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University Consortium in Uruguay

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Report No 13

End of Project Report of the Agricultural Economist
Advisors for U. S. A. I. D. / Tri-University Consortium
in Uruguay
April 30, 1975

by

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It is impossible to adequately acknowledge the many Uruguayan agricultural technicians and producers who have made this effort a success. There are three Uruguayans, however, to whom I must give special recognition for their cooperation, dedication and determination:

Cra. Viviane Laffitte de Cobas
Ing. Agr. Gonzalo Pereira
Mrs. María Luisa Coitiño de Sanguinetti.

I am grateful for having had the opportunity to work with these and other Uruguayan technicians. It is my hope that in the future Uruguayan agricultural technicians and producers will be given the incentives and opportunities to give to their country their full human capability.

Dr. James McGrann
Agricultural Economist.

INTRODUCTION

Project A, a part of the Tri-University Consortium, began in February 1973 and terminated April 30, 1975. The project supported by Texas A & M University involved 5 man-months of short-term assistance and 27 months of long-term technical assistance. (Appendix A).

The project activities were originally planned with personnel from the Agricultural Planning and Policy Division, OPYPA, of the Ministry of Agriculture and Fisheries (MAP), and the National Planning Office, OPP. With reorganization of the Ministry of Agriculture in April 1973 Project A was assigned to support the new Sub-Direction of Econometric Studies (SDEE). This new research division was placed under the same division of the Ministry as OPYPA but under a different administrative section, the Direction of Agricultural Economics Research (DIEA), a division that has the responsibility of the agricultural census and crop reporting.

When the project began there had been very little applied agricultural economics research done by OPYPA or OPP. The work done in the agricultural sector had been mostly of the diagnostic type, using secondary data or macro economic information put together by other official agencies. Development projects were proposed from a basis of descriptive reports and the required applied empirical data were not available in a usable form. There had been limited contact with the producers, producers' organizations and even the research technicians involved in physical experimental work.

With the exception of the economic section of the Plan Agropecuario (the World Bank supported MAP supervised credit program) very little applied agricultural economics research was in progress in the country. University trained agricultural economists were few and the demand for their services was great. MAP was faced with an increasing need for applied economic research in the agricultural sector for development planning, policy evaluation, product price and input price fixing as well as technical assistance to producers.

PROJECT OBJECTIVES

After a preliminary evaluation the following objectives were specified for Project A:

1. To increase the economic planning input of the Ministry of Agriculture in the decision making process for the agricultural sector by assisting in developing a permanent analytical and communicative capability. This will enable the continuing use of practical and theoretical economic analytical concepts necessary to develop policy issues and recommendations for the Government of Uruguay.
2. To develop production and planning guidelines by means of advanced economic model analysis, for the major agricultural production enterprises in Uruguay. The guidelines will represent the traditional production systems and the improved systems using known alternative technologies.
3. To develop a macro analytical model to evaluate alternative government policies and change in production technology with respect to such things as: 1) The market impact of increased agricultural production and demand for inputs, 2) The effects on farm income, 3) The change in foreign exchange earnings, 4) Productivity of capital in alternative uses and production regions.

ACCOMPLISHMENTS

Project A has, for the most part, accomplished the objectives established at the launching of the project. The first two major objectives have been adequately satisfied. In fact, the extent and depth of research, the number of publications and training far exceed what was viewed as feasible with the limited resources allocated to the project. Because of the impressive pay-off of the micro-economic studies which generated greatly needed data with revealing economic analysis, the macro-economic objective was delayed until last but will be completed. Although the basic data have been generated, the computer analysis and write-up of the macro analysis will be completed after the formal termination of the project (explanation follows later).

Foremost among the unique contributions of this project are the following:

1. Data were obtained directly by interviews with producers and research technicians at experiment stations. Too often economic researchers rely on census data and published official reports. The generation of empirical basic data from the reality of production as it is and as it potentially could be, is essential.
2. Of long lasting benefit is the special day-to-day training of technicians within the Ministry of Agriculture who are now prepared to identify problems, design research methods, conduct field surveys, carry out economic analysis and prepare meaningful reports (see Appendix B). This type of training could not likely have been obtained in such a short time in any other way than by the personal association with the project advisor.
3. For the first time computers in Uruguay were used for this type of research. The ground has been broken for further research data processing and economic analysis.

