

PURDUE UNIVERSITY
International Education and Research
International Programs in Agriculture



**PORTUGAL UNIVERSITY
INSTITUTES
DEVELOPMENT PROJECT**

(Contract AID/NE-C-1701)

**REPORT ON
SHORT-TERM STAFF ASSIGNMENT**

**Submitted by
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Purdue University
West Lafayette, Indiana**

September 20 - December 16, 1982

PORTUGAL UNIVERSITY INSTITUTES DEVELOPMENT PROJECT

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REPORT ON

SHORT-TERM STAFF ASSIGNMENTS

AND

LIVESTOCK IMPROVEMENT SEMINAR

AT

INSTITUTO UNIVERSITARIO DE TRAS-OS-MONTES E ALTO DOURO

(IUTAD) AT VILA REAL

September 20 - November 28, 1982

AND

UNIVERSIDADE DE EVORA (U.E.)

AT EVORA

November 29 - December 16, 1982

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Prof. Doutor Ario Lobo Azevedo, Reitor
Prof. Doutor Nuno Potes, Head of Zootechnia
Dr. John H. Sanders, Long-Term Advisor

AREA OF ASSIGNMENT

Visit national and regional research stations of Zootechnia, regional stations of the Ministry of Agriculture, Commerce and Fisheries (MACP), University and Institute farms at Vila Real and Evora and the farms of selected livestock farmers to be acquainted with research and production methods.

Organize and teach a three-week seminar consisting of 15 lectures on livestock breeding, genetics and selection methods by Dr. T. G. Martin and 15 lectures on sheep and goat management by Dr. J. B. Outhouse.

Certify staff members and others who attended and completed the requirements of the seminar for one semester hour of graduate credit at Purdue University in An. Sc. 691, Special Problems in Animal Science.

Consult with staff members at IUTAD at Vila Real and at UE, Evora on teaching, research and extension methods to improve livestock production in Portugal.

Conduct special seminars in sheep management and pastures and forages at the Universidade of Evora (UE).

Specific Objectives of the Assignment

The objectives of this short-term assignment were to strengthen and support those established by Purdue University for the Development Project as follows:

1. Establish sound teaching programs by visiting classes and assisting and advising where possible.
2. Develop analytical capabilities required to assess regional development needs and establish regional development priorities.
3. Determine regional development needs and constraints and set priorities to serve as a base for planning and implementation of applied research programs.
4. Establish means of disseminating information to farmers and to regional MACP stations in support of regional extension programs.
5. Present sound scientific information on sheep and goat management and livestock breeding and selection methods through seminars and consultations with individual staff members.

VILA REAL (IUTAD) AND TRAS-OS-MONTES

Identification of Portuguese Counterparts

Under the direction of the Professor in Charge of the Department of Zootechnia, Dr. Joaquim Lima Pereira, and with the cooperation of Professor John R. Foley, Chief of Party and Dr. James L. Ahlrichs, Long-Term Advisor, the following Portuguese staff members at IUTAD received the greatest help and advice:

Eng. Jorge Manuel T. Azevedo	- Sheep Production
Dr. Jose Alberto Caeiro Potes	- Reproductive Physiology and Dairy Production
Dr. Jorge Antonio Colaco	- Animal Breeding and Genetics
Dr. Aura Antunes Colaco	- Animal Physiology
Eng. Arnaldo Alves Dias da Silva	- Animal Nutrition
Eng. Carlos Alberto Sequeira	- Animal Nutrition
Eng. Nuno Moreira	- Pastures and Forages
Eng. Manuel Teles Oliveira	- Soil Science
Eng. Fernando Martins	- Pastures and Forages
Eng. Jose Luis Baltazar	- Farm Machinery & Equipment

Accomplishment with Respect to Objectives

September 20, 1982 - Arrived in Lisbon at 7:00 am and was met by Chief of the Purdue party, Professor John R. Foley and Eng. Jorge Azevedo. Visited AID Mission Office in Lisbon and discussed purpose of the short-term assignment and schedule with Mr. Charles Buchanan Jr., Project Manager and Mr. Don Finberg, AID Representative.

Left Lisbon at 1:00 pm and drove by automobile to Beja with Professor Foley and Eng. Azevedo.

September 21 - Dr. John H. Sanders, Long-Term Advisor at Evora (UE) and Eng. Jose F. Avo, Department of Zootechnia, Universidade de Evora joined us and the group drove to the UE farm at Almocreva in the Alentejo. Here we were met by Maria Helena Faleiro Estudante, Records Officer at the Experimental da Almocreva. Together they explained the agricultural and livestock production in the Alentejo including soil and pasture problems and the Alqueve system of rotation on poor soils, consisting of wheat - 1st year, oats with lupines or vetch - 2nd year and fallow (possibly with sunflower or safflower) for 1-2 years. This is done to 1) control weeds, 2) save moisture and 3) to restore fertility of the soil. There are 1.5 million hectares of land in the Alentejo area. There is a severe lack of rainfall in the summer months, typical of Mediterranean climate. Crops consist of wheat, and barley. Sheep glean the wheat and barley fields after harvest during the summer and pasture on poor soils in winter.

The leading breeds of sheep are the Portuguese Merino (white and black) Campanica and the Merino Precoce from France.

Ewes are bred in the spring and lamb in the autumn producing approximately 1.1 lambs per ewe. Some ewes are milked after weaning, producing 18-20 litres per ewe in 90-100 days in the area of Serpa, producing the famous Serpa cheese. Some farmers would like to lamb

the ewes in the spring with lactation in April and May and a dry period in the summer, when pasture is short and dry. Very few concentrates are fed to sheep. Most of the pastures are natural grasses with few legumes. Some crossbreeding has been done with the French Ile de France breed to increase lamb growth and carcass merit and with the German Milchschaaf to increase milk production.

Two University of Evora farms were visited where Portuguese White Merinos and Merino Precoce ewes were observed gleaning wheat fields and a private flock of Ile de France ewes was confined. A field of sudan grass had made excellent growth under irrigation and tomatoes were being harvested as a cash crop under contract.

September 22 - Visited the Government Research Center of Coudelaria de Alter as guests of the Director Dr. Armando Carvalho Alves Bento. Observed research with 80 Alter Real horses (stallions and mares) and 35 foals and their training in equitation. Also saw a primitive breed of horses called Sorraia. Here a bull performance test with Alentejano bulls was being conducted. The bulls received 2 percent of body weight of concentrates (corn, barley, oats and soybean meal) and 2 Kg. of straw per day. Gains averaged 1.6 Kg. (3.5 lbs) per day. Most of the bulls were owned by the station, but farmers could pay to have bulls tested. Bulls with below-average gains were culled and sold for slaughter. Dr. Joao Mendes Almeida was in charge of bull testing.

A ram testing station was also located here. Ram lambs of the Merino Precoce breed were started on test at 3-4 months of age and terminated at 18-24 months of age. They were fed 1.5% of their body weight in concentrates with 100 grams of straw per day. Those below average were culled for slaughter. All rams were recorded in the breed herd book if they scored 75 points or more on the test, which included gains and conformation scores. In both the bull and ram tests, the procedures for identification of superior sires appeared well managed and scientifically sound.

September 23 - Visited the Estacao Zootecnica Nacional (National Research Station for Livestock) at Fonte Boa near Santarem. Met briefly with Dr. Apolinario Vaz Portugal, Director, who turned us over to the Deputy Director Dr. Professor Jose S. Pires da Costa. The station consists of 202.3 ha of land for research purposes and employs a total of 500 people of which 80 are scientists engaged in research. It was founded by law in 1901.

We observed the Department of Nutrition, which was very well-equipped and staffed. Research was being conducted on the treatment of straw with urea and ammonia and supplemented with crop residues and tomato wastes. We then visited other areas of the station where we observed the following research:

a) Sheep Research

- 1) Accelerated lambing
- 2) Artificial rearing of lambs
- 3) Crossing native breeds with Friesland rams to improve milk production producing such crosses as the "Frissera" (Friesland x Serra da Estrela)
- 4) Sheep Milking Parlor

- 5) Twin sheep research & selection
- 6) Research with the Norwegian goat herd

b) Cattle Research

Using native Portuguese, breeds for the following:

- 1) Beef production
- 2) Milk production
- 3) Veal production
- 4) Some crosses with Frieslands and Charolais
- 5) Bull feeding station with 600 bulls, using 4400 tons of silage, in a wagon-wheel arrangement

The milk production research was done on pastures and forages (ryegrass and white clover with some lucerne) and a small amount of concentrates.

c) Horse Research

Approximately 80 stallions and 80 mares of the Lusitano breed were used in a research program.

The research at this station was well-managed and designed to help solve Portuguese problems in livestock production. The laboratories were well-equipped and the staff very well-trained.

September 24 - Met with Dr. Alberto Martinho, Deputy Director of the National Parque of Serra da Estrela at Manteigas, who escorted us over the mountain to the village of Sabugueiro, center of the best sheep cheese producing area in Portugal called Serra Cheese. The Parque contains over 100,000 ha of land. There are 137 villages containing from 500-1000 people each. Land is valued at about \$120 per ha (\$55/acre). In this area there are 1123 shepherds of which 80% are over 40 years of age. There are 38,000 sheep and 12,000 goats with an average of 50 per shepherd. Cheese from Serra da Estrela is valued at 10 US dollar per Kg. and one ewe will produce 15 kg year for a total of 150 US dollars. Problems of sheep production in the area include 1) Age of shepherds 2) Shortage of forage production (there are small isolated areas of irrigated rye) 3) shortage of veterinarians to treat the sheep and 4) Shortage of funds to finance the operations (only one bank will loan money).

September 25 - Arrived at Vila Real.

September 26 - (Sunday) - Met Dr. J. L. Ahlrichs (IUTAD).

September 27 - Accompanied Professor Foley and Engr. Azevedo to the Instituto Universitario de Tras-os-Montes e Alto Douro (IUTAD) to meet Dr. Professor J. Lima Pereira, Deputy Director and Head of Zootechnia to discuss plans for the stay at Vila Real.

September 28 - Visited the Institute Farm at Quinta de Prados and saw laboratories and classrooms and the sheep and cattle research facilities. Sheep and goat management and research consists of the following:

- 1) Selection for prolificacy with the Mondegueiro breed on

pasture, now producing 140% lamb crop.

- 2) Selection for prolificacy and growth rate with the Bragançano breed in confinement.
- 3) Crossbreeding of Bragançano with the Milchschaaf to improve production and growth rate in confinement.
- 4) Selection and management to improve productivity in 3 breeds of goats, Saanen, Norwegian and Serrana in confinement.

The area at Quinta de Prados consists of 52 ha of which only 30 is arable. Pastures are very limited and consist of volunteer grasses, woody legumes and subterranean clover. Eng. Nuno Moreira is directing pasture improvement through fertilization, liming and introduction of new forages. Only 5 ha are available to produce feed for 300 sheep and 85 cattle. 100 tons of corn silage and 100 tons of grass silage are stored each year, but additional straw, hay and concentrates are purchased. Straw is treated with sodium hydroxide to increase digestibility, ingestion and feeding value.

Cattle research consists of studies in milk production with Frieslands and crossbreeding of Marones, Gelbvieh and Brown Swiss for beef production. Land for both sheep and cattle research needs considerable expansion to permit development of research efforts.

