

PURDUE UNIVERSITY
International Education and Research
International Programs in Agriculture

1500001/53
PD AAP-459
ISN-35362



**PORTUGAL UNIVERSITY
INSTITUTES
DEVELOPMENT PROJECT**

(Contract AID/NE-C-1701)

**REPORT ON
SHORT-TERM STAFF ASSIGNMENT**

**Submitted by
DR. JAMES B. OUTHOUSE
Professor Emeritus of Animal Sciences
Purdue University
West Lafayette, Indiana**

April 30 - June 1, 1984

PDAAP 459

PORTUGAL UNIVERSITY INSTITUTES DEVELOPMENT PROJECT
(Contract AID/NE-C-1701)

REPORT ON
SHORT-TERM STAFF ASSIGNMENT
AT THE
UNIVERSIDADE DE EVORA (UE)
EVORA, PORTUGAL

April 30 - June 1, 1984

Submitted by

DR. JAMES B. OUTHOUSE
Professor Emeritus of Animal Sciences
Purdue University
West Lafayette, Indiana

TABLE OF CONTENTS

Acknowledgements	i
Itinerary of Short-term Consultancy	ii
Area of Consultancy	1
Specific Objectives of the Consultancy	1
Identification of Portuguese Counterparts	2
Universidade de Evora	2
Accomplishments with Respect to Objectives	3
Identification and Analysis of Problems Encountered	14
Opportunities for Teaching, Research and Extension Activities	15
Establishing and Maintaining Pastures	16
Management of Pastures for Sheep	17
Adapting Sheep Production Cycles to Pasture Growth	17
Future Requirements and Proposed Action	20
Summary	28
In Appreciation	30
Attachments	

ACKNOWLEDGEMENTS

The author expresses his thanks and appreciation to the following for making this assignment possible:

Division of International Programs in Agriculture at Purdue University.

Dr. D. Woods Thomas, Director

Dr. James L. Collom, Project Coordinator

Vivian L. Rider, Administrative Assistant

Dean of Agriculture at Purdue University

Dr. B.J. Liska

AID Mission Office, Lisbon, Portugal

Mr. Michael Lukomski, AID Representative

Ecn. José L. A. Pinheiro, Portuguese Representative

Universidade de Évora, (UE), Évora, Portugal

Prof. Doutor Ário Lobo Azevedo, Reitor

Prof. Doutor Nuno Potes, Head of Zootechnia

Eng. José J.M.G. Avô, Sheep Production

Eng. Carlos J.R. Roquete, Beef Production

Eng. Pedro Silveira, Pastures and Forages

Dr. José Luis Tirapicos Nunes, Reproduction Physiology

D. Maria do Carmo Silveira - AID Office, U.E.

Itinerary of Short-term Consultancy

Portugal University Institutes Development Project

Universidade de Évora, Portugal

J.B. Outhouse

Professor Emeritus of Animal Sciences, Purdue University

- April 5 - Left Indianapolis, Indiana USA at 1.10 p.m. on Pan Am Flt 556. Due to closing of JFK airport in New York by fog and wind, missed 6.20 p.m. flight to Lisbon. Stayed overnight at Hotel in New York.
- April 6 - Left New York at 7.30 p.m. on TAP Flt. 311.
- April 7 - Arrived Lisbon at 6.15 a.m. Met by Eng. Carlos Roquete, who delivered teaching material for seminar to Évora.
- April 8 - Left Lisbon at 1.20 a.m. on TAP Flt. 255. Arrived Johannesburg, Republic of South Africa at 2.00 p.m.
- April 9 - 28 - Attended Second World Congress on Sheep and Beef Cattle Breeding at Pretoria and visited research stations, farms and points of interest in South Africa.
- April 29 - Returned to Lisbon on TAP Flt. 254.
- April 30 - Arrived Lisbon at 7.15 a.m. Met by Eng. Avô, who drove me to the AID Mission Office at the American Embassy. Conferred with Ecn. José Luis A. Pinheiro on plans and objectives of consultancy. Accompanied Eng. Avô to Évora, arriving at 2.00 p.m.
- April 30 - June 1 - Conducted a 20-lecture seminar on sheep management, visited farms and research facilities and conferred with staff at Universidade de Évora on teaching, research and extension methods. Visited MAP Regional Research Stations at Serpa and Setubal to observe research in progress. Certified UE staff members, who completed seminar for one hour of graduate credit from Purdue University. Left copies of this report at Universidade de Évora.
- June 2 - 3 - Accompanied Eng. Jorge Azevedo of IUTAD to Vila Real for a follow-up visit at IUTAD at my own expense, to observe progress since my short-term assignment there in 1982.

- June 10 - 11 - Drove to Coimbra to observe work in progress at Escola Superior Agrária de Coimbra as guest of Dr. Fernando Delgado, who had attended my seminar at Vila Real in 1982.
- June 11 - 14 - Visited Tomar, Fátima and Nazaré enroute to Lisbon.
- June 15 - Visited AID Mission office and left copy of this report with José Luis A. Pinheiro. Conferred with PROCALFER staff on effectiveness of the program in Portugal.
- June 16 - Left Lisbon at 1:50 p.m. on TAP Flt. 312, arriving in New York (JFK) at 4:10 p.m. Left New York on Pan Am 563: arrived Indianapolis at 9:30 p.m. Drove to Lafayette in personal car.

Area of Consultancy

Organize and teach a four-week seminar consisting of 20 lectures on sheep management in three-hour periods with a 20 minute break.

Certify staff members and others who attend and complete the requirements of the seminar for one semester hour of graduate credit at Purdue University in Animal Science 695, Special Topics in Animal Science and present them with certificates of completion.

Consult with staff members at the Universidade de Évora on teaching research and extension methods to improve livestock in Portugal.

Visit Universidade de Évora farms to observe research in progress and help plan future research.

Visit farms of selected livestock farmers to become acquainted with production methods in the Alentejo.

Visit farms and regional research stations of the Ministry of Agriculture and Fisheries (MAP) to observe research and to discuss methods of disseminating information to farmers and cooperation with other research stations and the Universidade de Évora.

Meet with PROCALFER representatives to suggest methods of increasing the effectiveness of the program in Portugal.

An outline of the topics discussed in the seminar is included in this report as Attachment A.

Specific Objectives of the Consultancy

The objectives of this short-term consultancy are 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. Advise on operational mechanisms and links required to provide University support for regional extension activities.
5. Present sound scientific information on sheep production and management through the seminar and consultations with individual staff members.

Identification of Portuguese Counterparts

With the cooperation of Professor, Doutor Nuno Potes, professor in charge of Zootechnia (Animal Science), consultations were conducted with the following staff members:

- Eng. José J. M.G. Avó - Sheep production
- Eng. Carlos Roquete - Cattle production
- Dr. José Luis Tirapicos Nunes - Reproductive Physiology
- Eng. Pedro Silveira - Forage and pasture production
- Dr. Manuel Cancela de Abreu - Animal Nutrition
- Dr. Afonso de Almeida - Animal Nutrition
- Eng. Luis Fernandes - Farm Management
- Dr. Ofélia Bento - Animal Nutrition
- Dr. Maria José Barrisco - Reproduction

Universidade de Évora

The Universidade de Évora (UE) has an enrollment of approximately 1500 students. The Reitor is Professor, Doutor Ario Lobo Azevedo, who was visiting Purdue University in the U.S. during my assignment at Évora. Fortunately I had the pleasure of visiting with him on my previous assignment at Évora in 1982 and again on May 29, 1984 upon his return from the U.S.