4. A major contribution has been the continued communication and collaboration of the researchers with the production technicians, farmers, ranchers, and all major research and extension institutions dealing with agriculture within the country.
5. Although this project provided very little budget for out-of-country training and unique and highly productive arrangement has been made with Texas A & M University. A Uruguayan Ph. D. student has been granted a graduate assistantship by the University and the Project A has provided basic economic data for him to write his Ph. D. thesis on the macro-economic problem outlined in the objectives. The project provided financial support for a trip to Uruguay and computer time to develop the macro model.

Information Generated and Research Results

Information generated and micro economic results supported under Project A that have been published fall into the following five major areas: (1) technical coefficients or input-output coefficients for different enterprises and production technologies and corresponding enterprise partial budgets for different agricultural regions of the country, (2) linear programming analysis of typical ranch units for different regions, (3) agricultural commodity price analysis, (4) a study of the Uruguayan wheat production sector, and (5) various economic evaluations of technological change in production systems or demonstration units. A brief description of some of the useful findings of these areas of activity follows.^{1/}

1. Technical Coefficients and Enterprise Budgets.

The basic elements of any economic analysis or development plan, whether it is at the ranch or macro-decision level, are technical coefficients or input-output relationships for different production enterprises and technology. A major

1/ See Appendix B for the complete list of publications.

contribution of this research effort was development of a systematic methodology of data collection, synthesis, review and presentation. This involved questionnaire preparation, training of technicians to interview producers and establishment of contacts and gaining support of producers, technicians and organizations in the agricultural sectors. Coefficients were established for the major livestock and crop areas, accounting for approximately three-fourths of the country's land area, and have been or are in the process of being published.

Review of coefficients and analysis based on the coefficients by qualified professionals and comparison with the best imperial data available have proven that the procedure used in data collection is accurate and useful. The research also has proven that data necessary for economic analysis to improve producer and policy decisions can be assembled at the producer and technician level in Uruguay.

Enterprise partial budgets were assembled and published for the different production regions and technology. A description of the methodology of enterprise budgeting was also included in each publication. The enterprise budgets presented in an easy-to-understand and systematic form have already proven to be useful tools for technicians working with producers in the Plan Agropecuario and in CREA groups.

Use of the forage and livestock enterprise budgets themselves shows the structure of the costs for the different enterprises. These budgets show variable costs to be extremely low for livestock enterprises and the importance of price variation in explaining instability in producer income.

Comparison of production technology reveals the high marginal return associated with quite basic changes in management and small increases in purchase of off-farm inputs.^{1/} In major livestock areas the studies show that producers who have adopted improved management and production practices have increased calf and lamb weaning percentages to 80-85%, or 20-25% above the national average (this data is published in the technical series publications, see Appendix B).

1/ Referring to the net returns on the additional investment or increased investment in inputs and management practices.

2. Economic Evaluation

Uruguay is essentially a cattle and sheep country based on grazing. Due to the country's soils and climate, livestock will continue to dominate the agricultural sector's production. Beef, mutton, lamb, wool, hides and skins presently account for about 80 percent of the country's export earnings. Livestock grazing accounts for 90 percent of the land use.

Project A's supported research emphasized the determination of the economic feasibility of increasing production in livestock production, the key sector in Uruguay's agriculture.

- a) Analytical technique - The most important technique used in economic evaluation was linear programming. Although this technique is widely used in agricultural economic research in many countries of the world it had not been used in the agricultural sector in Uruguay. This technique is of particular value in policy evaluation and production decision situations involving many production alternatives and production constraints. The technique allows for simultaneous evaluation of a number of variables at one time with great analytical flexibility. Rapidly changing prices and price relationships due to inflation make this tool valuable in Uruguay because the computer can be used to save much of the labor and time involved in modification of prices of products and inputs.

Thirteen linear programming models have been formulated for different areas of the country and results of nine models in the livestock areas have been finished and written up for publication. The different models can be readily modified and revised as needs arise. A manual has been written to explain the implementation of the computer program and counterparts have been trained to use the computer for the analysis.

b) Conclusions based on the research results - The analysis in the livestock areas showed it to be economically feasible to double production and income with the technically improved system of livestock production. Transition to the improved system of production depends on ample supplies of key inputs, including phosphate fertilizer and legume seed for pasture improvements and materials both for fence division and development of water points.

The research demonstrated the economic feasibility of adopting the improved system even under adverse price conditions because of the high production response to improved management practices and the key off-farm purchased inputs. Therefore, a government policy aimed at insuring adequate supplies of key inputs would be more beneficial than an effort to hold input prices down or use subsidies that might lead to restricting supplies of inputs to producers.