Visited the village of Lamas d'Olo on the mountain of Alvao. This is a primitive village of stone houses with thatched straw roofs. Much of the surrounding area is covered by native grasses and heather. Marones cattle and native sheep graze with shepherds during the day and return at night. Corn (maize) is grown for corn bread for human use. The top of the plant above the ears is harvested for livestock, while the ears and stalks are left to mature for the corn grain. This visit allowed an appreciation of village life and livestock production typical of many areas of Tras-os-Montes.

September 29 - Visited Direccao Regional de Tras-os-Montes (DRTM) of MACP at Mirandela. Met with Dr. Amadeu Campos, DVM in charge of Public Health and Diseases and Eng. Maria Antónia Martins Cruz, in charge of animal production. The farm at Valongo supported 200 ewes and 7 rams of the breeds Sarda and Badano and crosses of these breeds. Crops grown include corn (maize) turnips, tobacco and sudan grass with irrigation. Met briefly with Eng. Herculano Brito de Carvalho, Director of the Station DRTM of MACP.

In the afternoon we visited the DRTM station at Macedo de Cavaleiros and farm at Estacao de Fomento Pecuario, where 100 Badano ewes were observed. Here the ewes are milked for cheese production, and only 1 lamb per ewe is raised. The lambs are weaned from the ewe at 60 days of age and fed a prepared creep feed that was pelleted. Met with Dr. Casimiro Escudeiro, Director of animal breeding, performance testing and artificial insemination for all cattle in Tras-os-Montes for DRTM. Saw herd of Friesland cattle, with U.S. Holstein infusion, used for milk production mostly on forage with little concentrates.

September 30 - Visited Posto Zootecnico de Malhadas DRTM station near Miranda do Douro, accompanied by Dr. Casimiro Escudeiro. Observed 50-60 Mirandesa bulls used in performance testing and A I research. One 5 year old bull weighed 1050 Kg. (2310) lbs). A number of very good Friesian bulls were also kept at this station for dairy

improvement.

A flock of approximately 150 Churro Galego Mirandes sheep was observed on pasture in care of a shepherd (pastor) and 2 guard dogs. The DRTM station at Malhadas was organized in 1955 and contained 50 ha (125 acres).

October 1 - Travelled north through the fertile valley of Vila Pouca de Aguiar, to Pedras Salgadas and Vidago, over Alvaio mountain to Barrocao, where we observed the village bull, a Barrosao, and later some Barrosao cows with the owner in pasture. Met with Eng. Vilhena Gusmao, Director of the DRTM station at Montalegre, who gave us a tour of the station farm and explained the research underway. Here we saw irrigated pastures of native grass, orchard grass and white clover and observed Barrosao cows and bulls grazing with use of electrified netting. We also saw seed potatoes which were yielding 30 ton per ha being harvested and a herd of Alpine goats. Turnips were being grown under irrigation, which was possible from a 2 ha pond of water against the hills, which had been constructed for irrigation. The pasture, cattle and crops looked the best here of any of the stations visited and reflected the planning for irrigation that had been done by Director Gusmao. We also visited the village of Covelaes and saw sheep and goats grazing on over 3000 ha of common pasture with 2 shepherds and their dogs in charge. Eng. Jorge Azevedo drove me on all of the above visits.

October 4 - Gave one-hour lecture on breeds of sheep in the U.S. to the class in sheep production taught by Eng. Jorge Azevedo.

October 5 - With Eng. Jorge Azevedo and Dr. Jose Potes, visited the IUTAD farm at Carlao to observe a flock of 94 Churra Badano ewes being selected for prolificacy by Eng. Azevedo. The farm manager Baltazar Bulas, reported that 31 ewes had lambed, producing 42 lambs with 10 sets of twins and two sets of triplets. These ewes will be milked for cheese production after the lambs are weaned. Returned by way of Sanfins do Douro, largest village in Portugal.

October 6 - Visited IUTAD farm of Petisqueira near the hospital in Vila Real to see Mondegueiro ewes on a small pasture, also being selected for prolificacy. These ewes were just beginning to lamb, but had 2 sets of twins.

SUMMARY OF VISITS

The opportunity to visit the above listed stations and farms afforded an excellent opportunity for me to see research in progress and to become acquainted with sheep production and management in many areas of Portugal and in the outlying regions of Tras-os-Montes. This proved invaluable in preparing material for the Livestock Improvement Seminar, in consulting with staff members of IUTAD and in preparing this report. Appreciation is expressed to Eng. Jorge Azevedo for driving me to these locations and acting as interpreter with those in charge and also to IUTAD for making these visits possible.

SEMINAR ON LIVESTOCK IMPROVEMENT

An outline of the seminar topics for Animal Science 691 -

Special Problems in Animal Science, is enclosed as a part of this report. (Attachments A).

During the week of October 18-22, Dr. T. G. Martin gave 12 lectures of one-hour duration each on genetic improvement of animals. These were given at 5:30 and 8:00 pm to allow IUTAD staff members to attend after work hours and students in the 4th and 5th year of training after regular classes. Approximately 60 people attended this course which included approximately 20 IUTAD staff members, 6 staff or other adults from outside of IUTAD and 34 students from IUTAD.

The material was presented in English on transparencies with an overhead projector and was duplicated and distributed to those in attendance. Professor Dr. Luis Sieve Monteiro, Professor of Genetics from Porto University served as interpreter from English to Portuguese for Dr. Martin. Dr. Martin also gave two one-hour lectures on October 28 on nutritive requirements of lactating cows and carcass evaluation of cattle and one final lecture on November 5, discussing the nutritive requirements of growing bulls for a total of 15 one-hour lectures.

Dr. J. B. Outhouse gave six one-hour lectures on sheep management, on October 25, 26 and 27 and two one-hour lectures on October 29. These were held from 5:30 to 7:45 pm with a 10 minute break midway through the period. He also gave seven one-hour lectures during the week of November 2 to 5 under the same format to complete 15 lectures on sheep management, reproduction, nutrition, milk production and carcass evaluation. Eng. Carlos Sequeira, M.S. and Eng. Manuel Teles Oliveira, M.S. served as interpreters from English to Portuguese for Dr. Outhouse to approximately 60 in attendance.

Credit should be given to Eng. Jorge Azevedo and Professor Dr. J. Lima Pereira for preparing an excellent brochure on the seminars and to Eng. Azevedo for helping to distribute it to interested persons at the DRTM stations and other stations visited from September 20 to October 5.

On October 28, Dr. Alberto Martinho Deputy Director of the National Parque of Serra da Estrela, narrated an excellent film on the life of the people and sheep production in the Serra da Estrela region.

By prior agreement with Purdue University, this seminar was offered for one semester hour of graduate Credit as An. Sc. 691 - Special Problems in Animal Science to those who had completed a baccalaureate degree. To obtain this credit, the recipient had to attend at least 20 hours of lecture and prepare a report of a minimum of 5 to 8 pages of high quality material on livestock improvement through genetics and animal breeding or sheep or beef production and management. The report was to contain information that would improve production levels in Portugal by discussing the current situation, the proposed solution and how much improvement can be made. It could be in either English or Portuguese and was to be submitted by November 12. Thirteen staff members of IUTAD elected to complete this report to obtain one semester hour of credit at Purdue University.

In addition to the seminar on Livestock Improvement, two guest speakers were contacted by Dr. Outhouse and Dr. Martin who agreed to present seminars on topics of interest to the staff and students. Dr.

C. E. Terrill, retired National Program Leader for Sheep and Goats of the Agricultural Research Service of the U.S. Department of Agriculture at Beltsville, Maryland discussed sheep and goat production in Europe and the U.S. in a two-hour seminar on October 12 from 2:00 to 4:00 pm. Mr. Neil McCall Smith from Crieff, Perthshire, Scotland, a noted Scottish Blackface sheep breeder and member of the Board of Governors of the Hill Farming Research Organization (HFRO) in Great Britain, discussed the sheep operations with 1400 ewes on his farm in Scotland and showed a film on sheep production in four different areas of the United Kingdom. This was presented at a two-hour seminar on November 16 from 2:30 to 4:30 pm.

Following Mr. McCall Smiths' presentation at 5:00 pm, the graduation ceremony for those completing the Livestock Improvement Seminar was conducted by the IUTAD Reitor Professor Dr. Fernando Real. Certificates issued by Purdue University were presented by the Reitor to 63 who attended the seminar and additional certificates were presented to the 13 who obtained credit in An. Sc. 691.

On October 31, accompanied by Eng. Jorge Azevedo and Dr. Jose Potes, I attended the Feira do Gado (Livestock fair) at Chaves. A tremendous crowd of farmers brought cattle, sheep, goats, horses, donkeys and mules to be displayed and sold privately to other farmers or for slaughter for food.

On November 15, Dr. T. G. Martin and I made a visit to the Regional MACP Office at Vila Real, where we conferred with Eng. Madureira, Director of Extension for Tras-os-Montes, who had just returned from a two-month visit to Purdue University and the University of Wisconsin in the U.S. He explained the organization and function of the Extension Service, which is a part of MACP. Technicians located at the Regional Offices of MACP visit the villages and disseminate information on a two-week schedule. These technicians are not specialists in any one field, so the information includes all areas of agriculture from grape culture to livestock production.

From our visit, we concluded that Extension activities were coordinated through the Director of Extension, but appeared to be inadequate in disseminating more than meager information on livestock management to farmers. Research activities at the Regional MACP stations seemed to lack coordination, since the purpose of such research remains vague and obscure and considerable duplication exists among stations and with IUTAD in regard to livestock research activities.

On November 8, accompanied by Dr. Jose Potes, Dr. T. G. Martin and I visited the Dairy Cattle A. I. Center at Aveiro, south of Porto. Semen was collected from eight Friesland bulls, which had been imported from the Netherlands, the United Kingdom and Canada, and used to inseminate approximately 10,000 dairy cows in the regions of Litoral and Douro. Bull calves were purchased from herds with superior cows enrolled in a milk recording scheme for improvement of milk production. Over 30,000 cows were enrolled in this scheme. These bull calves were grown to two years of age and growth rate was recorded.

Only the top bulls were then sold to farmers in the region. We also observed a village cooperative milking parlor, equipped with hot

water for washing udders and modern milking equipment to record the production of each cow for payment to farmers for milk produced. This is an excellent method of sharing the cost of equipment, controlling sanitary conditions and improving the quality of milk produced, since the villagers own from one to four cows each and such a program would be impossible if the ewes were milked by hand at each individual barn or home.

On November 15, I accompanied Eng. Jorge Azevedo and Engr. Conceicao Martins to Lamego to meet with Katherine Bayer and representatives of ICA a group involved in the improvement of living conditions and economic standards in the area. We visited three villages and observed the small livestock enterprises consisting of one dairy cow, a few sheep and rabbits and a few swine being produced by the villages. One villager had constructed a plastic greenhouse and had raised tomatoes. Since it was obvious that no one from the Extension Service had visited this area and the villagers were badly in need of help, Jorge Azevedo and I returned to Lamego on November 19 to meet with ICA representatives and the Director from MACP to plan a help program for this area. They were deeply appreciative of this help that IUTAD had given and would like to continue this help in the future.

The weeks of November 15-19 and November 22-26 were spent in reading and grading reports submitted by IUTAD staff members for credit in the course An. Sc. 691 at Purdue and in advising and consulting with staff members on their teaching and research programs.