Courses in Agriculture are taught at the Herdade da Mitra located approximately 12 Km from Évora. Students are transported to and from Évora 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, a herd of Alentejano cattle, a herd of Fresian dairy cattle, a herd of swine and a herd of horses.

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 in forage and pastures with sheep, beef cattle, dairy cattle and horses. Some of this research is being conducted at the Mitra with additional studies at UE outlying farms at Almocreva, Daroeira and Outeiro near Beja and at the government farm of Companhia das Lezírias near Lisbon.

Accomplishments with Respect to Objectives

April 30 - Arrived at the Lisbon airport on TAP airlines and was met by Eng. José Avó, who drove me to the AID Mission Office at the Embassy of the United States in Lisbon. Discussed the purpose of the assignment and proposed plans with Ecn. José Luis Almeida Pinheiro. Mr. Michael Lukomski, the AID Representative was in Washington, D.C. to confer with AID officials there. Drove to Évora and registered into the guest house at the Mitra.

May 1 - Holiday (Labor Day). Spent the afternoon with José Avó and family and became acquainted with the Mitra, Évora and surrounding areas.

May 2 - Visited farm of José Avó's father to assist with selection of Branco Merino rams for a flock of 450 Branco Merino ewes being used in an experiment on reproduction. One-half of these ewes had been injected with "Fecundin or Geminovin" obtained from Australia, which reduces the effect of ovarian steroids (estrogens) in reproduction and increases the effect of FSH and L.H. hormones, produced by the anterior pituitary, to increase ovulation rate in ewes. I assisted Eng. Avó and Dr. José Luis Tirapicos in this selection.

May 3 - Assisted Eng. Avó in having material for seminar duplicated for distribution to those in attendance.

May 4 - Gave first two lectures of the seminar on sheep management; one from 2.30 - 3.45 p.m. and the second from 4.15 - 5.30 p.m. with a 30 minute break between each. The seminar was attended by 30 students and staff and the equipment of an overhead projector, slide projector, screen and blackboard was provided. Copies of the material discussed were distributed to those in attendance and Eng. Avó and Dr. José Luis Tirapicos served as

interpreters for those who did not understand English.

May 5 - 6 - This weekend was spent with Eng. Carlos Roquete and family visiting Monsaraz, Vila Viçosa, Estremoz and Evoramonte and observing agricultural and livestock production in those areas.

May 7 - Accompanied Eng. Avó and Dr. José Luis Tirapicos to a farm near Évora being managed by Eng. João Torres of the Viticulture Department (UE) for his uncle, who lives in Lisbon. We observed a flock of Branco Merino ewes being bred to Merino Precoce rams and a group of young Yearling ewes, half Merino Precoce and half Branco Merino, also being bred to Merino Precoce rams. In addition the farm supported a herd of 40 dairy goats, some native Portuguese breeds and some black Spanish dairy goats being used to produce goat cheese for sale from the farm. The pastures were both improved and un-improved and appeared to be unusually lush for May. Oats and vetch will be harvested and used for either silage or hay as needed. A stand of subterranean clover was observed.

May 8 - Gave two lectures, one from 9.30 to 11.00 and the other from 11.15 a.m. to 12.30 p.m. on accelerated lambing. The class has increased to approximately 30 with the enrollment of five new members.

In the afternoon, with Eng. Avó and Eng. Roquete, I observed the use of a single strand electric fence used to rotationally graze pasture for the dairy herd of some 60 Fresian cows. One part of another pasture will be grazed and planted to sudan grass to furnish summer pasture under irrigation as the need arises.

I also observed the sheep research study on stocking rate of ewes on fertilized and unfertilized pasture, which I saw in 1982 and which has been in progress for the past seven years. This is a 3 x 4 factorial study involving 128 Branco Merino ewes. The stocking rate is replicated at 3, 6, 9 and 12 ewes per hectare and an economic analysis previously conducted indicates that the stocking rate of between 6 and 9 ewes per ha. is the most economical and generates the most profit. Hay has been fed in the hot summer months when the liveweight of the ewes falls below 40 Kg. This appears to be unlikely this year before the study is terminated, since adequate spring rains have produced a lush pasture in all replications and the pastures are unusually productive. Part of this study will be terminated on May 31, 1984 and replaced with other forage studies at the Mitra.

The unusual growth of both improved and unimproved pastures throughout the Alentejo in the spring of 1984 presents an opportunity for both grazing and the harvesting and storage of the excess forage for later use. A horizontal bunker silo is being constructed at the Mitra for the storage of silage for the dairy herd and the harvesting of some forage has just begun. Oats and vetch and other forages will be harvested and baled and stored as hay. Most areas of the Alentejo look like a virtual "Garden of Eden" and I was surprised to find this much forage being produced. With adequate rainfall and proper fertilization the soils in this area are capable of enough forage growth to support a heavy livestock population at the present time. The problem arises in getting these forages harvested and stored at the optimum time. In addition to bunker silos and the baling of small bales of hay, there appears to be an opportunity for preparing large round bales of forage which can be left in the fields for future use or stored near buildings, treated with formic acid and enclosed in plastic covers and used as silage. This process is now being used in the United Kingdom and to some degree in the United States. The limiting factor appears to be the availability of adequate equipment at a reasonable cost to make it profitable.

May 9 - Accompanied Eng. Avó on a trip to Almocreva, the Universida de de Évora farm near Beja. This is not the same farm I visited in 1982, but is located across the highway. It contains 1200 hectares and was purchased from the original owner following the agrarian land reform after the revolution of 1974. This farm contains many large fields of wheat, barley and oats and natural pastures. We observed a flock of 310 Branco Merino ewes being milked. These ewes were producing an average of 0,2 litres of milk per day in the later stages of lactation.

We also observed a flock of 1000 Branco Merino ewes that were not being milked. Some had been bred to rams of the Manchega breed from Spain and the crossbred daughters had been retained in the flock to increase milk production. Ewes of the Manchega breed will produce 80 litres of milk in 200 days (0,4 l/day). The future of this cross is in doubt however, because of lower wool quality and lack of muscling and growth rate in the crossbred lambs.

Shearing of this flock had just begun and we observed two

shepherds shearing with electrically - powered Lister machines, who appeared to be doing a good job of shearing. An examination of some of the fleeces indicated that the wool would grade 60 to 62 spinning counts with good resilience and a staple length of 10 to 12 centimeters. An Ile de France ram has been used to increase muscling and growth rate in the lambs and some of his crossbred sons have been retained for future use in the flock.