The 35 percent rate of return for credit used for investment in pasture improvement, division fences and watering points in 1973 indicate that the government policy aimed at subsidizing credit is not necessary to make investments profitable.

The linear programming and price analysis studies clearly demonstrate the very unstable livestock and wool prices and, in turn, the income in Uruguay's livestock sector. This instability has a very adverse effect on technological change because it increases the financial risk of debt financing of investment in improvements. The instability of real prices (price adjusted for inflation), combined with rates of inflation averaging about 80 percent annually, has a very negative impact on investment programs, such as pasture improvement, that require at least 5 years to receive the full returns on the investment.

The studies point out the need for balanced, long-term agricultural policies for the livestock sector which would include coordination of credit, tax and pricing policy to stabilize income and encourage investment in the livestock sector.

Adoption of the improved system of production was shown to increase the use of on-ranch labor by 40 percent. This has important implications for increasing employment opportunities in the rural sector. With increased use of off-farm inputs and increased production of livestock products for processing and marketing employment would also increase in the agri-business sector.

Although Uruguay has a small land area suitable for crop production the studies in the crop area show that adoption of production-increasing technology could result in adequate domestic supplies of cereals, feed grain and oil seed. Again, as in the livestock sector, supplies of key off-farm inputs are critical. Declining and unstable crop prices have discouraged investment in production-increasing technology. The research indicates that with adoption of improved production practices and encouragement of production of crops with a relatively low portion of imported inputs this sector could produce a sizeable exportable surplus at prices competitive in the world market.

An increased specialization of fattening cattle in the major crop area on improved pastures grown in crop rotations could be complementary to specialized livestock areas where breeding cattle and sheep have the comparative advantage. Early fattening of cattle could cut 1 to 2 years of the normal production cycle. If the improved technology could be widely adopted in the breeding areas and complemented by the early fattening in the crop area national extraction rate (cattle slaughter/cattle stock) could be increased to at least 25 percent from the now low 17 percent annually.

The recent low prices for beef and wool and high prices for grains have emphasized the need for diversification in the agricultural sector of Uruguay. The studies show that even in the specialized livestock areas, adoption of production-increasing practices has important diversification implications by allowing the producer to switch among different livestock enterprises.

Realizing the full potential of technological improvement in the cropping area would enable greater crop diversification and higher production efficiency. Diversification at the farm level could help stabilize income not only at the farm level but also at the national level.

Although the research was not aimed at marketing problems per se, important marketing implications arise. For example, the studies show a large potential for increasing mutton and lamb production. Realization of this potential is directly related to establishment of a stable export market for lamb and mutton. Stabilization of agricultural prices will be closely tied to marketing diversification in location and in types of products produced for sale, development of storage facilities and obtaining of long term contracts in international markets.

The models of typical farm units give a quantified estimate of the implications of the forementioned factors at the ranch level for difficult regions of the country. With finalization of the macro economic analyses, the aggregate sector estimates are to be derived.

3. Price Information Studies^{1/}

Price information publications have been readily accepted by producers and agricultural technicians because of limited access of long-term information adjusted for inflation. The problem of severe price instability of agricultural prices is clearly demonstrated in the graphic analyses. These publications also point out the necessity of additional research for development of an effective long-term price stabilization policy in the agricultural sector.

^{1/} See Appendix B for specific publications on price information

4. Study of the Wheat Production Sector.^{1/}

The study of the wheat production sector presents detailed information in tables and graphic form as well as an econometric analysis of the variation in area planted to wheat from 1950 to 1973.

The sharply decreasing trend in wheat production in Uruguay was associated with decreasing prices, credit availability, an increasing relative cost of tractors and adverse weather conditions.

The econometric analysis showed that producers respond positively to increased wheat price and credit availability but that variation in area planted from year to year for the most part is caused by excess rainfall during the land preparation and planting period. Any wheat production and export policy proposed for Uruguay must take into account the extreme weather variation in the country.

5. Economic Evaluation of Demonstration Units

Economic evaluation of a number of demonstration units has proven to be an effective means of communicating physical information to producers and shows the economic benefits from technical change. The CREA group evaluation was used to show that finishing young light steers versus older heavier steers could increase net income per unit of feed 38 percent. Economic evaluation of the Young demonstration units showed that with pasture improvement and grazing management it is economically feasible to increase production up to 430 kgs. per Ha. seven times the national average of about 60 kgs. per Ha.

^{1/} See Appendix B for specific publication.