On November 27, I left Vila Real to consult with the staff at Universidade of Evora (UE) and give seminars on livestock and forage production until December 17.

IDENTIFICATION AND ANALYSIS OF PROBLEMS ENCOUNTERED

Opportunity for IUTAD Staff to Complete Graduate Degrees

The staff in Zootechnia at IUTAD is a young, energetic and enthusiastic group, who are doing an excellent job of teaching and research within the limits of their training and experience. Under a recent national law in Portugal, they are required to earn a Master's degree or pass a rigorous examination within three years of initial employment and a Ph.D. degree after eight years of face dismissal. There appears to be a limited opportunity to obtain an advanced degree with the limited funds available, which is frustrating to the staff. Such degrees may require an absence from their work for a period of one to three years for training outside of Portugal in France, the Netherlands, Great Britain or the United States. This will require funds for replacements, scholarships or grants to support them and a definite plan of rotation among staff members to take a leave of absence from present duties to complete these degrees or IUTAD will face a constant turnover in staff personnel.

Cooperation between IUTAD and MACP

Greater cooperation between the Ministry of Education and the

Ministry of Agriculture, Commerce and Fisheries (MACP) in the training of students, conducting research and disseminating information to farmers appears highly desirable and necessary. While the primary purpose of IUTAD is to train students in Agriculture, Animal Production and Forestry under the Ministry of Education, experience in most other countries has shown that an effective teaching program must be supported by an equally effective research program to generate new knowledge and train graduate students for advanced degrees. In my opinion fundamental research in the breeding, selection, nutrition and management of livestock should be initiated and planned by scientists, who are trained to conduct such research and interpret the results. Most of these scientists in the Tras-os-Montes area are located at IUTAD. The application and development of new research can be conducted at the MACP Regional farms to test its adaptation to the breeds and environmental conditions of the region. This would afford an excellent opportunity for staff members in need of research material to qualify for the M.S. or Ph.D. degree to conduct and supervise the research and collect data for such degrees. The regional MACP farms could then serve as demonstration farms, which farmers could visit to see the results of such research at field days or open houses organized and conducted by the Extension Service of MACP.

Such a cooperative effort on the part of IUTAD and MACP appears absolutely necessary if the objectives of both groups are to be met and agriculture in the Tras-os-Montes area is to be improved and served.

Need for additional land for livestock research

The small amount of land available for pasture and forage production will be a serious deterrent to expansion of livestock research at the Quinta de Prados. There appears to be no opportunity to expand land ownership in the vicinity of the Quinta and land is expensive and difficult to purchase. An economic study needs to be made on the cost of purchasing feed for 85 cattle and 300 sheep over a period of years versus the cost of obtaining additional land by purchase, renting or leasing land in an area some distance from the Quinta, possibly in the valley of Vila Pouca de Aguiar, which is highly productive and suited to pasture and forage production.

Need for dissemination of information to farmers

It is very difficult to transfer information to farmers who need it, when nearly half of them can neither read nor write. The best ways appear to be through field days, demonstrations or tours organized and conducted by the Extension Service of MACP to let farmers see new technology based on research conducted by IUTAD and the MACP stations. Another method could be by developing videotapes of 30 minutes or less to be broadcast to the villages at a specified time (early morning or noon when farmers could see them on T.V. channels) or by taking television sets with recorders to the villages for showing to a gathering of the villagers. These tapes would cover

subjects dealing with proper management, nutrition, breeding or selection of livestock and could be produced at IUTAD or MACP stations at a reasonable costs. The Chinese parable "One picture is worth a thousand words" would appear to apply to the present situation, where reports or papers would not be read.

The socio-economic structure associated with village living, small land holdings and small flocks and herds of livestock coupled with the difficulty in travelling to many rural areas of Tras-os-Montes, increases the difficulty of disseminating information. An effort should be made to organize local groups or societies of farmers and encourage them to develop local leadership and self-education among members. Cooperative efforts could be encouraged in the purchase of expensive equipment and facilities for use of villagers, who were members of the local societies.

Need for a post-mortem laboratory and incinerator at IUTAD

A well-equipped post-mortem laboratory at the Quinta would aid in the diagnosis of disease and subsequent treatment of IUTAD livestock used in research and teaching. Disposal of diseased carcasses should be through an incinerator connected with the laboratory. Such a laboratory could be used to support the teaching program as well.

High incidence of brucellosis, tuberculosis and parasites

The high incidence of brucellosis among flocks of sheep in certain areas of Tras-os-Montes and brucellosis and tuberculosis among goat herds, creates a serious threat to human health. Animals need to be identified, tested and those infected should be destroyed and the carcasses or milk should not be used for human consumption. This will require a national effort on the part of veterinarians working through such Agencies as DGP or MACP, which should create indemnity payments to farmers for infected animals destroyed. This will be a costly but much-needed effort if meat or milk products are to be accepted in the European Economic Community (EEC) from Portugal, which has high health standards enforced by inspection of livestock and slaughter facilities.

The high rejection of cattle, sheep and goat livers from fluke or other parasites indicates a need for greater treatment and control of internal parasites among these animals.

Wool production and research

There appears to be no effort to increase or improve wool production of sheep in Tras-os-Montes. Most of the wool used in Portugal is imported, but the demand appears to be high. Additional research should be conducted to determine the grease fleece weight, staple length, fiber diameter (grade) and clean fleece weight of wool among wool producing breeds and efforts should be made to find markets for Portuguese wool and to educate farmers in the production of a higher quality product thus increasing income from sheep.

Library facilities for staff and students

The library facilities at IUTAD appear to be completely inadequate for research or teaching or for reference material for students. A high priority should be given to enlarging the library space and improving the learning atmosphere by insisting on silence during library hours. The purchase of books and scientific journals, which can be used by students and by staff in developing research and teaching programs, should receive administrative support.

Departmental staff communication

In the absence of departmental faculty and staff meetings, there appears to be little or no communication between staff members doing teaching or research in related fields. Monthly staff meetings would increase such communication, reduce duplication of effort, develop cooperation of effort and serve as a media for making announcements regarding policy, seminars, meetings or other events of interest to the staff.

Cooperation with Procalfer

A complete and exhaustive study on the status and improvement of sheep and goat production in Portugal has been made for Procalfer - Ministry of Agriculture, Commerce and Fisheries (MACP) and for the Sheep and Goat Development Program of the General Direction for Livestock (DGP), formerly Veterinary Services. These studies and recommendations for improvement are reported by Dr. Warren C. Foote and Associates in reports dated June 6-19, 1981, October 23, 1981, October 30, 1981, August 4, 1982 and August 31, 1982.

In these reports, seven MACP or INIA stations have been designated for research programs with sheep, including one in the Tras-os-Montes area at Macedo de Cavaleiros to study milk production in the Churro Badana breed.

Only one station in Portugal has been designated for goat research. This is at Castelo Branco with the Serrana breed. I would strongly recommend that IUTAD contact Dr. Luis Gama, Head of the Sheep and Goat Department of DGP to investigate the possibility of participating in additional goat research with the Saanen, Norwegian or Serrana breeds located at the Quinta de Prados of IUTAD, under the direction of Eng. Jorge Azevedo.

A seminar-workshop, conducted by Dr. Luis Gama and Dr. Warren C. Foote was scheduled for early December, 1982, at Lisbon to discuss the justification for the Procalfer program, objectives, required resources, reports from station participants, procedures to achieve objectives, factors which may limit success and recommendations for the future. It was strongly recommended that representatives from IUTAD contact Dr. Luis Gama for participation in this seminar-workshop and the Procalfer program.

SPECIFIC RECOMMENDATIONS FOR SHEEP AND GOAT IMPROVEMENT

Sheep and goats can play a unique role in food production in Portugal. They are the most efficient animals to convert the energy in grass and forages into food and fiber for man. They can do this from non-cultivated areas, from crop residues and aftermath and from by-products of food processed for human use. They can do this on small parcels of land or on terrain less suited for grazing by cattle. They are low-energy users since this can be done by self-grazing. In addition, their production and reproduction cycles can be adapted to the seasonal growth of forages, which is determined by annual precipitation in Portugal.

The demand for lamb meat is high in the EEC especially in France, and cheese made from sheep's milk could become a speciality item throughout Europe, demanding a high price as it does in Portugal. Even wool produced by the Portuguese breeds may find a ready market in Italy and other European countries.

To meet this challenge and take advantage of the opportunities of the EEC, immediate steps must be taken to improve both meat and milk production of sheep and goats and to increase wool production in sheep.

There is considerable agreement among both Portuguese scientists and those from other countries who have studied the situation, that the level of productivity among Portuguese breeds of sheep and goats must be increased. This includes lambs and kids raised and sold for meat production, milk production in certain breeds of sheep and all breeds of goats and wool production in all breeds of sheep.

Methods of increasing this productivity were presented and discussed in the Seminar on Livestock Improvement held at IUTAD from October 18 to November 5, 1982. They are outlined also in considerable detail in the 1981 and 1982 Procalfer reports. Among those which offer the greatest possibility include the following:

- 1) Survey and determine the present levels of productivity among the Portuguese breeds of sheep and goats and identify those breeds which offer the greatest genetic potential for increased productivity.
- 2) Develop and establish basic management programs to increase productivity in accordance with feed supply and environmental conditions.
- 3) Establish the levels of nutrition necessary to support an increase in productivity among sheep and goats.
- 4) Develop means of increasing the feed supply, especially during periods of drought and hot weather and even in periods when rainfall and temperature are more favorable.
- 5) Identify and select exotic breeds for use in Portugal to use in a well-controlled crossbreeding program, similar to that used in the stratified crossbreeding program used in Scotland, which is outlined later in this report.

- 6) Determine the feasibility of carrying lambs and kids to heavier weights for eventual market in the EEC.
- 7) Improve the health of sheep and goats through testing and elimination of diseased animals carrying brucellosis and tuberculosis and through more complete parasite control, vaccinations and disease prevention methods.

The use of accelerated lambing programs for sheep, producing three lamb crops in two years, may have limited use in Portugal because of a lack of adequate nutrition during the May lambing and subsequent lactation during the hot, dry summer months, but the traditional spring breeding and fall lambing used in most parts of Portugal could be modified to include an early fall breeding period with lambing in late winter to take advantage of the spring growth of forages. Ewes bred in the spring, when fertility is lower than in the fall, are subjected to the effects of stress due to the hot summer temperatures. This may result in impairment of ovarian function, failure of fertilization, embryonic death and birth of weak, light-weight lambs. All of these reduce the fertility and productivity of ewes.

The fastest way to increase productivity in ewes is through a well-controlled crossbreeding program. The heterosis (hybrid vigor) generated by crossbreeding alone will result in an increase of from 15 to 30 percent in net returns through the offspring of such crosses. When rams of highly-prolific breeds such as the German Milchschaaf (East Friesland), Romanov, Finnish Landrace or Flemish (Flanders) are crossed with ewes of native Portuguese breeds to produce a highly-prolific F_1 crossbred ewe, the prolificacy of this crossbred ewe will double net returns. If these F_1 crossbred ewes are bred to terminal sires of the meat-type breeds, such as the Merino Precoce, Ile de France Charolais, or Texel, the growth rate and carcass merit of the lambs produced will be greatly improved. This 3-breed crossing system can be used without destroying any of the native Portuguese breeds, since they will be necessary to produce the F_1 crossbred ewe. All F_1 ram lambs and all of the lambs sired by meat type rams should be sent to market to prevent a mongrelization of the Portuguese flocks, which will happen if they are kept for replacements. Such a cross-breeding program will have to be carefully controlled and monitored by those who understand crossbreeding systems. Plans for crossbreeding to increase meat, milk and wool production are included as attachments B and C. Additional plans are outlined in the Procalfer Report--"A suggested outline for evaluation of selected Native and Exotic breeds of sheep and goats and their crosses in Portugal" dated 3-29-82. (August 4, 1982).