Following lunch at Alvalade, we visited Daroeira, a second farm assigned to the Universidade de Évora by the Ministry of Agriculture. This farm containing approximately 1200 hectares did not appear to be as well suited by soil and topography as Almocreva for the production of wheat, barley or oats, but well suited for cattle production with native pastures and well designed barns. It contains an artificial lake of about 5 million cubic meters of water retained by a dam 10 - 15 meters high. It is being used to furnish water for irrigation and for an extensive rice producing area on the farm.

On the return trip we passed by Alcacer do Sal on the Sado river, one of the largest rice producing areas in the Alentejo and visited the Barragem do Pego do Altar, a national dam built during the Salazar Regime. The artificial lake formed by this dam is one of the largest in the Alentejo and furnishes both hydro-electric power and water for rice production in the Sado valley near Alcacer do Sal.

May 10 - Gave two lectures in seminar, one on highly prolific breeds from 9.30 to 11.00 a.m. and the second on crossbreeding systems for Portugal from 11.15 a.m. to 12.30 p.m. The afternoon was spent preparing this report.

May 11 - Attended a symposium on Endocrinology and Reproduction sponsored by the Department of Zootechnia at the Universidade de Évora held at the Herdade da Mitra. Speakers from the United Kingdom, Spain, Argentina and Portugal discussed a number of subjects related to reproduction in sheep and cattle on May 11 and horses on May 12 at Companhia das Lezírias near Lisbon.

A copy of the program and speakers is included in this report as Attachment B.

May 12 - With Eng. José Avó and Dr. José Luis Tirapicos, I visited

the farm of Jerônimo Avó, José's father, to observe a flock of 500 Branco Merino ewes being bred to Branco Merino rams and used as a control flock for the Fecundin and Geminovin experiment. Toured the farm, buildings and garden and advised on use of large cattle barn and equipment to be converted to a barn for sheep.

May 13 - Accompanied Eng. Avó to Portel, where we met with Nuno Zapico de Sousa Franco to observe a small flock of crossbred ewes being graded up by the use of a German Merino ram. Some ewes contained 87 1/2 percent German Merino breeding after two backcrosses to the German Merino. Rams of similar breeding were being used for crossing on additional Branco Merino ewes. Yearly lambing rate of the German Merino is 1.7 to 1.8 per ewe and the carcass merit is high and Sr. Franco hopes to develop a flock of nearly pure German Merinos after two more backcrosses.

We then drove to another of his farms in the Portel area where we observed a flock of 400 Branco Merino ewes being bred to crossbred rams from the first flock on an accelerated lambing program. These ewes had lambed in January and most of the lambs had been marketed. Another flock of 150 Branco Merino ewes were lambing on an alternate schedule at the rate of 1.2 per ewe. Both of these flocks were on an eight-month lambing interval, producing three lamb crops in two years. Thus a lamb crop was produced every 4 months between the two flocks.

This demonstrates to my satisfaction that Branco Merino ewes in Portugal are capable of breeding at any season of the year and follow an accelerated lambing program as outlined in my seminar. The limiting factor appears to be feed and nutrition for those ewes lambing in May. Sr. Franco has solved this problem by providing irrigated pastures during this period with water from a nearby river. Hay was being harvested from this area in May and irrigation will follow to stimulate a second growth for grazing. He has convinced his shepherd, who was opposed to the program at first, that they can double their lamb crop under good management, using this program. This proved to be one of the most worthwhile visits to date and illustrates one method of increasing the productivity of Portuguese flocks through acceptance of modern technology.

May 14 - The day was spent preparing for tomorrow's seminar, in consulting with staff members and in preparing this report.

May 15 - Gave two lectures in seminar, one on artificial rearing of lambs from 9.30 - 11.00 a.m. and the second on management at lambing time and nutritional deficiencies of nursing lambs from 11.15 a.m. to 12.15 p.m. The afternoon was spent preparing this report and consulting with Eng. Avô.

May 16 - Accompanied Eng. Avô and Eng. Roquete to the cattle barns for weaning and weighing of calves from the 50 cow Alentejano herd at the Mitra. Twenty-three calves, varying in age from 7 to 9 months had an average weaning weight adjusted to 250 days of 268.0 Kg for bulls and 228.8 Kg for heifers. Average daily gains from birth to weaning was 0.94 for bulls and 0.795 for heifers with 61% of the bulls and 55.5% of the heifers above the average.

Following the weighing of the calves, the cows were weighed and given a score as to the amount of fat covering on their bodies. Cow weights varied from 500 to over 700 Kg, depending on age and maturity and the fat score averaged about 3.5 on a 1 to 5 scale, with 5 being the fattest.

In the afternoon I accompanied Dr. José Luis Tirapicos to a farm near Évora which had 2 hectares of Luzerne (Alfalfa) being harvested as hay, primarily for lambs. In past years this field which was irrigated has produced 4 cuttings of alfalfa per year with a total yield of 8 to 10 tons. We observed a flock of 500 Branco Merino ewes being bred for September and October lamb on once-a-year lambing, although the rams had been left with the ewes throughout the year and some ewes had young lambs with them. This farm had a tremendous crop of oats to be harvested for grain, some plants nearly 1 1/2 meters tall. Other fields of oats and vetch will be harvested as hay. This flock is available for research studies by the Universidade de Évora.

May 17 - Conducted seminar on milk production in sheep and goats from 9.30 - 11.45 a.m. without a break because of rain. At 2.30 p.m. accompanied Engs. Avô and Silveira and João Lobo, Joaquim Casquinha, Torcato Celestino and Lopes Castro to a farm near Vila Viçosa, where 200 Branco Merino ewes were being milked. These ewes were producing 40 litres of milk near the end of lactation period and milking will be terminated on May 31. Ewe lambs, sired by Branco Merino rams are returned to the flock, while all lambs sired by Ile de France rams are marketed. A good stand of subterranean

clover was observed in a cork orchard and a remodled barn for winter use was examined.

We visited a second farm, owned by a German businessman. in which two very good stands of subterranean clover existed. This farm had approximately 450 Branco Merino ewes on the accelerated lambing program with plans to increase to 700 head. A lake, retained by a new dam, will be used to irrigate 5 ha of sudan grass for the May-lambing ewes. Next year plans are to irrigate 10 ha of white clover and tall fescue. A sheep and goat cheese factory at Vila Viçosa was visited and the process of cheese making was discussed. The milk of goats is boiled to protect against brucellosis and both the sheep and goat milk is strained through 10 filters before the cheese is made.

May 18 - The morning was spent working on this report and the seminar was conducted from 2.30 - 5.30 p.m. on the subjects of confinement systems and equipment for sheep farms.

May 19 - 20 - The weekend was spent visiting Évora and working on this report.

May 21 - Accompanied Eng. Avó, Eng. Silveira and Dr. E.D. Carter from Australia to inspect and evaluate pastures on the home farm of Eng. Avó near São Cristovão and then to the UE farm of Almocreva near Beja. Here we saw some stands of subterranean clover, hay-making from oats and vetch, and scarification of land to be planted to wheat in late summer. Dr. Carter and I were unable to obtain a sensible answer to why most plowing is done to an 18 inch depth, except that it has traditionally been done that way for many years. The Branco Merino flock of nearly 1000 ewes being bred for October lambs, was observed and plans for its future use were discussed. Heavy rains, unusual for this time of year, prevented further inspection of forage research plots or attendance at a sheep sale in Beja.