A way to summarize the project's research effort would be to say that it has proven that: (1) a data base can be developed in Uruguay for useful applied agricultural economic research, (2) through completion of studies, publication and communication of results, the need for agricultural economic research has been more clearly recognized, and (3) the Uruguayan technicians have proven they can do high quality agricultural economic research using sophisticated techniques and are able to communicate results in an easy-to-understand, practical, problem-solving manner. It is fair to say one could not ask for more from such a small project effort, especially in light of the limited resources with which it had to work.

Personnel Training.

1. Economic analysis at one point in time is not sufficient. Its usefulness is temporary and tentative. With constant changes in economic relationships a continued flow of economic analysis is essential. Training of people to do this is basic to its continuance.

Project A accomplishments include a significant number of people in Uruguay trained in the research methodology including data collection techniques, data preparation for linear programming and partial budget analysis, computer data processing and report preparation. (Appendix E) The technicians have gained a sense of responsibility to other institutions and producers who provided much of the basic data and have developed a valuable alliance for continued collaboration.

2. A worrisome, time consuming problem has been the development of procedures, programs and personnel to facilitate computer data processing within the country. Computers are used for administrative matters and adjustments to handle research models required a great deal of effort. The accomplishment of this task is worth listing as a significant contribution to the research effort in the country.

3. Publications of this project include selected reports of research methods -- partial budgets and linear programming -- for the express purpose of giving support to the training of research technicians who can use these publications as methodological guides.
4. The SDEE group had a number of opportunities to use the data and research results for application on specific problems presented by different MAP divisions including such things as:

Impact of increased fertilizer price on economic feasibility of pasture improvement.

Economic evaluation of the potential for increasing mutton and lamb production.

Evaluation of production systems and producer demonstration units.

Evaluation of potentials for increasing beef production in conjunction with a study committee with the Plan Agropecuario.

Provided information and data analysis to FAO and World Bank technicians.

Provide information to OPYPA for recommendations to the government on fixing grain prices.

Development of a report on agricultural credit availability and technological change in Uruguay for the AID-MAP technical assistance loan proposal.

Publication of Research Results.

The contract consultant supported by the relatively few, and at times transitory, team members has emphasized the distribution of the team's research results as widely as possible. This has been done through publications, presentations at meetings, and individual communication with producers' technicians and officials.

1. SDEE, with the support of Project A, now has developed the most complete and comprehensive source of farm level production and economic data available for livestock and cereal-crop production sectors in Uruguay. This information has been developed from producer interviews (over 200 producers have been personally interviewed), meetings with CREA groups (private organizations of producers), technicians working in the Plan Agropecuario and technicians at the different experiment stations.

Production coefficients and 9 linear programming models have been completed for the major livestock areas in Uruguay. The areas account for 45 percent of the country's land area and 50 percent of the cattle and sheep. Production coefficients and 4 linear programming models have been completed for the major crop area.

Publications have been of three types: (1) Technical, (2) Information series, and (3) Short research summaries. The number of publications is most favorable (Appendix B). About 22 different publications have been completed. These publications are duplicative to some extent because of the different audiences being reached. The publication accomplishment of the SDEE is particularly noteworthy in view of the fact that a major weakness among researchers is to permit research findings to fall into uselessness in unpublished data.

2. The results of the economic studies have been communicated to other technicians informally as well as through publications. Analyses were reviewed by others to not only gain their counsel but to keep them informed of the research progress. All who provided information for the studies received the results of the studies.

3. Visiting consultants from national and international organizations have conferred with the researchers and used information provided. Information has found its way into basic documents for loans and policy action proposals.

Involvement of Other Organizations and Producers.

One of the most significant accomplishments of the SDEE has been the generation of a broad base of support for its research activity in the agricultural sector. In addition to very cooperative direct producer support SDEE has received support from the following institutions: SUL (national wool growers' association), CREA (a national private technical assistance organization of agricultural producers), the Plan Agropecuario, the different experiment stations of the Centro de Investigaciones Agrícolas and the Banco de la República (national bank in charge of producers' credit). These organizations have assisted in all phases of the research activity and an effort has been made to see that they receive results from their effort through SDEE conference presentations and publication of information and research results.

Special mention must be made of the support from Dr. von Oven, an agricultural economist working with the Plan Agropecuario in the farm record and economic section. Dr. von Oven has been the single most important individual source of project support. He also has been very instrumental in coordination of economic research with the Plan Agropecuario activities and has been most cooperative in supplying his data and personal time to the research effort.