Native Portuguese breeds should be identified and performance and progeny tested to improve their productivity. Since the heritability of multiple births in sheep is low, estimated to be only 15 percent, genetic gain through selection will be slow, however some progress will be made if the following recommendations are followed:

- 1) Select on number of lambs born rather than on number raised,

since the number born is more indicative of the genetic potential for multiple births.

- 2) Select replacements from young ewes with multiple births rather than from older ewes, since multiple births increase with age of ewe.
- 3) Select replacements from dams with a lifetime record of multiple births.
- 4) Select ewe lambs that exhibit estrus (heat) early, since they are usually more fertile than late-cycling lambs. Pregnancy in ewe lambs can be determined as early as 60 days by ultrasonic detectors. Early estrus can be determined in open ewe lambs by using a vasectomized ram with a marking harness or colored grease painted on the brisket. Selection must be based on accurate records preferably obtained through a performance testing program. Most performance testing programs make adjustments for environmental factors such as sex of lamb, age of dam, birth code (single, twin or triplet) and rearing code (reared as a single, twin or triplet), so that the data will reflect a more accurate measurement of the trait to be selected. Remember that twins produced by the use of exogenous hormones may have no greater potential for multiple births than single lambs produced normally.

When the genetic potential of native Portuguese breeds has been identified and a crossbreeding program, using highly prolific breeds has been established, multiplier flocks should be developed to produce the highly prolific F_1 crossbred ewes that can be purchased by farmers. In this manner, farmers can obtain the benefit of a crossbreeding program without having to maintain more than one flock or plan the crossbreeding procedures.

One management program to demonstrate the value of improved nutrition and management as outlined in the Procalfer Report--"A suggested outline for evaluation of selected native Portuguese and Exotic breeds of sheep and goats and their crosses in Portugal" dated 3-29-82 (Aug. 4. 1982) has considerable merit. Two flocks of ewes could be used, one with the traditional methods of breeding, lambing, nutrition and health care and one of the same breeding using new management procedures to obtain maximum productivity. In a similar manner one flock of straightbred native ewes could be compared to a crossbred flock originating from the same breed, using exotic breeds to increase productivity and would demonstrate the value of crossbreeding. This could be conducted with a minimum of expense at IUTAD or MACP stations and could allow for genetic response under "minimum" vs "maximum" conditions.

These programs to increase productivity in sheep and goats will have to be accompanied by higher levels of management to be successful. Definite breeding periods will have to be established and

the rams removed from the flock after two estrus cycles. Extra lambs that cannot be transferred to other ewes will have to be reared artificially as discussed in the Seminar on Livestock Improvement. Lambs will have to receive better nutrition and care if they are to make maximum gains and obtain a weight acceptable in the EEC.

UNIVERSITY OF EVORA (U.E.), THE ALENTEJO AND LISBON

The (1) area of assignment and (2) specific objectives of assignment remain the same as previously reported.

Introduction

The University of Evora (U.E.) has an enrollment of 1500 students in agriculture with similar options to those at Vila Real. The Reitor is Professor, Doutor Ario Lobo Azevedo, a soil scientist and Purdue's project is coordinated by Dr. John H. Sanders. Dr. C. L. Rhykerd, short-term advisor in Agronomy from Purdue, spent nearly three months from September 21 to December 8, 1982, teaching a course on pastures and forages and consulting with staff members and students. Courses in agriculture are taught at the Herdade Da Mitra located approximately 10 km from Evora. Students are transported to and from Evora by bus. The Mitra contains 286.32 ha of land and the offices, laboratories and lecture rooms for agriculture are located there. The Mitra supports a flock of Branco Merino ewes bred to Merino Precoce rams, a herd of Alentejano beef cattle, a herd of Fresland dairy cattle and a herd of swine.

The Department of Zootechnia (Animal Science), with which I am most familiar, is headed by Professor, Doutor Nuno Potes, supported by a young, energetic staff of teachers and researchers. Research is being conducted in nutrition, management, reproductive physiology, genetics, selection and forages and pastures with sheep, beef cattle, dairy cattle, swine and horses. Some of this research is being conducted at the Mitra with additional studies at U.E. outlying farms at Almocreva near Beja, and at the government farm of Companhia da Lezirias near Lisbon.

Identification of Portuguese Counterparts

Under the direction of Dr. John H. Sanders, Chief of the Purdue party at U.E. and with the cooperation of Professor, Doutor Nuno Potes, Professor in charge of Zootechnia (Animal Science), which employs 18 people, 11 full-time and 7 part-time, consultations were conducted with the following:

Eng. Jose J.M.G. Avo	-	Sheep Production
Eng. Carlos Roquete	-	Cattle Production
Dr. Jose Luis Nunes	-	Reproductive Physiology
Dr. Ofelia Bento	-	Animal Nutrition, Pastures, Forages
Dr. Afonso de Alineida	-	Animal Nutrition
Dr. Manuela Cancela de Abrus	-	Animal Nutrition
Dr. Maria Jose Barrisco	-	Reproduction
Eng. Manuel Baeira	-	Swine Production
Dr. Monte Costa	-	Meats and Carcass Grading

Accomplishment with Respect to Objectives

November 29 - Visited the department of Zootechnia and the Herdade Da Mitra accompanied by Eng. Jose Avo and Eng. Carlos Roquete. Observed a sheep research study on stocking rate of ewes on fertilized and unfertilized pastures. This was a 3 X 4 factorial study involving 128 ewes. The stocking rate was replicated at 3, 6, 9 and 12 ewes per hectare and will continue for 5 years. Hay is fed in hot summer months if the liveweight of the ewes falls below 40 kg. An economic analysis of this project conducted by Dr. John H. Sanders indicates that a stocking rate of between 6 and 9 ewes per ha is the most economical and generates the most profit. Plans are being made to conduct a study involving 500 commercial ewes on a set stocking rate compared to rational grazing on an outlying farm in the Alentejo.

In the afternoon, I visited the Department of Rural Extension of the University in Evora. This Department is headed by Eng. Eduardo Figueira, who will leave in January, 1983, for two years to study for the M.S. degree and possibly the Ph.D. degree at the University of Wisconsin under Dr. James Mayhew in Extension Education (CAVE). Others in this Department include Eng. Antonio Vale Estrela and Eng. Nuno Jordao. The Department of Rural Extension is a part of U.E., training approximately 5 students per year for the B.S. degree in Rural Extension. Technical information is transmitted to farmers by the Departments of Agronomy, Zootechnia, etc. through the Extensão Rural of MAP. Only a small number of youth projects exist at present and these are largely independent groups.

November 30 - Visited Vale de Moura which consisted of 537 ha with 600 Branco Merino ewes and 100 head of cattle. 432 ewes had lambed and 7 percent had produced twins. This farm hopes to increase its ewe numbers to 1500 head. Some ewes were sired by Landschaf rams from Germany and Awassi rams from Israel. A small flock of Awassi ewes and rams was observed.

In the afternoon we visited Quinta da Figueireda operated by João Torres Vaz Freire. An excellent flock of 150 Merino Precoce ewes and rams was observed with weights of 90 kg per ewe. Lamb crops had been produced in June and July of 1981, January, 1982, and September of 1982, on an accelerated lambing program with a lambing rate of 130% for each lambing. The farm also supported a herd of crossbred cows bred to Limousin bulls from France and a grove of oranges. This farm was involved in the Agrarian Reform of 1974-75.

Another large estate was visited in the afternoon. This estate had originally consisted of 7000 ha of land. It was taken over by the Communist government following the Revolution of 1974-75. The present government has returned 4000 ha to the original owners, but retained 3000 ha. Prior to the Revolution, this farm had produced rice and contained the largest privately owned lake in Portugal consisting of 7 million cubic meters of water. The farm presently raises 500 Branco Merino and Merino Precoce crossbred ewes bred to Landschaf rams to lamb in February. An excellent crossbreeding program was being used as follows: Branco Merino ewes are bred to Landschaf rams weighing 100 kg. The F₁ crossbred ewe lambs are bred to Merino Precoce rams

weighing 120 kg to produce the market lambs, which were being finished on a 15 percent protein pellet and sudan grass hay, produced by irrigation from the lake. Lambs were sold at 30 kg for 200 escudos per kg or a total of 6000 escudos each.

December 1 - Together with Dr. John Sanders, Professor C. L. Rhykerd and two members of the U.E. Agronomy staff, I visited a number of farms south and east of Evora to study pastures of subterranean clover and oats and vetch in the cork oak and olive tree-producing areas of the Alentejo. Observed a flock of 400 Branco Merino ewes bred to Merino Precoce rams. Lambs were being sold at 25-30 kg for 200 escudos per kg. We visited the site of a dam to be built on the Guadiana River to form the largest lake in Portugal covering 265,000 ha between Alquevo and Serpa near Moura. Work on a series of four dams has been stopped for two years to consider the costs involved and possible uses, either for hydro electric power or irrigation. The water must be pumped to higher levels for irrigation at high costs. The river is now being shunted through a tunnel to allow completion of one dam, which will be 120 feet high.

December 2 - Visited the government-owned farm of Companhia da Lezirias south of Lisbon. This farm contains over 10,000 ha and is the largest farm in Portugal. The farm supports a herd of 80 Lusitano mares and stallions, over 2000 beef cattle, 140 Fresland dairy cattle and 1900 Branco and Merino Precoce ewes. The livestock operations are under the direction of Professor, Doutor Nuno Potes, Head of Zootechnia at U.E., who was our guide on the tour. Much of the farm has low fertility soils of low productivity, however a dam is being built to cover 400 ha with a capacity of 9 million cubic meters of water to irrigate pastures and rice-producing fields. The cattle operations consisted of a herd of Mertolengo cattle, which are very adaptable to the productivity of the land. These cattle had an 11-month calving interval. These were being crossed with Charolais and Fresland bulls to produce faster growing calves. Other herds consisted of Alentejano cows crossed with Charolais bulls with the crossbred heifers backcrossed to Alentejano bulls. Smaller herds of Alentejano and Charolais herds were observed also. The Fresland herd, largely from the Netherlands and the United Kingdom was averaging 5000 kg of milk in 305 days and was one of the best Fresland herds seen in Portugal. These cows were bred by AI with semen from the U.K. They were housed on slotted floors and the feed consisted of corn silage supplemented for protein by brewers grains and sunflower seed meal. Plans are to increase this herd to 200 head.

The 1400 Branco Merino ewes were bred to Merino Precoce rams and some to Charolais rams from France. Lambs had been weaned and were being finished on a 15 percent protein pellet and straw in an excellent lamb finishing barn. Lambs were marketed as they reached 28-30 kg in weight and were selling for 200 escudos per kg.