May 22 - Carcass grading and lamb slaughter methods were discussed in seminar from 9.30 - 12.30 p.m. Worked on report in the afternoon.

May 23 - Accompanied Eng. Avó, Eng. Roquete, Dr. José Luis Tirapicos and Lopez Castro to Serpa, where we visited the Estação de Fomento Pecuário do Baixo Alentejo (State Research Farm for Lower Alentejo). Dr. António José Borges Bettencourt, the Director, spent the day with us, discussing the

research being conducted and hosting us for lunch. This station involves two farms totaling 1472 hectares. Livestock include 2000 ewes, 300 cattle, 50 goats and 100 Black Portuguese swine. Crops include pastures, (some irrigated), oats and vetch for hay and silage, sunflowers, olives, irrigated alfalfa and sorghum. Over 3000 metric tons of grass silage was stored in 5 bunker silos and another silo was being filled. All pastures were well fenced for rotational grazing and pasture management.

Research with sheep included the propagation of the Campanica breed, now growing extinct in Portugal, growth and prolificacy studies with the Merino Precoce, reproductive studies with the Branco Merino using Fecundin or Geminovin in cooperation with UE on similar studies, crossbreeding studies using Ile de France and Manchega rams and milk production studies with the Branco Merino and crosses involving the Manchega and Ile de France rams. A new modern Alfa-Laval milking parlor was being used, which would accommodate 44 ewes at a time, with the milk stored in a stainless steel bulk tank.

Research with cattle involved the productivity and prolificacy of the Mertolenga breed, comparing the growth rate and economic returns of pure Mertolenga calves with crossbred calves sired by Charolais bulls. A five-year study is being made on the productivity and economic returns comparing Alentejano and Mertolenga heifers. Fifteen Alentejano heifers, equal in initial lineweight to 22 Mertolenga heifers, will be maintained on 10 hectares each of pasture, with supplementary silage feeding used in the summer if necessary. Charolais bulls will be rotated between the breeds to sire the calves and pastures will be rotated every year to eliminate both bull and position effect of the pastures. Pasture for heifers was being irrigated by gravity from an artificial lake and alfalfa and sorghum was being irrigated by pumping from wells. Additional research was being done on the production of pork from the Black pigs and the quality of Serpa sheep cheese from the milking ewes.

Dr. Bettencourt is the only assigned staff member to supervise and conduct the large amount of research at this station. This presents a great opportunity for cooperation between the station and the staff at UE to collect and summarize data for teaching information and to complete advanced degrees.

May 24 - Discussed performance testing and diseases and parasites of sheep in seminar from 9.30 - 12.15 p.m. Worked on report in afternoon.

May 25 - Spent the morning preparing this report and at 2.30 p.m. gave two lectures in seminar on nutrition of sheep.

May 26 - 27 - Spent the weekend with Eng. Avó and family. Attended a simulated bull fight sponsored by UE students.

May 28 - Left by bus with members of seminar to visit farms in the Setubal area. The first visit was to Posto Experimental de Pegões a regional MAP farm under the direction of Eng. Tec. Agr. Oliveira. Here we observed a mixed flock of Saloia and Friserra ewes, milked for cheese production. The Director said that the Saloia, a nature breed of this area was much better adapted to climate and conditions than the Friserra which produced well the first year but had health problems later. The Friserra would produce about six percent more milk, but the Saloia milked longer, usually until July. The Friserra was showing reproductive problems, as all of the Saloia were bred for September lambs, but very few of the Friserra were bred. Friserra lambs were more subject to enterotoxemia than Saloia lambs. The milking parlor was designed by Fullwood Ltd. of Ellesmere, Salop, England and accomodated 24 head at a time.

Since the Friserra results from a cross of Friesland rams from Germany and Serra da Estrela ewes, the station was using Friserra rams to keep the bred pure however the problems demonstrate the loss of heterosis due to inbreeding. A third cross with a different sire breed might maintain heterosis longer. We also observed an irrigated pasture which had been in continuous production for 27 years and a field of tall fescue (*Festuca*) which would be harvested for hay.

The second visit was to a privately-owned farm, Herdade de Gambia composed of 126 ha and managed for the owner by Eng. Francisco Borba. Here 400 Friserra and a few Saloia ewes were being developed for milking, however lack of electricity prevented use of a Fullwood milking parlor similar to the MAP stations. This parlor cost 400.000 escudos installed. Lambs were weaned at 45 days and sold at 25 - 30 Kg liveweight. Three hectares of irrigated sorghum was used as supplemental pasture in the summer.

Following lunch at Setubal, we visited Herdade do Zimbral managed by José Busttorf da Silva, where 600 ewes, largely Branco Merino were being

bred to Awassi rams to increase milk production in the F₁ daughters. 220 ewes were producing 180 litres of milk. Native pasture was being irrigated by wells and gravity.

An interesting stop was made to Quinta de Camarate where the owner Eng. Soares Franco explained the operation from a previously prepared chart. Grapes for Lancer's wine are the principal crop grown and undoubtedly help support the sheep enterprise, which is complimentary. The sheep are grazed on small plots of improved, fertilized and irrigated pastures, some containing subterranean clover. The ewes started as Saloias and are gradually being replaced by Friserra ewes through a good selection program based on adequate records. Outstanding Friserra rams based on performance of the dam are being used. Ewes are culled if they don't produce 200 litres by the second lactation and his goal is 500 litres now with more from selected rams with 1000 litres in 270 days in the dam's record.

Lambs were weaned at 8 days and raised artificially on reconstituted milk replacer at a cost of 31 escudos per day, while ewe's milk is worth 80 escudos per day for cheese making. Ewes receive pasture, hay, silage and 1/2 Kg of concentrates in the last month of pregnancy which is increased to 1 Kg for two months of lactation. The ewes lamb once a year in September - October and are vaccinated for mastitis. Lambs are vaccinated against enterotoxemia and sold at 20 Kg. liveweight.

This visit was gratifying to me because it demonstrated many management practices and new technology discussed in the seminar namely:

- 1) the value of good records;
- 2) selection and culling based on records and performance testing;
- 3) good fertilization and management of pastures;
- 4) early weaning and artificial rearing of lambs in a milk-producing flock;
- 5) supplementation of rations with concentrates during the last month of pregnancy and the first two months of lactation, and
- 6) adequate disease prevention through vaccinations.

A herd of 40 Saanen goats was also being milked with plans to supply the milk to hospitals.

The last visit was to the intensive farm of Eng. Antonio Avillez at Azeitão who was maintaining 100 ewes and 94 lambs on four hectares with irrigation. A large reservoir served as the source of water. Pastures were

all fenced and rotated so that the first pasture was re-used every four weeks. The pastures were short and appeared to be at the maximum stocking rate.