IICA (the Interamerican Institute of Agricultural Sciences) has actively supported SDEE. They donated U\$S 1,000 for SDEE publications and in November of 1974 agreed to pay the salary of two technicians to work with SDEE. IICA also paid travel and per diem cost for two of the SDEE technicians to attend a week long international conference on systems analysis in Balcarce, Argentina. SDEE technicians presented a conference paper on research results which will be published in an IICA conference publication financed by IICA. It is anticipated that IICA will continue to support SDEE activities.

The broad based support generated by SDEE has come from personal contact with producers and agricultural technicians. Most of this support is unofficial and not from the top administrative level. Nor are the individuals at this level always the most influential in encouraging greater support for the research effort. However, if agricultural economics research is to be relevant, problem solving and to improve production and policy decision, their support, influence and guidance are vital (Appendix C).

Project Objective Now in Development.

The project objectives to generate basic economic data at the producer level have been accomplished. In fact, as indicated previously, the study has gone far beyond the original expectations. Models were developed for more livestock areas than were anticipated, due to the sector's importance. Crop models were also developed for selected crop areas.

The macro-economic model which brings together macro economic data for an overall national analysis is now in progress. The elements of the model have been identified and the coefficients for the input-output matrix are mostly computed. This model will require computer data processing which can be done more efficiently with a computer that has a capacity beyond the capacity of local computers; therefore, the data will be processed at Texas A & M University.

Although the project will formally terminate before this final stage can be completed, the work will continue with the support of the University, faculty advisors and Roberto Vázquez, a Ph.D. candidate from Uruguay. Completion of this objective is projected for December 31, 1975. The appropriate understanding and use of the results of the macro-economic model will depend greatly upon the continuing research staff here in the country. Roberto Vázquez, it is hoped, will be among them.

REFLECTION ON FUTURE RESEARCH NEEDS,
PERSONNEL TRAINING AND RESOURCE SUPPORT.

On the date of termination of Project A the actual continued support of the SDEE by the MAP is not clear nor is the actual future responsibility of the group defined. Without a clear idea of these conditions it is not possible to make definite recommendations, as is requested in the contract, for future research activity, personnel training and resource support. In light of this situation reflections are made on what should be done to develop agricultural economic research in the MAP. No specific recommendations can be made, however, on the how, by whom and when it is to be done. These reflections, it is hoped will be helpful to administrators in their decisions as to future development of the SDEE group and the direction and support of all agricultural economic research in the MAP.

Reflection on Future Research Needs

1. Sub-Dirección continued research effort.
 - a) Finish livestock - crop area study.
 - b) Initiate the rice area study.
 - c) Initiate the dairy area study.
 - d) Serve as back-up to macro analysis being done at Texas A & M University.
 - e) Continue study of agricultural credit and cash flow analysis at the production level.

2. Support to OPYPA
 - a) Coordinate data collection.
 - b) Plan and carry out study to determine machinery capacity and requirements.
 - c) Study agricultural labor problem.
 - d) Strengthen price fixing basis for crops, methodological approach and policy evaluation.
 - e) Support supply-demand studies for inputs and agricultural commodities.
 - f) Strengthen micro data and methodological base for their project proposals.

3. Support to Centro de Investigaciones Agropecuarias.

a) Systems or demonstration units planning and evaluation.

Crop - livestock units:

La Estanzuela
Treinta y Tres
Young

Livestock systems:

Tacuarembó
Basalto area

Dairy System La Estanzuela.

b) Support economic evaluation of fruit and vegetable research.

c) Assist in statistical evaluation of research results such as is now in progress for forage fertilizer response work at Tacuarembó.

d) Assist in agricultural economics and farm management extension.

4. DIEA Statistical Division.

a) Assist in planning of census to generate more valuable information for economic research.

5. Plan Agropecuario.

a) Assist in planning and implementation of small farm economic and financial study.

b) Serve as a back-up to economic problems as they come up and maintain coordination of efforts.

c) Coordinate efforts with the economic section of the Plan (SERPA).

6. Continue to maintain support and coordination of agricultural economic research activities with the CREA group and SUL.

7. New areas of agricultural economic research.

a) Marketing, Distribution and Demand Studies.

- i) Distribution, pricing and sources of the input factors of agricultural production.
- ii) Market structure and performance of agricultural products. Study of intermediaries, institutions, channels, regulations, controls, costs related to functions and profits, relative to the domestic marketing of agricultural products. The role of supermarkets, chain stores, voluntary chains, cooperatives, centralized markets, storage facilities, grading systems, market news service, multi-pricing systems, marketing orders and other market related variables should be studied.
- iii) Export demand, export pricing, merchandising of agricultural products in a competitive world market and the economics of imports of agricultural inputs should be studied in depth on a continual basis.

b) Extension work in agricultural economics.

