems on which they will work. The reasons for selecting IRI are that they have had previous experience in both the "campo cerrado" soils research and the training aspects of the project. The work to be undertaken under the new contract will in actuality be a continuation of work already started or in progress. Hence a rupture of continuity, which might have occurred were another contractor to be approached, will be avoided.

The responsible Brazilian organization will be the Escritório de Pesquisas e Experimentação (EPE), of the Ministry of Agriculture. Field work will be carried out at experiment stations operated by that organization. Research planning and documentation will conform to established norms in use by EPE.

Project strategy will be essentially two-pronged: A) adaptive research for the economic development of the "campos cerrados" and B) educational and professional improvement of Ministry of Agriculture personnel.

A) Adaptive Research

To permit expansion of intensive agriculture on the "campos cerrados", the first priority will be the continued development of a Soil Fertility Research Division. The investigations presently under way on the soils of the "campos cerrados" are 1) large soil samples collected from representative areas. Each unit represents several million hectares; 2) chemical and physical analysis have been made on each of these soil units. (Laboratory and pot studies are being conducted on these soils to determine the soil factors which limit crop production and the quantity of limestone necessary to neutralize the aluminum); 3) phosphorous fixing capacities of each of the soil units; (this determines the economical rates for phosphorus fertilizer application) 4) native availability of nitrogen and potassium, and 5) quantity of micronutrients to apply to each soil unit. Pot test studies will then be correlated to soil tests. Field experiments will be conducted to develop an economically sound system for making fertilizer recommendations based on information gained from crop response data. In order to increase the efficiency of fertilizer used, methods of fertilizer applications will be studied. Attention will be given to the specie and variety of the test crop, double cropping, and inter-planting systems.

Through the Ministry of Agriculture Experimental Stations in the "campo cerrado" area, research will be carried out on field crops, pastures, and range management.

B) Educational and Professional Improvement

1. In order to prepare participants for graduate level study abroad, approximately 40 of the Ministry of Agriculture's researchers will be trained per year at the Matão Training Center. The courses will include, research methodology and practical field plot experimental techniques and intensive English language training for the potential recipients of U.S. graduate scholarships.

2. Four academic participant candidates, jointly selected by IRI and the Ministry of Agriculture, will be sent to the U.S. each year for degree training.

3. Under the project, efforts will be made to improve and expand cooperation and coordination of research on "campos cerrados" between the Ministry of Agriculture, State Secretariats of Agriculture, Agricultural Universities and other international, federal, state, industry, and local agricultural research organizations.

As follow up to the research conducted under this contract, the results will be published in available scientific media.

Technical guidance and assistance will be given to the editorial staff of EPE's scientific journal "Pesquisa Agropecuária Brasileira" (PAB). In addition, support will be offered to further develop means to improve the flow of information, ideas, and problem solutions between research and extension organizations.

PLANNED TARGETS

The planned Targets for the project are as follows:

(1) Correlate soils tests to develop methodology for an economically sound system to make fertilizer and soil treatment recommendations for animal and crop production in the "campos cerrados" area as follows:

(a) To be able to make soil fertility recommendations applicable to 30,000,000 hectares by 1971 and to be able to expand those recommendations to the entire campos cerrados area by 1975.

(b) To do feasibility studies on the production of field crops on the "better" land and to have cost study recommendations available by 1975.

(2) To correlate soil tests to develop and initiate a program for growing pasture legume crops.

(a) To reduce per hectare requirements for chemical nitrogen by 50 kilograms and increase the protein content of the forage at the same time by using legume crops that "fix" nitrogen from the air into the soil.

(b) To have legume pasture variety recommendations, and, or, mixes based on test plots available for the entire "campos cerrados" areas by 1975.

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(3) To develop a **Soils Fertility Research Program** within the Ministry of Agriculture specifically for the "campos cerrados" areas. A requisite for continued U.S. assistance to the project will be that a minimum of at least 7 new research personnel be added to the Ministry of Agriculture's Soils Research Division Staff before the end of 1971. In addition, increased supporting budgets must be made available on the "campos cerrados".

(4) To increase beef production on selected demonstration sites by quadrupling inventory turnover of stocker cattle and increasing production on a per hectare basis by a minimum of two hundred percent.

The increased inventory turnover will be made possible by using light weight cattle from unimproved ranges on improved permanent pasture and feeding the animal until he reaches a desired weight, rather than letting him fluctuate in wet weight according to season and the rainfall. Such a program will also reduce the death rate from 15 percent to less than 5 percent. The improved productivity per hectare will be the result of soil and pot work, nitrogen fixing legumes, using improved pasture mixes adapted to the area, and proper pasture management and fertilization.

(5) To develop within the Ministry of Agriculture a program for information dissemination that will report on activities within the "campos cerrados" within one month. (This is opposed to the present system which takes one year or more). Research findings will be made available to researchers, seedmen, fertilizer manufacturers, livestock breeders, in both the public and private sector. At least ten major soil research publications on "campos cerrados" soils will be made available per year through the Ministry of Agriculture's Division of Soils and Soil Fertility.

DOONSTRA

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NONCAPITAL PROJECT FUNDING (Obligations in \$000)

Table 1
Page 1 of 2 pages
COUNTRY: Brazil

Annex A
PROP Date: July 9, 1970
ORIGINAL: X

Project Title: Agricultural Research and Extension
Institutional Development

Project N9: 512-15-110-247.1

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Fiscal Years	Ap	L/G	Total	Cont ^{1/}	Personnel Serv.			Participants		Commodities		Other Costs	
					AID	PASA	Cont	U.S. Agen.	Cont	U.S. Agen.	Cont.	U.S. Agen.	Cont
Operational (\$) FY-70	AG	G	358	358			242		14		7		25
Budget FY-71	AG	G	161	156			69.3		35			5	51.7
Budget FY-72	AG	G	330	306	20		193		35		5	4	73
Budget FY-73	AG	G	313	287	22		208				5	4	74
Budget FY-74	AG	G	322	296	22		210				5	4	81
Total Life	AG	G	1484	1403	64		922.3		154		22	17	304.7

^{1/} Memorandum (nonadd) column.

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Provides 15 months of funding from 7/1/70 - 9/30/71

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RIO DE JANEIRO

Table 2
 Page 2 of 2 pages
 COUNTRY: Brazil

\$ Equivalent (1976)
 Exchange Rate \$1.00 = \$1.25

Annex
 Project No: S13-11-1p-04.1

Fiscal Years	Municipalities		Other Municipalities		Fund for Procurement of Commodities		
	Local Government		Cooperatives	Other	Metric Tons	Value	World Market Price
	U.S. Cents	Country Cents	Country	(\$ 1000.0)	(Tons)	(\$ 1000.0)	(\$/T)
Operational FY-70		6					
Budget FY-71			80.0				
Budget FY-72			80.0				
Budget FY-73			80.0				
Budget FY-74			80.0				
Total Life		68	320.0				

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TOTAL 3 005

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