We visited a second farm, owned by Eng. Avillez in which 500 sheep were grazing on 23 ha with over 800 sprinklers in the irrigation system. 220 Saloia ewes, milked by two men by hand, were producing 80 - 90 litres per day. Irrigated fields of sudan grass are planned for both farms.

May 29 - Gave two lectures in seminar; one on pastures and forages and one on adjusting sheep production cycles to existing feed supplies.

May 30 - Signed all Certificates of completion for those attending the seminar and diplomas for those receiving graduate credit from Purdue University.

May 31 - Met with seminar for discussion of the course and supervised filling out Registrar forms for credit. Went to luncheon arranged by members of the seminar.

June 1 - Met with the Animal Nutrition staff to discuss future plans at 2.30 p.m. At 4.00 p.m. presented certificates of completion for all who attended the seminar and diplomas for those receiving graduate credit in An Sc 695, both prepared by the Division of International Programs in Agriculture at Purdue University.

Identification and Analysis of Problems Encountered

The land in the Alentejo is gently rolling or level with wheat, barley and oats, the principal crops. In certain areas olive and cork trees, citrus fruits, tomatoes and rice in irrigated areas are grown. Pastures are largely native grasses with white clover and some legumes and an attempt is being made to develop stands of subterranean clover to furnish nitrogen for the grasses. Farms are large, varying from 100 hectares to 5000 hectares or more. Most owners are using modern machinery to operate these farms.

Unfortunately the Alentejo and surrounding areas of the south of Portugal 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. In limited cases, pastures were observed to respond well to both fertilization and irrigation. Feeds for livestock are limited largely to grasses grown from October to May, supplemented by cereal straws, some treated with ammonia or sodium hydroxide. Excess pasture growth is harvested as hay, baled in the traditional rectangular bale, and stored for use as needed. Some is chopped in the field and stored as silage in a bunker or pit silo with concrete or earthen sides.

In May 1984 the unusual situation of high rainfall and cool temperatures has produced an excess of pastures and forages, beyond the ability of the present livestock population to consume it. Fields are green and lush and some grasses are 12 to 18 inches high. Unfortunately most farms are not equipped with machinery to harvest this growth and much of it will undoubtedly be wasted.

Farming operations in the Alentejo and surrounding areas underwent considerable change as a result of the Agrarian Reform following the revolution of 1974 - 75. Large land holdings taken by the government were divided into smaller tracts and operated by the workers as cooperative farms. It soon became apparent that the workers lacked the experience and ability to maintain the productivity of these farms. The present government has gradually returned most of this land to the original owners, who are in a re-building process to increase the productivity of the land. 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, one

year with sunflower 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. They also glean sunflower or safflower seeds on fallow land and consume acorns from the land oak tree, which serve as substitutes for cereal 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. Procalfer funds for livestock research have been assigned largely to Regional MAP stations. Unfortunately most of the personnel at these stations are not trained to organize, conduct or analyze such research and the results leave much to be desired. Cooperation with the University staff would improve these results.

Opportunities for Teaching, Research and Extension Activities

The Universidade de Évora has a large land area in farms available for research and demonstration purposes. In addition to the 286.32 ha of land at the Herdade da Mitra, there are three farms in the Beja area owned by UE. These include Almocreva containing 1200 ha, Daroeira, 1200 ha and Outeiro, 600 ha for a total of 3.000 ha. Together with the Mitra, a total of 3.286.32 ha (8,100 acres) is available for research. Almocreva may be reduced to 800 ha, but will sustain 1500 Branco Merino ewes. Daroeira will have a herd of cattle, 300 sheep and rice fields and Outeiro will produce cereals with some livestock. Research studies at the Mitra have generated some data that can be used by UE staff members toward the completion of a Master's degree, but much more research is needed if all staff members are to complete the requirements for advanced degrees.

The three farms near Beja offer tremendous potential for research. A committee has been appointed to develop a coordinated plan of research to include studies in soil fertility, adaptable forage and pasture plants and farm management studies including an economic analysis of the costs and returns under different systems of management and different livestock

species (cattle and sheep). These farms can eventually be used as demonstration farms for farmers to see research in action and to encourage the acceptance of new technology. Livestock or crop field days can be organized and promoted by the Extension Department of the University and the MAP Stations.

Opportunities to generate additional research appears possible at the National Plant Research Station at Elvas, the National Animal Research Station at Fonte Boa and the state-owned farm of Companhia das Lezírias, with its extensive livestock operations under the direction of Professor Doutor Nuno Potes, Head of Zootechnia at UE. Cooperation among these groups is necessary in the future.

Library facilities at the Mitra are inadequate for undergraduate use and certainly limiting for staff members. A high priority should be given to the purchase of subscriptions to scientific journals and textbooks as funds become available.

A computer terminal at the Mitra which can be connected to the computer at the University in Évora is badly needed and would save transportation costs and staff members' time. Laboratory teaching equipment such as microscopes are necessary to eliminate the need to repeat some courses as many as six times.

Establishing and Maintaining Pastures

The problems of establishing a viable, year-round forage and pasture program in the Alentejo and surrounding areas in the south of Portugal is a long term project of 25 years or more. The soils will respond to fertilization and liming and native pastures will produce well without renovation. Subterranean clover, which appears to offer possibilities of introducing a legume into grass pastures has succeeded when properly fertilized and managed, but many stands have died out after one or two years, due to low organic matter and fertility in the soils and lack of rainfall in the summer. Native white clover on the other hand seems to thrive if adequate moisture is available, such as seen in May of 1984. Irrigation has been limited to cereal crops and rice, however observations on some farms would indicate that irrigated pastures which can sustain a stocking rate of 20 ewes per hectare will be a profitable enterprise when part of the farm is irrigated and used as a lactation pasture in an accelerated lambing program.

Non-irrigated pastures can be reserved for non-lactating ewes.

Twenty highly productive ewes, weaning 30 lambs averaging 30 to 35 Kg each will produce 1000 Kg of lamb meat per hectare at a value of 200 escudos per Kg or 200,000 escudos per hectare. This amount of income should justify the cost of irrigation over a period of time if the accelerated lambing program is used.

Management of Pastures for Sheep

Most pastures need to be better managed in Portugal. Very little fencing is used to permit rotational grazing. Limited observations on areas where fencing is used indicates that weed control is better and the productivity of the pasture is increased, when rotational systems are used. Rotational grazing in the U.S. has been shown to increase the productivity of pastures, preventing over-grazing or under-grazing. It can be accomplished through the use of low-cost electric fencing when the ewes are newly born and has the added advantage of reducing internal parasitism in lambs and foot rot in older sheep. Excess forage growth in the spring can be harvested and stored in large round bales or as silage for periods of depressed pasture growth. Round bales have less spoilage than square bales and can be left in the pasture fields without housing.

The fencing of pastures will reduce the time the shepherd spends watching the sheep and free him to obtain the necessary records of breeding, lambing and weights of lambs, which will be necessary if improvement in sheep productivity is to be obtained. Ewes and lambs must be identified with individual numbers, which can be assigned as the lambs are born and then used to obtain growth and other information needed in the selection of the superior animals to be retained in the flock. This is the first step in an improvement process.