- i) Farm management and production economics to distribute useful information generated by economic research agencies, and government action programs.
- ii) Marketing, price analysis, demand analysis and outlook information need to be widely distributed.
- iii) Transfer of innovations:

Study of producer's decision process and means to increase rate of adoption of production increasing technology.

Define means to increase managerial capacity.

Reflection on Training of Personnel .

There can be no misunderstanding about the important role of technical training as a part of development and economic progress. The realization of an appropriate level of training is complicated by the fact that when the need is greatest the resources available are usually scarce and the time required is long but the need is immediate.

The direction of university training in Uruguay is not in line with the competence required in the economy. Increased training in technical agriculture, agricultural economics, business management, finance, public administration as well as the basic sciences would contribute to the internal capability. Training in agriculture should include courses in economics, marketing, and business management.

A continual flow of students to graduate schools for advanced degrees, mostly at the Masters level would provide the needed research capacity. It should go without saying that specific steps to retain the trained returning technician in key positions must be instigated. A training program without a technique for assuring the benefits to the country is only a partial program. The flight of trained people from Uruguay is a serious consequence of inadequate compensation within the research institutions and administration that fails to maximize the utilization of the human resource. Returning scholarship students must be assured in a formal way of an appropriate position upon the successful completion of their training. The absence of this formal assurance leads to the search for other alternatives and frequent employment outside of Uruguay.

The scholarship students studying abroad must represent a balance with the technical competence required. Universities should be chosen carefully to be sure the training is meaningful and practical.

On-the-job training with consultants from foreign universities or from local institutions can be extremely effective. Because consultant time is scarce and expensive, it should be utilized to the greatest extent possible. Returning scholarship students should be assigned a teaching function immediately, not necessarily in the university, but be assigned assistants for daily associations as well as arrange seminars and short courses.

Because of the shortage of published research, every possible effort should be made to make the research experience in a graduate program as useful as possible. This might be done by the scholarship student thinking through possible thesis research projects with consultants and directors before going abroad. It would be highly desirable if he could take research data with him for analysis or arrange for others to provide the required data at a time when the student is prepared to develop a thesis project. If a university has a team of consultants in Uruguay it may be possible for them to represent the graduate faculty and direct the thesis project here in the host country. Timing may be difficult to work out, but where this has been done the value of the thesis research experience has been greatly enhanced.

One of the most significant sources of teaching material is the published results of research and the reports of methodology. Every effort possible should be made to publish the results from experiments, economic analysis, and observations. These reports should be made available to graduate students to stimulate their interest in the ongoing research and help them search for improved research methods as well as areas of needed research. Too often students fail to relate their thesis research experience to the research needs within their own country.

Reflection on Research Infrastructure Needs.

To realize fully the human resource capability in research activities there has to be a complementary infrastructure. Reference has been made to the building of an infrastructure required to implement the research activities supported by project previously in this report (developing of computer facilities, a data collection procedure, data base, material support, etc.).

Due to severe budgeting constraints the SDEE had to put together a very minimal infrastructure by using borrowed equipment (calculators and typewriters), office space and a car for field work from other divisions of the MAP or AID. Needless to say, these basic research support problems must be solved in order to build an effective research organization.

Agricultural economic research requires limited material and equipment support relative to other types of agricultural research. Acquiring calculators, typewriters, insuring access to transportation for field work and materials for publishing would meet most of the resource needs of SDEE.

Adequate computer facilities exist in Montevideo to meet economic research needs. Further development of computer analytical programs should be encouraged. Centralization and developing of a MAP computer center would be valuable not only to economic research but to all other research activity.

The importance and success of the SDEE group in publication of research results and methodology have been pointed out. In order to accomplish this publishing equipment and personnel had to be acquired, duplicating facilities that exist in several other divisions of the MAP. Most all the publications were financed by funds other than from the MAP budget support. Centralization of publication and adequate budget support for publication of all MAP research should be a priority effort.

Although obtaining these infrastructure requirements seems very elementary it has been the area of greatest frustration to the long-term advisor. He and the SDEE directors have spent an excessive amount of time and effort in acquiring basic material and equipment necessary for the work of the group.

The economic division of the MAP needs assistance in the development of a more effective administration, aimed at increasing the efficient utilization of both the human and material resources. Agricultural economic research, planning, and policy formulation are not adequately coordinated and in many cases there is duplication of effort. Increasing the number of Ministry divisions and separating them physically only adds to the difficulty in coordinating effort.