December 3 - With Eng. Jose Avo and Eng. Carlos Roquete, visited Herdade das Oliveiras operated by Jose Potes, brother to Professor Doutor Nuno Potes. This large estate also was involved in the Agrarian Reform of 1974-75 and only recently returned to its owners. It contained a large lake available for irrigation. A flock of 300 Branco Merino and Merino Precoce ewes was managed on an accelerated

and 100 lambs born in September were grazing on a pasture of oats and vetch, which had been irrigated. There appeared to be plenty of pasture available. The shepherd was given an incentive of 150 escudos per lamb raised to encourage multiple births. In addition to the sheep, 100 dairy cows and 60 beef cows were maintained and the young bulls were fed in confinement for market. The beef cows were largely crossbred, bred to Limousin bulls. The beef cows and 100 yearling replacement ewes were grazing on native pastures, supplemented with subterranean clover, part of it in a 40 year old cork oak grove.

This visit was followed by a trip to Herdade da Fonte do Abade where an outstanding herd of purebred Alentejano cattle was observed. Sr. Jose Sebastian Capoulas Jr. and his son explained the breeding program and the show ring record of the herd, which was obtained prior to the Agrarian Reform of 1974-75. During the Reform, records were not kept and Sr. Capoulas was re-establishing the herd on available records. The herd consisted of 90 cows at this location with 250 in 3 locations. The herd averages 96% calving rate with a 12 month interval. The 3 year old herd bull was estimated to weigh 900 kg, but mature bulls at 5 years have averaged 1200 kg. Bulls are exported to Italy and other European countries. Some of the poorer cows were being crossed with Charolais bulls to produce market animals.

At the Vale de Melhoradas, owned by Luis Potes, older brother of Professor, Doutor Nuno Potes, a herd of 110 Mertolengo cows was being re-built after the Agrarian Reform. The cows averaged 400 kg and a 1 1/2 year old bull, 500 kg liveweight. This herd had a good calving percentage with an 11 month calving interval. Some of the cows were bred to crossbred bulls to produce market animals. This breed appears well adapted to the lower fertility soils and hot summer months when feed supplies are limited.

December 4 - In the morning we were treated to a hot branding demonstration of 20 Alentejano yearling bulls, conducted by Professor, Doutor Nuno Potes and students in Zootechnia at the Mitra. In the afternoon, Dr. T. G. Martin and I met with Dr. Potes and the staff of Zootechnia at the Mitra to discuss research and extension issues in sheep and cattle production.

December 5 - Dr. & Mrs. T. G. Martin and Dr. & Mrs. J. B. Outhouse were entertained at dinner by Eng. Jose Avo and Eng. Carlos Roquete and families.

December 6 - With Engs. Avo and Roquete, we visited Herdade das Murteiras owned by the Almeida Foundation and were accompanied by Henrique Granadeiro, Manager. We observed a branding operation and a classification of the 100 cow Alentejano herd as well as a herd of 36 purchased Charolais cows. A new barn for the Charolais herd was being completed. The farm also maintained a herd of 30 Lusitano mares.

December 7 - During the morning, I enjoyed a cordial and informative visit with the Reitor of the Universidade de Evora, Professor, Doutor Ario Lobo Azevedo. He discussed the organization and enrollment at U.E. and plans for future growth. He expressed an interest in growing turnips and fortunately I was able to supply him with a copy of a paper on research done with turnips for sheep at Purdue which should be helpful in getting this plant established as a temporary forage crop for sheep or cattle.

In the afternoon I presented a seminar to the U.E. staff and students at the Mitra on "Management and Nutrition for Improving Sheep Production." This seminar was attended by approximately 35 staff members and students.

Dr. T. G. Martin gave a seminar on "Genetic Selection for Livestock Improvement" in the morning and visited the Reitor in the afternoon.

December 8 - Travelled to Lisbon by bus.

December 9 - Dr. T. G. Martin and I met with Mr. Charles Buchanan Jr., Deputy Director of the USAID Mission in Lisbon. I presented him with a copy of my report completed through the Vila Real experience. We discussed our assignments in regard to meeting objectives and our experiences at both Vila Real and Evora. Both Dr. Martin and I indicated that we would be willing to return to Portugal in one to two years, if invited to do so, to observe progress being made and to consult or give seminars in livestock production and management.

In the afternoon we met with Dr. Carlos Fontes, Director Geral da Pecuaria (DGP), formerly Veterinary Services, accompanied by Dr. John H. Sanders of U.E. Problems concerning the expansion of the sheep, goat, dairy cattle and beef cattle production in Portugal were discussed. We stressed the need to eradicate brucellosis and tuberculosis in the cattle, sheep and goat herds and flocks and Dr. Fontes assured us that they were aware of the seriousness of the problem and steps were being taken to eliminate this serious threat to their products when they enter the EEC. Dr. Fontes further assured us that DGP would cooperate with both IUTAD and U.E. by making data collected in the past and now being collected, available to staff members who wished to use it as research data for obtaining advanced degrees.

December 14 - I participated in a seminar in Lisbon sponsored by the AID Mission with speakers from Procalfer, MAP, national research stations and the Purdue advisors. The topics and speakers are included as Attachment D. This seminar was attended by approximately 175 persons, including good representation from both IUTAD at Vila Real and U.E. at Evora, including the Reitors of both Universities. Insufficient time limited questions to speakers and discussion of the material presented, however a summary of the presentations is being prepared and a future meeting in the spring of 1983 is planned. As a result of this seminar and a meeting with the Reitors of IUTAD and U.E., together with the Purdue advisors following the seminar, greater cooperation between all groups represented is assured.

SUMMARY OF THE EVORA ASSIGNMENT

As at Vila Real, the opportunity to visit the above listed research stations, the Universidade de Evora and the farms in the Alentejo, afforded an excellent opportunity for me to see research in progress, observe cooperation between groups involved in education, research and extension and become acquainted with sheep and cattle production and the management systems used to produce them. Appreciation is expressed to Dr. John H. Sanders for organizing the

visits, to Professor, Doutor Nuno Potes and his staff, particularly Eng. Jose Avo and Eng. Carlos Roquete for conducting the visits and acting as interpreters with Portuguese farmers and other personnel and to the Universidade de Evora for making these visits possible.

IDENTIFICATION AND ANALYSIS OF PROBLEMS ENCOUNTERED

The situation at Evora and in the Alentejo differs considerably from that at Vila Real and Tras-os-Montes. The land in the south is not mountainous, but level or gently rolling. The principal crops include wheat, barley, oats, rice in certain areas, olive and cork trees, tomatoes and citrus fruit. Pastures are largely native grasses with an attempt to develop stands of subterranean clover to furnish nitrogen for the grasses. Farms are much larger in the south, varying from 100-200 ha to 4000-5000 ha. Farmers appear to be better educated and utilize modern methods of production with more machinery. Farms contribute more to the GNP as compared to the subsistence production found in the north.

Unfortunately the Alentejo and surrounding areas of the south are subjected to a Mediterranean climate, which includes a long, hot, dry period from May to October. Many soils are thin, lacking in organic matter and low in fertility. Fertilization and irrigation are limited to cereal crop production to justify the costs involved. Feed supplies for livestock are limited largely to grasses grown from October to May, supplemented by cereal straws, some treated with ammonia or sodium hydroxide and in limited cases to corn (maize) fed as silage from trench silos. Brewer's grains, the by-product of the beer-brewing industry have a high salt content, which limits their use as feed for livestock unless the salt is removed by processing.

Farming operations in the Alentejo and surrounding areas underwent considerable change as a result of the Agrarian Reform following the Revolution of 1974-75. The government confiscated most of the large land holdings and divided them into smaller tracts as cooperative farms operated by the workers. It soon became apparent that the workers lacked the experience and ability to maintain the productivity of these farms and when the Communist government was replaced by the present government, the large land tracts were gradually returned to the original owners. Most of these large farms are now in a re-building process to increase their productivity. The Alqueva system of crop rotation is used, which consists of wheat the first year, oats with vetch or lupines the second year followed by two years of fallow ground possibly with sunflowers or safflower as a cover crop. This is done to 1) control weeds, 2) save moisture and 3) to restore fertility to the soil. Sheep glean the wheat and barley fields after harvest during the summer and pasture on the poor soils in the winter. Acorns from the oak trees serve as a substitute for traditional concentrates in the fall and early winter.

Funds for fertilization, seed purchase, irrigation and research in developing new varieties of plants are severely limited. The Procalfer program is working through the Portuguese Ministry of Agriculture and Fisheries (MAP) to improve both the productivity of the land and the livestock industry. Research in these areas is being

conducted at the Universidade de Evora (UE), the National Plant Research Station at Elvas, the National Animal Research Station at Fonte Boa, near Santarem and at regional MAP stations. There appears to be a reasonable degree of cooperation among all of these groups to accomplish the desired results.

Research studies at the Mitra (UE) have generated some data that can be used by staff members toward the completion of a Master's degree, but much more research is needed if all staff members are to complete requirements for advanced degrees. Plans are underway to allow selected staff members to obtain additional course work in the United States either at Purdue University or other universities as recommended by Dr. John Sanders. Opportunities to generate additional research data in which staff members may participate appears possible at the plant research station at Elvas under the direction of Eng. David Crespo and at the well-equipped National Animal Research Station at Fonte Boa. In addition the state owned farm of Companhia da Lezirias with its extensive livestock operations under the direction of Professor, Doutor Nuno Potes, Head of Zootechnia at U.E., offers considerable opportunity for additional research studies. At present Eng. Afonso de Almeida, a staff member at Fonte Boa spends two days a week teaching nutrition at the Mitra to students of U.E.

Observations of library facilities at the Mitra indicated that textbooks and scientific journals were inadequate for undergraduate use and certainly limiting for staff members, however these may be supplemented by library facilities at the Universidade de Evora. Classrooms and teaching laboratories were modern and well equipped, but some of the research laboratories had new sophisticated equipment that had not been installed possibly due to a lack of funds or a lack of personnel to install and service the equipment.

OBSERVATIONS CONCERNING PASTURE AND FORAGE PRODUCTION

Following my observations of the soil conditions and the difficulty of establishing a viable year-round forage and pasture program in the Alentejo and surrounding areas in the south of Portugal and after reviewing the Procalfer program for forage production, I am convinced that any increase in forage production is a long-term project requiring 25 years or more. Subterranean clover, which appeared to offer possibilities of introducing a legume into pastures has not succeeded, due primarily to low fertility of the soils, low organic matter and low moisture content during the hot summer months. Most stands have died out after one to two years. Extensive plans for the building of a series of dams in the Moura area have been halted for two years by the government to determine the use for irrigation or hydro-electric power. Extensive use of lime on acid soils has been questioned by agronomists, since it may effect the availability of certain trace minerals. Adequate fertilization will be limited by the high cost of nitrogen and other plant nutrients.

One source of information that has not been tapped is the Hill Farming Research Organization (HFRO), Bush Estate, Penicuik, Midlothian, EH26 OPH, Scotland. Mr. John Eadie, Director and his associates, have been successful in identifying and developing forages

associates, have been successful in identifying and developing forages and pasture plants that will thrive in low fertility, high acid soils in Great Britain and their expertise should be requested.

Under the above conditions, I would recommend that sheep and livestock production be adapted to existing patterns of forage and pasture production. This will be much easier and quicker in producing results than adapting forage production to the livestock production cycles. Portugal cannot afford to wait for 25 years to develop a forage program before it improves its livestock industry, especially if it enters the EEC in 1984.