Adapting Sheep Production Cycles to Pasture Growth

It may be easier in the long run to adapt the breeding and production cycles of the sheep to fit the existing forage production than to try to change the types and productivity of forages produced in the Alentejo. Fortunately most of the Portuguese breeds will mate at any time

of the year and are capable of raising two lambs to market weight, especially if the production cycle can be adjusted to take advantage of the spring growth of pastures and forages which occurs from February until June.

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 percent of the fetal growth takes place and reaches a peak at about one month post-partum to meet the high requirements of lactation.

The present system used in many Portuguese flocks of spring breeding and fall lambing does not make the most efficient use of pastures and reduces the productivity of sheep used for meat production. As a result the low lambing rate of 0.9 to 1.0 lambs per ewe may be due in part to the stress of high temperatures during gestation in the hot summer months, which results in 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 are 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 spring growth of pastures and forages.

If the ewes are not milked for cheese production, the lambs can nurse the ewes for a longer period and be marketed at from 30 to 35 Kg. These lambs will find a ready market in the EEC at Easter time, when most of the Northern European countries do not have lambs to market, since most lambs are born in March and April and are not marketed until late summer or early autumn. Not only will these heavier lambs find a ready market in the EEC, but the greater fertility, normally associated with autumn breeding, should increase the lambing rate to approximately 1.5 lambs per ewe.

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 there is a ready market and emphasis should be placed on heavier lambs for export to the EEC in the spring months.

A more complete discription of this procedure is given on pages 23 through 26 in the previous report of my short-term assignment at Vila Real and Evora, Portugal from September through December 1982.

Future Requirements and Proposed Action

During this consultancy, emphasis has been placed in increasing the prolificacy and productivity of the Portuguese breeds of sheep. These two factors are the most important in determining the economic returns from sheep.

A number of methods of accomplishing the above have been stressed in the seminar on sheep management and in consulting with staff members at the Universidade de Evora. These include the following:

1. Establish a system of record keeping in Portuguese flocks

This must have a high priority if any improvement in productivity is to be achieved. In most flocks, no records are kept or are in the minds of the shepherd and permit no analysis of data for selection of more productive animals.

A simple set of records can be obtained at lambing time involving the following:

- 1) Tag or tatoo of lamb
- 2) Date and year of birth
- 3) Sex of lamb
- 4) Single or Twin
- 5) Sire and dam of lamb
- 6) Birth weight of lamb

These records could be followed with weaning weights of lambs, with very little extra time and labor involved, since the flock must be rounded-up and handled at this time anyway.

From these records, the owners or University staff members could make the necessary adjustments to compare weights and gains in a performance testing program to serve as the basis for better selection of breeding stock. This leads to the second recommendation as follows:

2. Establish a sheep performance testing program

Since lamb weights and gains are relatively easy to obtain and are important in the economic returns from sheep, a performance testing program based on weights obtained at birth, weaning and 90 or 100 days is recommended. These weights need to be adjusted for environmental factors, which are non-genetic in nature and include

- (1) age of dam;
- (2) sex of lamb;
- (3) birth code (single, twin or triplet)

and (4) rearing code (reared as single, twin or triplet).

A table of adjustment factors based on the above variations is enclosed as Attachment C. This is based on a 90 day weight, but weighing of the lambs can vary from 70 - 110 days and adjusted to 90 days as shown in table 1. This involves three steps as follows:

1) Determine weight per day of age (WPDA) as follows:

$$\frac{\text{Actual weight of lamb}}{\text{Age in days}} \times 100 = \text{WPDA}$$

2) Determine 90 day weight:

$$\text{WPDA} \times 90 = 90 \text{ day weight}$$

3) Determine adjusted 90 day weight:

$$90 \text{ day weight} \times \text{adjustment factor (from table 1)} = \text{adjusted 90 day weight}$$

Identification of superior individual lambs can be made easier if the lambs are ranked within sex on the basis of an adjusted 90 day weight ratio. This is obtained as follows:

$$\frac{\text{Individual's adjusted weight}}{\text{Average of adjusted weights of all lambs of same sex}} \times 100$$

Therefore those above 100 are better than the average for the flock and breeding replacements should be selected from the top half of the flock and can be identified quickly.

Additional comparison can be obtained if the lambs are weighed again between 180 and 240 days of age and an adjusted 210 day weight be obtained. This eliminates any maternal effect of milk yield in the ewe and is especially important for ram lambs being kept for breeding purposes. The entire program can be adapted to summarization by the computer, if available.

3. Develop a selection program based on performance records

Prolificacy in the flock as well as weight gains in lambs can be improved by a good selection program. Unfortunately 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 replacements on the number of lambs born rather than the number weaned by the dam, as this 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 as this is a more accurate record than selection based on only one or even two lambings.
- 4) Select ewe lambs that exhibit estrus (heat) early, since they are usually more fertile than late-cycling lambs. Early estrus can be determined in open ewe lambs by using a vasectomized ram with a marking harness.

The above selection methods will increase prolificacy in a flock and when used in conjunction with growth performance records should improve the productivity of a flock.

It may be necessary for University staff or MAP personnel to establish demonstration flocks based on the above procedures to convince flock owners and shepherds the value of such a program.

4. Develop a carefully controlled and monitored crossbreeding program

Crossbreeding in commercial flocks will increase the productivity by 15 to 20 percent above the average of the parent breeds that produced them. This is due to heterosis (hybrid vigor) in the offspring produced. The livability and growth rate of the lambs is improved and the F₁ daughters have more multiple births. A good 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 Portuguese breeds to identify the more productive animals and to determine which breeds can contribute to a crossbreeding program and the traits they can contribute. Ewes from these flocks can then enter a planned crossbreeding program, combining the best traits available. To protect the identity of the present breeds, farmers should be encouraged to form breed societies in which superior performance-tested animals are registered and from which superior breeding stock can be obtained for both purebreeding and crossbreeding. These societies should be controlled by the breeders themselves, but under the guidance and supervision of trained personnel from the Ministry of Agriculture or the University.

Before any crossbreeding program is started on a large scale, the native breeds of Portugal need to be evaluated as to what they can contribute to a successful crossbreeding program.

The foreign breeds now being used in a rather haphazard manner to increase prolificacy in Portugal, should be tested in University or MAP station flocks before they are recommended for use in a crossbreeding program. As previously mentioned, the Universidade de Evora has adequate facilities and farms to do this. Comparisons can be made on the sire-effects of a number of foreign breeds in large flocks under controlled conditions and the results made available at field days or in research or extension publications.

Foreign breeds which offer possibilities of increasing prolificacy and milking ability include the East Friesland and Milhschaf from Germany, the Lacaune from France, the Awassi from Syria or Israel, the Chios from East Mediterranean areas, the Horned Dorset from England, the Romanov from Russia, the Finnish Landrace from Finland and the Boroola Merino from Australia. Highly productive F_1 daughters, sired by these rams out of existing Portuguese breeds can then be bred to rams that will improve the growth rate and carcass qualities of the lambs produced. All lambs should be marketed and none retained in the flock for breeding purposes to prevent a backdown in the system or a mongrelization of the sheep flocks of Portugal.