The most serious problem in the economic division of the MAP is not the capability of the personnel. It is devising the administrative and support means to utilize effectively the human capability. In the utilization of this capability lies the success of agricultural economic research and its potential contribution to development of the agricultural sector.

APPENDIX A

**Project A - Texas A & M University personnel involvement
(all agricultural economists).**

<u>Short-term assistance</u>	<u>Timing</u>	<u>Responsibility with Uruguayan team</u>
Dr. Clive Harston	Feb. 1973	Planning project activities.
Dr. Ray Billingsley	Feb. 1973	Planning project activities.
Dr. Lonnie Jones	June 1974	Planning of macro model and communication of research results.
Mr. Roberto Vázquez	Jan. 1975	Develop macro economic model.
Dr. Clive Harston	March 1975	Termination of project.
 <u>Long-term advisor</u>		
Dr. James McGrann	Feb. 1973 to Apr. 1975	Advise in all aspects of project.

APPENDIX E

Publications.

English Translation of Publication Titles Done with Ministry of Agriculture and Fisheries, SDEE Division, supported by Project A.

Technical Series Publications:

1. Economic Analysis of the Traditional and Improved Production Systems in the Basaltic Area of Uruguay. MAP-DIEA. Technical publication No 1. October 1974. Montevideo, Uruguay.
2. Economic Analysis of the Traditional and Improved Production Systems in the Cristalino Area of Uruguay. MAP-DIEA. Technical publication No 2. December 1974. Montevideo, Uruguay.
3. (a) Economic Analysis of the Traditional and Improved Production Systems in the Garzon Sub-zone Uruguay. MAP-DIEA. Technical publication No 3.
4. (a) Economic Analysis of the Traditional and Improved Production Systems in the Sandy Soils area of Tacuarembó, Uruguay. MAP-DIEA Technical publication No 4.

(a) Publications completed and approved but not printed.

Information Series Publications:

1. **Technical Coefficients and Partial Budgets for Livestock in the Basalto Zone: Uruguay. MGA-DIEA, Information Series No 1. Montevideo, Uruguay, May 1974.**
 2. **Technical Coefficients and Partial Budgets for Livestock in the Cristalino Zone: Uruguay. MGA-DIEA, Information Series No 2. Montevideo, Uruguay, June 1974.**
 3. **Technical Coefficients and Partial Budgets for Livestock in the Garzón Sub-zone: Uruguay. MAP-DIEA, Information Series No 3. Montevideo, Uruguay, September, 1974.**
 4. **Historical information on Livestock Prices: Uruguay. MAP-DIEA, Information Series No 4. Montevideo, Uruguay, 1974.**
 5. **Historical Information on Crop Prices: Uruguay. MAP-DIEA, Information Series No 5. Montevideo, Uruguay, 1974.**
 6. **Technical Coefficients and Partial Budgets for Livestock in the Sandy Soils Area of Tacuarembó, Uruguay. MAP-DIEA, Information Series No 6. Montevideo, Uruguay, April 1975.**
 7. **Wheat in Uruguay: Determinants of the Sectors Performance 1950-1973. MAP-DIEA, Information Series No 7. Montevideo, Uruguay, April 1975.**
 8. (a) **Technical Coefficients for Livestock Zones in Uruguay, MAP-DIEA.**
 9. (a) **Economic and Technical Programming of a Livestock Ranch in the Cretácicos Soils, Uruguay. MAP-DIEA.**
 10. (a) **Manual for Linear Programming Computer Program. IBM-LPS. MAP-DIEA.**
 11. (b) **Technical Coefficients and Partial Budgets for Livestock and Crops in the Crop-Livestock Area Litoral Uruguay. MAP-DIEA.**
 12. (b) **The Balance of Payments Position of the Principal Crops and Alternative Crop Production Techniques in Uruguay. MAP-DIEA.**
- (a) Publications completed and approved but not printed.
(b) Publications in the process of being completed.

Information Papers:

1. **Summary of the Linear Programming Analysis in the Basalto Zone of Uruguay.** MAP-DIEA, Montevideo, Uruguay, June 1974.
2. **Economic Analysis of the Production of Lamb and Mutton in the Basalto and Cristalino Area of Uruguay.** MAP-DIEA, Montevideo, Uruguay, July 1974.
3. **Linear Programming Analysis of the Dr. Severi Ranch, Durazno, Uruguay.** MAP-DIEA, Montevideo, Uruguay, July 1974.
4. **An Analytical Methodology for Studying Summer Crop Pricing Policy.** MAP-DIEA, August 1974.
5. **Economic Analysis of Systems of Production.** MAP-DIEA, Information Paper No 5, October 1974.