The emphasis placed by many on increasing the stocking rate per hectare is unrealistic when the pastures cannot support the present low stocking rate. What this statement really means is to increase the potential for a higher stocking rate, but this will take years to accomplish. For the time being it would appear that the emphasis should be placed on increasing the productivity of the animals per hectare at the present low stocking rate. Fortunately this can be done through multiple births in sheep. Most of the cost of lamb production is in the cost of feeding the ewe when the lambs are marketed from ewes' milk and pasture. Most ewes are capable of raising two lambs to market weight without materially increasing the need for additional pasture, especially if the production cycle can be adjusted to take advantage of the spring growth of pasture and forages. Rotational grazing in the U.S. has been shown to increase the productivity of pastures preventing over-grazing or under-grazing. This can be accomplished through the use of low-cost electric fencing and has the added advantage of reducing internal parasitism in lambs and foot rot in older sheep. Excess forage growth in the spring could be harvested and stored in round bales or as silage for periods of depressed growth. Round bales have less spoilage than square bales and can be left in the pasture fields without housing.

I am convinced that most Portuguese breeds of sheep are capable of producing and raising more than one lamb per ewe. Little has been done to increase the incidence of multiple births, because of the systems of management used for centuries. Most shepherds (pastors) prefer one lamb per ewe because ewes with twins require extra care. However when an incentive of 150 to 200 escudos is offered per lamb raised, this attitude changes rapidly. In flocks where this incentive is given, shepherds are proud of their twin lambs and readily point them out to visitors. Some breeders are using an accelerated lambing program to increase productivity by producing three lamb crops in two years. This system has limitations in Portugal, unless irrigated crops can be grown during the summer months.

SPECIFIC RECOMMENDATIONS ON SHEEP PRODUCTION

In an effort to adapt sheep production to existing forage production the following recommendations are made:

- 1) Change the breeding season of sheep from spring to early autumn.

The present system of spring breeding, fall-lambing of ewes practiced in Portugal appears to be counter-productive in

relation to the most efficient reproduction cycle of sheep as well as to forage production. In the northern hemisphere, most breeds of sheep have a higher ovulation rate in September and October, when the photoperiod is reduced to 10-12 hours of daylight. This has been reported in a research study from Texas in the U.S. with Rambouillet ewes, which have a similar origin to the Merino Precoce found in the Alentejo. These results are reported in Table 1:

TABLE 1. Ovulation Rate and Lambing Rate in Rambouillet Ewes Bred in Four Different

Breeding Intervals

	Mar. 21 - <u>May 2</u>	June 21 - <u>Aug. 2</u>	Sept. 21 - <u>Nov. 2</u>	Dec. 21 - <u>Jan. 1</u>
% Ovulation Rate	106	141	175	152
% Lambing Rate	84	97	127	135

- 1) Sheepman's Production Handbook. Rev. Ed. 1981, Sheep Industry Development, Denver, Colorado. pg. 37.

This study agrees with research conducted by Prudue University at Lafayette, Indiana, also with Rambouillet ewes on an accelerated lambing program as reported in Table 2.

TABLE 2. Fertility of Rambouillet Ewes by Season of the Year¹⁾

	<u>Lambing Period</u>		
	<u>January</u>	<u>September</u>	<u>May</u>
% of Ewes Lambing	93.8	85.9	87.8
% Lambs Born per Ewe	168.0	147.8	147.7
% Lambs Raised per Ewe	137.3	125.4	129.2

- 1) Four Year Summary Accelerated Lambing Program - Purdue Mimeo AS-383. 1968.

Central Portugal is the same distance from the equator as central Indiana since the 40th parallel of latitude passes through both areas and the photoperiod should be similar.

Ewes bred in the spring are subjected to a period of considerable stress during the hot, dry summer in Portugal. Additional studies in Texas have shown that Rambouillet ewes subjected

to 12 or 24 hours of heat stress at temperatures of 32° C (90°F) during early gestation have a lower lambing rate, smaller lambs at birth and a lower survival rate at birth than non-stressed ewes. Results are reported in Table 3.

TABLE 3. Influence of Length of Exposure to 90° F (32° C) Temperature Stress upon Birth Weight and Lamb Survival.¹

<u>Treatment</u>	<u>No. Ewes</u>	<u>Av. Birth Wt (Kg.)</u>	<u>% Lamb Survival</u>
Non-Stressed	21	4.3	100
12-hour Stress	20	3.6	80
24-hour Stress	29	2.6	55

1) Journal of Animal Science 27:153. 1968, (Texas).

It would seem logical that the low lambing rate of 0.7 to 0.9 lambs per ewe may be due in part to the stress of high temperature during breeding and gestation in the hot summer months, which results in impairment of ovarian function, failure of fertilization, increased embryonic mortality and the birth of weak, light-weight lambs. This could be avoided by allowing the ewes to pass through the summer on a maintenance diet, when feed supplies limited, and breed them in late August and early September. There should be a flushing effect from increased pasture growth in early autumn and even more important, the lambing and lactation phase will coincide more completely with the natural growth of pasture and forages.

There are three periods in the annual reproductive cycle of the ewe when nutrition is critical. A slight increase in energy intake at breeding time will increase ovulation rate, but protein and energy requirements increase rapidly during the last month of gestation when 70% of the fetal growth takes place and reaches a peak at about one month post-partum to meet the high requirements of lactation. The energy requirements of the pregnant ewe, bred in the spring as is the custom in Portugal are diagrammed in Figure 1. Pasture and forage production in Portugal is diagrammed in Figure 2. From these diagrams it is apparent that ewes lambing in September-October are not making the best use of pasture and forage production to meet the nutritional requirements of gestation and lactation without use of concentrates. This could be corrected with a late August or early September breeding period and a lambing period in January and February as shown in Figure 3.

One of the reasons given for fall lambing is the price differential paid for lambs when marketed. In December of 1982, lambs with a liveweight of 10-20 Kg. were selling from 200-220 escudos per Kg. if sold by Christmas. This would be a value of from 4000 to 4400 escudos per lamb. Lambs marketed in the spring (April-May) were expected to bring from 140-150 escudos per Kg. This would result in a value of 3000 escudos, if marketed at 20 Kg., however these spring lambs born in January-February could be carried to 30 Kg. on milk and grass, which would result in a value of 4500 escudos (30 Kg @ 150 escudos) and these lambs would find a ready market in the EEC at a

heavier weight supplying a demand for lamb meat at Easter time, when most other European countries do not have lambs to market.

Portugal is fortunate in having ewes that will breed at most anytime of the year, while ewes in other EEC countries to the North are seasonal polyestrous, breeding only in the autumn. Most lambs in the U.K. and northern Europe are born in March and April and are not marketed until late summer or early fall.

This leads to a second recommendation as follows:

- 2) Produce lambs in January and February to take advantage of the spring forage and pasture growth and sell them at heavier weights of 30 Kg. for the EEC market.

Not only will these heavier lambs find a ready market in the EEC, but the greater fertility normally associated with fall breeding should increase the lambing rate to approximately 1.5 lambs per ewe. This will increase the total liveweight of lamb marketed to 45 Kg. per ewe with a value of 6750 escudos (45 Kg @ 150 escudos).

In my opinion, it will be impossible to market lambs with a liveweight of 10-20 Kg in the EEC. These lambs along with the cheese produced from sheep's milk should be marketed in Portugal, where they have a ready market, and emphasis should be placed on heavier lambs for export to the EEC in the spring months.

I would offer a third recommendation as follows:

- 3) Develop a carefully controlled and monitored crossbreeding program, using highly prolific breeds followed by a second cross of the F₁ daughters with meat-type rams having a high growth rate and superior carcass merit.

This program is outlined in Attachments C and D previously discussed.

Such a method of crossbreeding will increase the heterosis (hybrid vigor) of the lambs produced, increase the incidence of multiple births in the F₁ daughters and produce a heavier, meatier lamb for market. A good F₁ crossbreeding program will increase lambing rates in two to three years, where a program based on selection will take 20 to 30 years to accomplish the same results. Performance testing and selection should be encouraged in existing flocks to identify the more prolific animals and breeds, which can then serve as producers of the ewes to enter the cross-breeding program without destroying any of the existing breeds. Once the program is inaugurated, a series of multiplier flocks could be established which would make the initial cross, producing the highly productive F₁ crossbred daughters to be sold to farmers to produce the market lambs.

A stratified system of crossbreeding has been used in Scotland for many years without destroying any existing breeds. The hill breeds of Scottish Blackface and North Country Cheviots are allowed to produce four lamb crops as pure breeds under extensive hill farming conditions. The older ewes at six years of age are then bred to Border Leicester rams to produce a crossbred ewe, the Grayface from the Scottish Blackface and the Halfbred from the North Country Cheviot. These crossbred ewes are then bred to meat-type rams such as the Suffolk or Oxford to produce the market lambs for the EEC. This can be diagrammed as follows.