Once the program is inaugurated, a series of multiplier flocks could be established, which would make the initial cross, producing the highly-productive F_1 crossbred daughters to be sold to farmers to produce the market lambs.

Breeds of rams to use as terminal sires, which will improve growth rate and carcass merit of the market lambs include the Merino Precoce, Ile de France and Charolais from France, Texel from Holland, Suffolk, Hampshire and Dorset Down from England, Mutton Merino from Germany and the Dorper and Dormer from the Republic of South Africa.

The above systems of crossbreeding or modifications is used in commercial flocks in most of the important sheep producing countries of the world, including the United Kingdom (England, Scotland and Wales), New Zealand, Australia, South Africa and the United States. If Portugal

is to increase the productivity of its sheep for meat, wool and milk production, a planned and supervised crossbreeding program offers the quickest and most productive way of doing it. Lambs must have a higher growth rate and improved carcass merit to compete for a market in the EEC and crossbreeding offers the greatest potential of accomplishing it.

Outlines of crossbreeding programs, using the breeds described above are included in Attachments D and E of this report.

The U.S. Feed Grains Council has prepared a publication entitled "New Methods of Sheep Management for Mediterranean Areas" which gives a crossbreeding and lamb feeding program for countries in the Mediterranean basin. Another booklet "Sheep Systems for Higher Meat Production" describes new cooperative sheep management systems, which help to provide the right conditions in which the latest technical husbandry developments will give best results. Copies of these booklets may be obtained by contacting International Sheep Programmes, U.S. Feed Grains Council, 11, College Green, Gloucester GL1 2LX, England or Mid East/African Headquarters, U.S. Feed Grains Council, via XX Settembre n° 5, Rome, Italy or International Headquarters, U.S. Feed Grains Council, 1575 Eye Street N.W. Suite 1000, Washington, D.C. 20005, U.S.A.

5. Develop a Grading and Inspection Program for Lamb Carcasses

There is very little incentive for improvement in sheep production in Portugal until farmers are paid for the quality of lamb meat produced. Under the present system of marketing, all lambs regardless of differences in quality or muscling are paid about the same price per kilogram within the season of the year and weight range of the lamb. Highest prices are paid for small lambs with a liveweight of 10 - 20 Kg from November to February. Lower prices are paid for heavier lambs of 20 -35 Kg and when marketed from late spring to early autumn. At present there appears to be very little inspection at slaughter time by a veterinarian for disease, such as brucellosis and tuberculosis. In a similar manner, no grading system to differentiate the fat cover and muscle development in a lamb carcass is used.

It is strongly recommended that inspection for disease be required of all lambs slaughtered in slaughter houses and all reactors be barred from

sale in the retail markets. It is further recommended that a grading system be developed to differentiate quality, shape and fat cover of carcasses and to identify those lambs with a high cutability of lean meat in the retail cuts, similar to that used in the United States, New Zealand or Great Britain. Both inspection and grading will be required of all lambs marketed in the EEC and when retail markets and the consuming public are willing to pay more for high quality carcasses, farmers will be encouraged to produce a better product. Such a program of inspection and grading should logically be under the supervision of the Ministry of Agriculture and conducted by veterinarians and graders trained in meat and food technology.

6. Encourage the Use of Accelerated Lambing Programs where Management and Irrigation Warrant it.

The Portuguese breeds of sheep are well adapted to using an accelerated lambing program, because they have a short or no anestrus and will mate almost any time of the year. This is one way of increasing the productivity of a flock to three lamb crops in two years without increasing the lambing rate or the labor at each parturition. By reducing the lambing interval to eight months, instead of twelve, ewes can lamb in January, September and May over a two year period as follows:

<u>Breeding (36 da)</u>	<u>Lambing (145 da)</u>	<u>Weaning lamb (60 da)</u>
August 10 - Sept. 15	January (this year)	March 15 - April 1
April 1 - May 7	September (this year)	Nov. 15 - Dec. 1
Dec. 1 - Jan. 6	May (next year)	July 15 - Aug. 1

The ewes may be divided into two flocks each lambing every eight months, with the result that a new lamb crop is born every four months on the farm as follows:

<u>Flock A (lambing in:)</u>	<u>Flock B (lambing in:)</u>
January (this year)	May (this year)
September (this year)	January (next year)
May (next year)	September (next year)

This accelerated lambing program must be supported by irrigation of a

suitable crop such as sudan grass during the summer for the ewes lambing in May.

It must also be accompanied by a high level of management to observe the strict schedule of breeding and weaning of the lambs, which can be sold at 10 - 20 Kg or heavier weights at weaning time. It can be adapted to flocks producing sheep cheese, with some modifications.

The advantages of accelerated lambing are as follows:

- 1) The lifetime productivity of the ewes is increased by 50 percent, without a corresponding increase in feed or labor.
- 2) The seasonal variation in lamb meat is reduced and the cash flow to the farm is more evenly distributed.
- 3) Buildings and facilities are used more often and rams can be used for breeding every four or eight months, thus reducing the cost per lamb produced.
- 4) Better use is made of seasonal variation in pasture growth where gestation and lactation are coordinated with feed supply.

The major disadvantages are the high level of management required for the program to succeed and in Portugal, irrigation will be required for ewes lambing in May to produce forage during the hot summer months.

As previously mentioned, I was very pleased to see a number of accelerated lambing systems in operation in Portugal. Those farmers who are using the program were enthusiastic about it and pleased with the additional income it generated. Shepherds however, must be convinced of its value, if it is to prove successful.

7. Develop a program to improve the quality of Portuguese wool

The income from the export of textiles, both from wool and cotton manufactured in Portugal, exceeds that of any of other product, including Port wine. Very little effort has been made to encourage sheep farmers to improve the quality of wool produced. The Branco Merino and the Merino Precoce produce a high quality wool, which can compete with other wools on the world market, yet the price paid for Portuguese wool appears to be below that paid for wool from other countries, including Australia, New Zealand and the U. K., which have a well developed system of grading and marketing of their wools.

Sheep producers need training in the shearing, sorting and handling of

wool to produce a cleaner fleece, which can be sold on a graded basis. Specialists at the Universidade de Évora or at the Instituto Universitário da Beira Interior (IUBI) at Covilhã or in MAP should develop a national program of wool grading and marketing so that farmers producing the better quality wools will be paid according to grade and value, thus creating an incentive to make the necessary improvements.

SUMMARY

The opportunity to increase and improve livestock production, especially sheep production, 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 agriculturists by the Universidade de Évora and other agricultural universities and the cooperation of all agencies involved in disseminating the information to farmers who need it. Many livestock producers appear willing to accept new technology if it can be demonstrated that it will improve their economic status.