Conference Papers on Livestock and Crop Production Systems Analysis:

1. (a) **Economic Analysis of the Production Systems in Young.** Sociedad Rural de Rio Negro, Young, Uruguay, 1974.
2. (a) **Evaluation of a Cattle Breeding System: Economic Analysis of Beef Production in Sandy Soils.** Estación Experimental del Norte, Tacuarembó, Uruguay, 1974.
3. **Economic Analysis of Production Systems.** IICA Conference, Balcarce, Argentina, 1974.
4. (a) **Economic Evaluation of the La Dehesa Demonstration Unit of the CREA, Florida, for the March '73 to March '74 Period.** 6th National CREA Field Day, Florida, Uruguay, 1974.

- (a) **Publications outside the Ministry of Agriculture's supported division (DIEA, SDEE).**

APPENDIX C

Research Commitments of SDEE outside of Regular Research Activity.

- A. Agricultural systems planning and evaluation, Centro de Investigaciones Agrícolas "Alberto Boerger".
 - 1. Dairy production system, La Estanzuela.
 - 2. Cropping and Livestock System, La Estanzuela.
 - 3. Cropping and Livestock System, Young, Rio Negro.
- B. CREA, Florida, livestock grazing system evaluation.
- C. Plan Agropecuario Livestock production research committee on a cooperative study of physical and economic evaluation of pasture and livestock management improvements.
- D. Statistical evaluation of fertilizer response for pasture in Tacuarembó. This work is with a technician at the experiment station there.
- E. University thesis project involving a linear programming model for a ranch in the cropping area. This study is in cooperation with the Plan Agropecuario.
- F. Participation in research activity for the Plan Agropecuario small farm development pilot project.
- G. A time series price study for the major crops and livestock provides a basis and convenient reference for other research studies but gives a graphic picture of price problems in the country.
- H. A study of agricultural credit sources, supply and requirements serves as a basic document for loan and credit policy.
- I. A complementary off-shoot of the cost analysis research studies has been the accumulation of cost data for specific sub-activities. For example a document was prepared showing the cost of baling hay and another report compares the inputs and costs of producing wheat and pasture together and the alternative of wheat and pasture separated.

APPENDIX D.

**Computer Programs Available for
Analytical Work.**

1. **Linear Programing (LPS-IBM-360)**
2. **Multiple Linear Regression.**
3. **Step-wise Variable Selection Multiple Linear Regression.**
4. **Analysis of Variance and Covariance.**
5. **Input-output Analysis. ***
6. **Population simulation. ***

* **Require some modifications to be used on IBM-360
40-DOS computer.**

APPENDIX E.

Uruguayan Technical Personnel Involved in
Research Activity as of April 30, 1975.

<u>Supporting Agency and Personnel</u>	<u>Timing</u>	<u>Accumulated time</u>
<u>Ministry of Agriculture and Fisheries</u>		
Cr. Viviane Laffitte de Cobas ^(a)	5/73-4/75	23
Ing. Agr. Gonzalo Pereira	5/73-4/75	23
Cr. Bibiana Troncoso de Davrieux	1/74-4/75	7 ^(b)
Cr. Alfonso Carluccio	1/74-11/74	10
Ing. Agr. Lillian Sierra de Albuquerque ^(c)	6/73-10/74	4
Ing. Agr. Miguel A. Cetrángolo ^(c)	10/73-8/74	10
Carlos Rogberg	11/74-4/75	5
Alejandro Digniero	11/74-4/75	5
<u>IICA (IICA (Inter-American Institute of Agricultural Science))</u>		
Ing. Agr. Joaquín Secco	9/11/74-4/75	6.5
Ing. Agr. José Ma. Ferrari	9/15/74-4/75	6.5
<u>OPP (National Planning Office)</u>		
Cr. Agustín Benzano	3/73-9/73	6
<u>Banco de la República O. del Uruguay (National Bank)</u>		
Alvaro Machado (programmer)	9/74-4/75	<u>6</u>
Total accumulated MAP support in man months		87
Total accumulated man months of support of all organizations		112

(a) Acting director of project supported Sub-Dirección de Estudios
Econométricos (Sub-Director of Econometric Studies).

(b) Mrs. Davrieux average less than $\frac{1}{2}$ time because of pregnancy leave.

(c) During indicated period acted as Sub-Division Director.