Figure 1. - Energy Requirements of Cows-Fall Laying

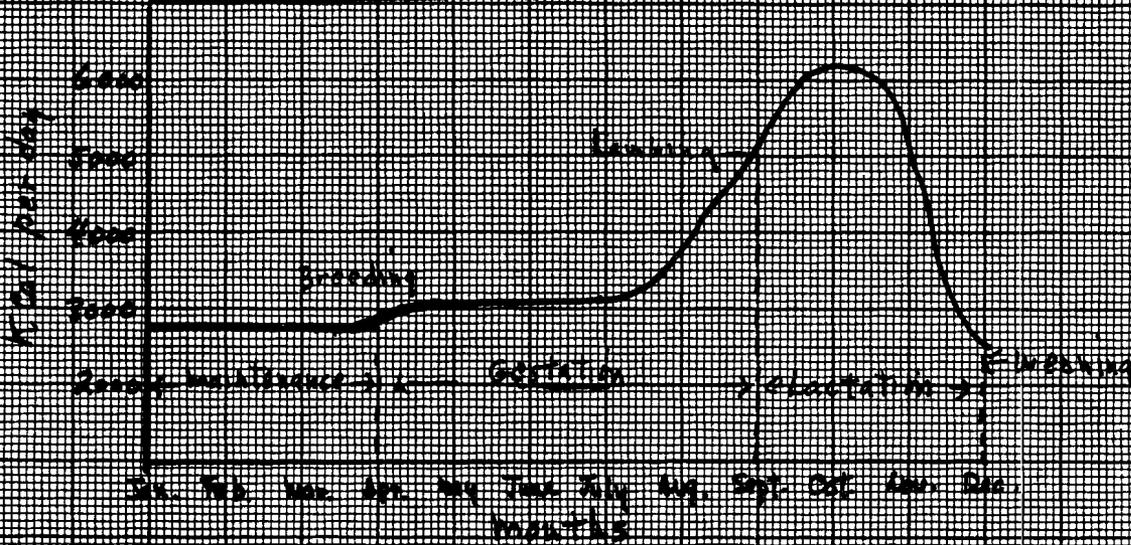


Figure 2. - Pasture Growth in Portugal

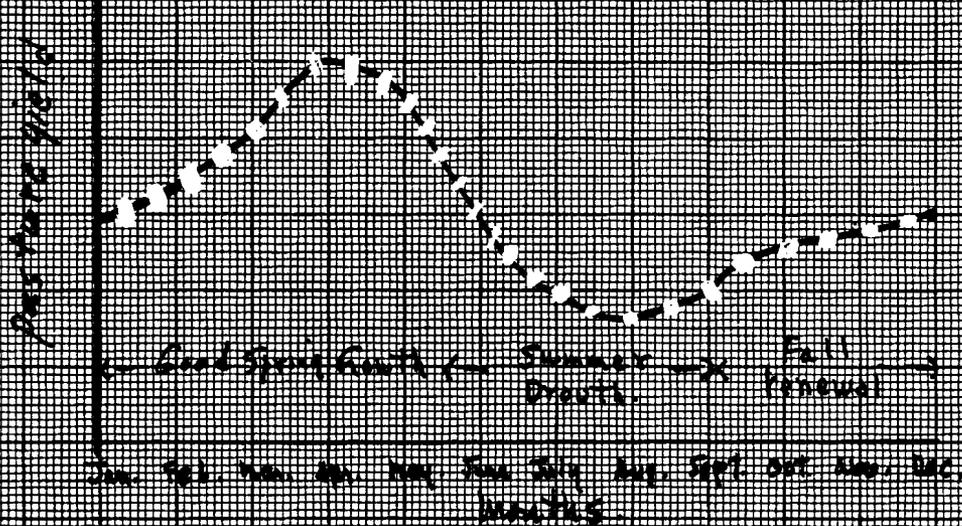
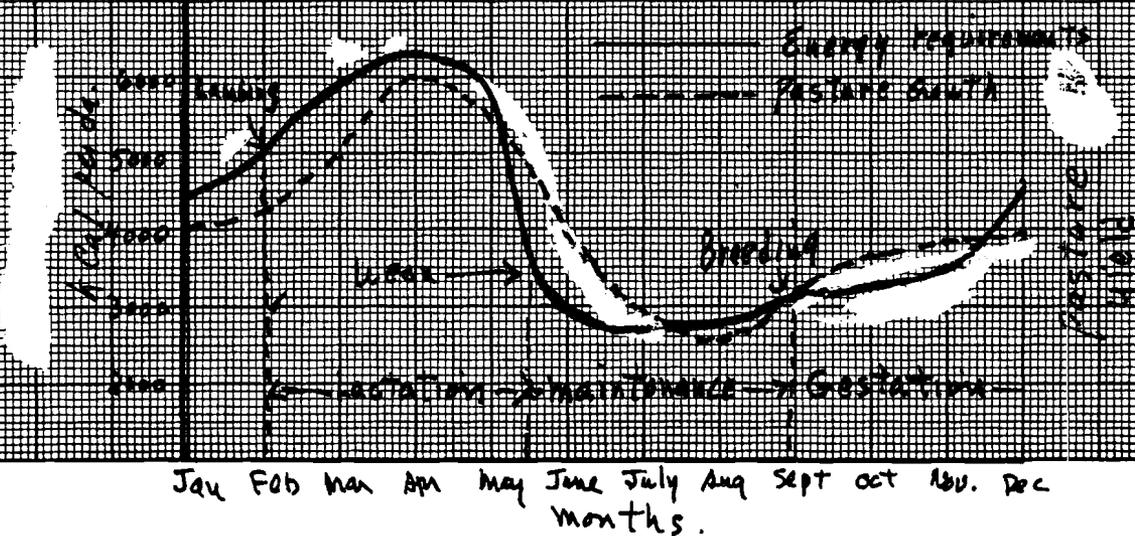
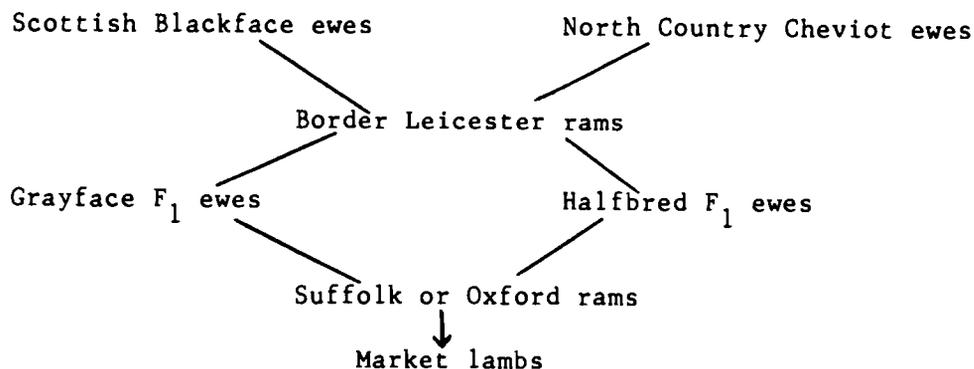


Figure 3. - Spring Laying and Pasture Growth





All crossbred lambs are marketed and not kept for replacements to maintain heterosis and keep the system from breaking down.

The fourth recommendation involves improvement in wool production.

- 4) Develop a research and marketing program to identify the grades of wool produced in Portugal and to find a market for Portuguese wool.

The Branco Merino and the Merino Precoce breeds grown largely in the Alentejo, produce a high quality wool. Very little effort has been made to encourage sheep farmers to improve wool production or to find a market for this Merino wool or the coarser wools produced in other areas. Specialists at the Universidade de Evora or at the Instituto Universitario da Beira Interior (IUBI) at Covilha or in MAP should be trained and encouraged to develop a national program of wool grading and marketing. There appears to be a high demand for woollen sweaters, suits and coats and other clothing in Portugal, yet most of these products are imported from the U.K. or other countries. This development could lead to a viable textile industry in many areas of Portugal and help increase the income from the sheep industry.

FUTURE REQUIREMENTS AND PROPOSED ACTIONS

The Portuguese people are hard-working, intelligent, courteous, friendly and dedicated to improving their standard of living and increasing their level of education. Unfortunately they find themselves at a disadvantage among other western European countries, because of a low level of income and a high level of illiteracy among those engaged in their leading industry - Agriculture. This could be disastrous as they enter the European Economic Community in 1984. They are deserving of all the aid that a developing country can get and we hope that this short-term assignment will help to increase the productivity of the livestock segment of agriculture. We are proud to have had a small part in this effort.

The facilities at IUTAD are very limited but the staff is well qualified and the morale appears to be high. Unfortunately they are handicapped by a lack of adequate funds and an apparent rivalry between the Ministry of Education and the Ministry of Agriculture, Commerce and Fisheries (MACP) in serving the Agricultural Community. A more cooperative effort between these two groups in determining

policy and defining responsibilities would increase the effectiveness of both.

The socio-economic structure in agriculture and the isolation of many villages in Tras-os-Montes presents a difficult problem in disseminating new information to farmers. Many livestock producers appear to be willing to accept new technology if it can be proven that it will improve their economic status. A serious limiting factor to livestock production is the uncertainty of the feed supply and the lack of concentrates (cereal grains and protein supplements) necessary for high levels of production in the dairy, beef, sheep and goat enterprises. A lack of feed during the dry, hot summer months limits the effective period of productivity to the winter months from October to April and reduces the potential income from these animals. A concerted effort should be made to identify new varieties of forages, that are adapted to year-round yields, to properly fertilize and lime such varieties based on soil tests and to develop systems of irrigation where feasible. Systems of low-cost feed storage, drying and pelleting of feedstuffs to be used during the drought period offer possibilities of extending the feed supply. As previously mentioned, a greater effort should be made at the national level to eliminate brucellosis and tuberculosis in livestock which is a serious threat not only to human health but to the marketability of livestock products in the European Economic Community.

Alternative methods for the acquisition of land for research and development at IUTAD beyond the purchase, renting or leasing process should be investigated. Some Universities in the U.S. have been successful in obtaining land by approaching elderly farmers to will their farms to the University with the provision that they can continue to live on the farm and share in the income until their death, at which time it becomes the property of the University, thus eliminating considerable inheritance taxes or death duties.

To support the continuing teaching, research and extension programs, sources other than AID should be contacted for support. These include such agencies as the Lilly Foundation of Indianapolis, Indiana, whose subsidiary Elanco International and Merck, Sharpe and Dohme, would find a ready market for their pharmaceutical products among livestock producers in Portugal. Winrock International of Morrilton, Arkansas has shown an interest in sheep and goat expansion in many countries, with much less potential than is found in Portugal. There may be other untapped sources of both financial and technical aid that should be contacted.

The opportunity to increase and improve livestock production in Portugal appears to be almost unlimited, if the obstacles previously mentioned can be overcome and many of the traditional methods replaced with new technology. The key to success will be based on sound research and the education of a new generation of young agriculturalists by IUTAD and UE and the cooperation of all agencies involved in disseminating information and advising those who need it.

Offered at Vila Real, Portugal

Fall, 1982

Sheep Management - J. B. Outhouse

1. Accelerated lambing

Utilization of breeds with a short anestrus period and adapted to out-of-season breeding to reduce the lambing interval to 8 months, resulting in 3 parturitions in 2 years.

2. Highly prolific breeds for increased productivity

Utilization of breeds with the genetic potential to produce from 2-5 lambs per parturition. In crossbreeding with indigenous breeds producing 1-2 lambs, this can result in from 2-2.5 lambs per parturition for greater lamb productivity and greater milk production.

3. Artificial rearing of lambs

Rearing lambs on a cold, liquid milk replacer from birth to weaning. Composition of milk replacer powder and necessary equipment, training and feeds.

4. Management of lambs

Diseases and nutritional requirements of nursing lambs, treatment and prevention of nutritional deficiencies, creep feeding to supplement ewe's milk and weaning procedures.

5. Reproductive physiology

Effects of light, temperature and nutrition on reproductive performance, hormonal control of reproduction, reproduction with exogenous hormones, fertility testing of rams, pregnancy testing of ewes, artificial insemination, and diseases of reproduction.

6. Milk production in sheep and goats

Factors affecting milk production, composition of milk, length of lactation, hormonal control of lactation, anatomy of the udder, nutritional requirements of lactation and lactation rations.

7. Confinement rearing systems

Housing and floors for confinement, feeder space requirements, systems of feeding, rations for confinement, adaptable breeds, behavior patterns in confinement and manure disposal.

8. Sheep handling facilities

Sorting chutes, foot baths, dipping tanks, lambing pens, feeders and waterers, loading chutes, buildings, creep for lambs and sheep equipment.

9. Carcass evaluation

Live and carcass grading, measurements to obtain yield grades, live and carcass weights, and quality factors.

10. Diseases and parasites of sheep and goats

Common diseases associated with young, nursing and growing lambs and kids, common diseases of sheep and goats, internal and external parasites of sheep and goats, and the prevention and control of each.

11. Nutrition of sheep and goats

Nutritional requirements, intermediary metabolism, ration formulation for growth, reproduction and lactation, and the kinds and utilization of pastures and forages.

Genetic Improvement of Animals and Cattle Husbandry - T. G. Martin

1. Genetic and environmental effects on animal performance

Relative importance of genotypic and environmental effects on animal performance. Heritability of major traits.

2. Changing mean level of performance through selection

The roles of heritability, selection differential and generation interval as factors influencing change in performance. Results of a long-term selection study will be reported as an example.

3. Estimating breeding value

Use of performance records on progeny, parents, siblings and other relatives to improve selection accuracy.

4. Performance testing

Adjustment of records for major environmental influences. Specific considerations in designing testing programs for dairy and beef cattle and sheep. Use of computers.

5. Selection for multiple traits

Formulation of the selection index and expected change in individual traits.

6. Inbreeding

Measurement of inbreeding and relationship. Effects of inbreeding on major economic traits.

7. Crossbreeding

The concept of heterosis (hybrid vigor). Relative importance of hybrid vigor in the offspring and in the parents. Systematic approaches to crossbreeding, including specific crosses, rotational crossbreeding and formation of new breeds. Relationship of crossbreeding to pure breeding.

8. Selecting animals for crossing ability

Selection on the basis of performance of progeny or siblings as crossbreds. Choice of breeds to be used in various crossbreeding systems.

9. Breeding for specific environments

Discussion of the nature of genotype by environment interactions with examples of situations where this is and is not important.

10. Nutritive requirements of growing bulls and lactating cows

The protein and energy required for various rates of growth and lactation. Utilization of local feedstuffs will be included in the discussions.

11. Carcass evaluation of cattle

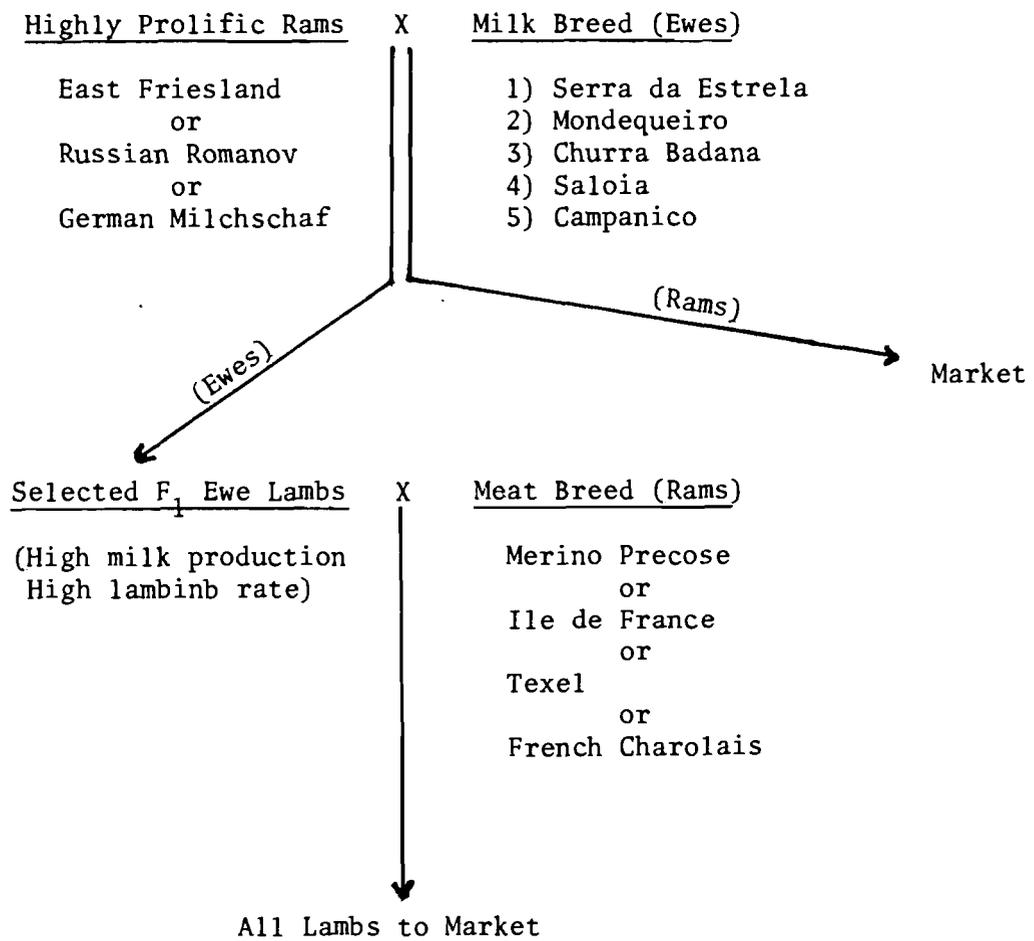
The importance of fat cover, carcass weight, maturity and conformation will be discussed.

REFERENCES

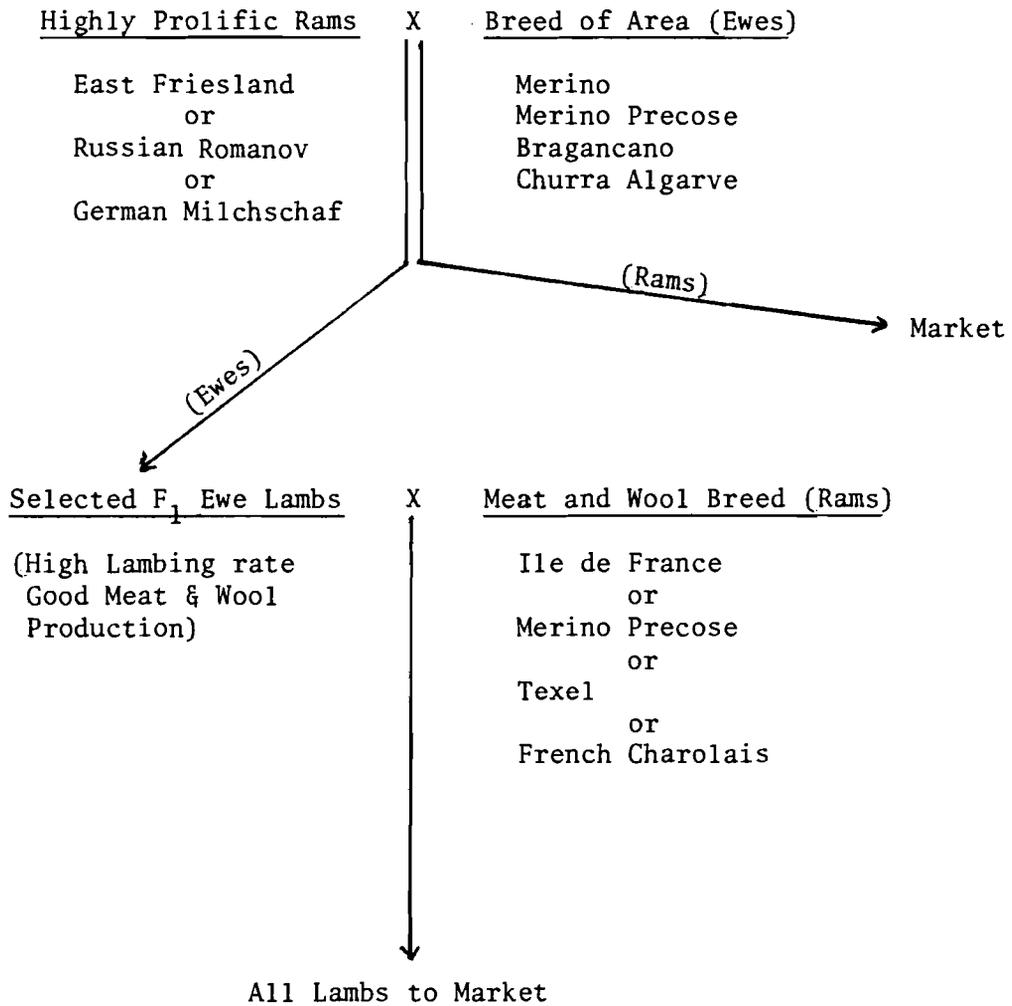
Sheep Management - J. B. Outhouse

1. The Sheepmen's Production Handbook, Revised Ed. (1981). Sheep Industry Development, 200 Clayton St. Denver, Colorado 80206
2. Hulet, C. V. 1978. Advances in accelerated lambing. N. C. Reg. Pes. Pub. 248.
3. Outhouse, J. B. 1974. Ewe productivity on accelerated lambing programs. Purdue Sta. Bul. 49.
4. Dickerson, G. E. 1977. Crossbreeding evaluation of Finnsheep and some U.S. breeds for market lamb production. NC-111 pub. 246. ARS. U.S.D.A.
5. Fredericksen, K. R., R. M. Jordan and C. E. Terrill. 1980. Rearing lambs on milk replacer diet. U.S.D.A. Farmers' Bul. 2270.
6. Outhouse, J. B., V. F. Slack and R. J. Warner. 1981. Indiana 4-H Sheep Project. Purdue Ext. Bul. 4-H 286.
7. Inskeep, E. K. 1974. Artificial insemination in sheep. West Virginia Agr. Exp. Sta. Bul. 629.
8. Research for an intensive total confinement sheep production system. Canadian ARC Tech. Bul. No. 2.
9. Housing and equipment for sheep. 1978. U.S.D.A. Farmers' Bul. 2242.
10. Dairy Goats - breeding, feeding, management. 1966. Mass. Ext. Bul. 439.
11. Milk Goats. 1946. U.S.D.A. Farmers' Bul. 920.
12. Hogue, D. E. 1981. Sheep Mimeo 1982. Cornell Ext. Bul. 57.

CROSSBREEDING PLAN FOR PORTUGAL
FOR MILK PRODUCTION (LEITE)



CROSSBREEDING PLAN FOR PORTUGAL
FOR MEAT (Carne) AND WOOL (Lã) PRODUCTION



COLÓQUIO SOBRE FORRAGENS E PRODUÇÃO ANIMAL

ESTAÇÃO AGRONÓMICA DE OEIRAS

14 de Dezembro de 1982

PROGRAMA

- 0:900 - Inscrições
- 09:30 - Abertura pelo Eng. José Carvalho Cardoso, Secretário de Estado da Produção Agrícola
- 10:00/
10:20 - Cultivares forrageiros para o regadio e sequeiro pelo Eng. Teodósio Salgueiro da Direcção Geral de Agricultura
- 10:20/
10:40 - A importância relativa de prados de regadio e sequeiro no Alentejo, pelo Eng. André Dordio do MACP
- 10:40/
11:00 - O programa de forragens na Estação de Melhoramento de Plantas de Elvas, pelo Eng. David Crespo da Estação de Melhoramento de Plantas
- 11:00/
11:20 - Prioridades na investigação e produção de forragens em Portugal pelo Dr. Charles Rhykerd, da Universidade de Purdue
- 11:20 - Intervalo
- 11:40/
12:45 - Discussão dos temas abordados

Chairman: Eng. José Almeida Alves

Moderadores (Eng. André Dordio
(Sr. Rex Henry
(Eng. João Cabral
(Eng. Nuno Moreira

Relatores da parte da manhã (Eng. Nuno Moreira - IUTAD
(Dr. Charles Rhykerd

- Almoço

- 14:30/
14:50 - Melhoramento dos pequenos ruminantes, pelo Dr. Warren Foote da Universidade de Utah
- 14:50/
15:10 - Nutrição e manejo na produção de ovinos em Portugal, pelo Dr. James Outhouse da Universidade de Purdue
- 15:10/
15:30 - Análise econômica da produção intensiva de borregos no Alentejo, pelo Dr. John Sanders da Universidade de Purdue
- 15:30 - Intervalo
- 16:00 - Discussão dos temas abordados
- Chairman: Dr. Apolinário Vaz Portugal
- Moderadores (Dr. Luis Telo da Gama
(Dr. John Sanders
- Relatores da parte da tarde (Dr. Luis Telo da Gama
(Dr. John Sanders
- 17:30 - Conclusões (a serem redigidas e apresentadas pelos relatores)