Those involved in teaching, research and extension activities at the Universidade de Évora are young, energetic, sound in their thinking and anxious to utilize new technology. Some lack experience but this will come in time. Those who have had the opportunity to visit or study abroad have widened their professional horizons and increased their knowledge of new techniques, permitting them to accept additional responsibilities upon their return to Portugal. It is hoped that this policy will be continued in the future as the staff increases in size. The only limitation to their achievements will be a shortage of funds and lack of equipment, but many will find ways to carry out their assignments in spite of these shortages.

Greater cooperation between the Universities administered by the Ministry of Education and the Regional Research Station administered by the Ministry of Agriculture is a must if progress is to be made. Not only is there a lack of cooperation, but duplication of research efforts, poorly planned comparisons which are difficult to analyze and long delays on the part of the administrators in giving approval to research proposals or in allocating funds is discouraging to the staff members involved and costly to the nation.

The lack of cooperation between the Ministry of Agriculture and the Ministry of Education was very evident during my seminar on sheep management at the Universidade de Évora. The Regional MAP director scheduled a similar seminar for MAP employees at the same time and refused to cooperate with UE by either combining the seminars or allowing MAP employees to attend my seminar.

Procalfer funds are being delayed too long in the red tape of approval and distribution by the government agencies in Lisbon and the regional directors of MAP. I have seen very little evidence of improvements which can be attributed to the use of these funds or the recommendations of the Procalfer program either in 1982 or in 1984. I would strongly recommend that research staff at the Universities and the MAP regional stations be permitted to submit research proposals directly to Procalfer, with the approval of their superiors, and Procalfer be permitted to allocate these funds directly to research projects on the basis of merit. This would encourage staff members to generate new research, duplication of efforts would be eliminated and the effective use of these funds would be enhanced.

I was informed by staff members at the Universidade de Évora that a research project proposal on sheep improvement had been submitted to Procalfer in May of 1983 and UE had never received acknowledgement of the proposal, even though it had received tentative approval by Dr. Carl Hausler of Procalfer before it was submitted. The same situation existed at IUTAD at Vila Real.

The Portuguese people are hard-working, intelligent, courteous, friendly and dedicated to the improvement of their standard of living, especially among those engaged in their leading industry-agriculture. They are deserving of any help that the AID or Procalfer programs can give.

I have enjoyed consulting with the staff at the Universidade de Évora and in presenting the seminar on sheep management. If any of my suggestions or recommendations are accepted and used in Portugal and result in the improvement of the sheep industry, or other livestock enterprises, then I shall consider this consultancy a success.

In Appreciation

The author wishes to express his appreciation to Eng. José Avó for organizing the seminar and farm tours in the Alentejo and for acting as interpreter in the seminar and on the farm visits; to Eng. Carlos Roquete for assisting with the farm tours and for arrangements upon arrival and departure from the Lisbon airport; to Dr. José Luis Tirapicos Nunes for interpretation of the sections on reproduction and diseases and parasites in the seminar and for additional farm visits; to all three for entertainment and meals on weekends in their homes; to Dr. Cancela de Abreu for interpretation in the Nutrition Section of the seminar; to Eng. Pedro Silveira for organizing farm tours and the bus trip to visit farms in the Setubal area for the seminar; to Prof. Doutor Nuno Potes for his support of this consultancy; to D. Maria do Carmo Silveira for her help in the AID office at UE and for typing this report and to many others who contributed to its success.

ATTACHMENT A

Outline of Animal Science 695
Special problems in Animal Science
Offered at Universidade de Evora, Portugal

Outline of Animal Science 695
Special problems in Animal Science
offered at Universidade De Evora, Portugal

May 1984

Sheep Management - Dr. J.B. Outhouse

1. Reproductive Physiology

Effects of light, temperature and nutrition on reproductive performance. Hormonal control of reproduction and reproduction with exogenous hormones.

2. Management at Breeding Time

Fertility testing of rams, pregnancy testing of ewes, artificial insemination and diseases of reproduction. Management of ewes and rams at breeding time.

3. Accelerated Lambing

Utilization of breeds with a short anestrus period, adapted to out-of-season breeding with a lambing interval of eight months, to produce three parturitions in two years.

4. Highly prolific Breeds for Increased Productivity

Utilization of breeds with the genetic potential to increase fecundity and productivity of ewes in a crossbreeding program.

5. Crossbreeding Programs to Increase Productivity

Use of highly prolific breeds and terminal sires to increase meat (carne), wool (la) and milk (leite) production from indigenous breeds of Portugal.

6. Artificial Rearing of Lambs

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

7. Management of Nursing Lambs

Prevention and treatment of nutritional deficiencies. Creep feeding to supplement ewe's milk. Weaning procedures.

8. Milk Production in Sheep

Anatomy of the udder, hormonal control of lactation, composition of milk. Factors affecting milk production.

9. Confinement Systems

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

10. Sheep Handling Facilities

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

11. Carcass Evaluation

Live and carcass grading, yield grades, weights and quality factors affecting lamb consumption.

12. Performance Testing

Adjustment of records for major environmental influences. Specific considerations in designing a testing program for sheep and lambs.

13. Diseases and Parasites of Sheep

The prevention and treatment of diseases and parasites associated with sheep.

14. Nutrition of Sheep and Lambs

Nutritional requirements for growth, reproduction and lactation. Kinds and utilization of concentrate and forages.

15. Adapting the Production Cycle of Sheep to the Feed Supply in Portugal

Comparison of autumn vs spring lambing and the marketing of 20 kg lambs and ewe's milk vs 30 kg lambs for the E.E.C.

Note:

One semester hour of graduate credit may be earned at Purdue University by attending at least 12 of the above lectures and by meeting with Professor Outhouse to discuss the application of one topic to Portuguese conditions.

33

REFERENCES

Sheep Management - J. B. Outhouse

1. The Sheepmans' Production Handbook, Revised Ed. (1982). Sheep Industry Development, 200 Clayton St. Denver, Colorado 80206
2. Hulet, C. V. 1978. Advances in accelerated lambing. N. C. Reg. Res. 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. Inskip, 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.
13. Battaglia, R.A. and V.B. Mayrose. 1981. Handbook of Livestock Management Techniques. Burgess Pub. Co. Chapter 7: pgs. 355 - 408.
14. Feeding the Ewe. 2nd Ed. 1981. M.L.C. Sheep Improvement Services. U.K.

ATTACHMENT B

Seminar on Endocrinology and Reproduction

Dia 11 de Maio - Herdade da Mitra

- 9.00 h - Acolhida e café
- 9.30 h - Início dos Trabalhos
- 10.00 h - Imunologia/Endocrinologia - Dr. M. Stork, Wellcome Foundation, U. K.
- 10.45 h - Endocrinologia Hipotalâmica - Prof. Doutor J. Parada, Universidade Complutense, Madrid
- 11.45 h - Café
- 12.00 h - Los Niveles Séricos de Gonadotrofina PMSG em Yeguas Preñadas - Profs. Doutores M.A. Zanini, J. Losino e R. Orias, Universidade de Rio Cuarto, Argentina
- 13.00 h - Intervalo para almoço
- 14.30 h - Reprodução Controlada em Ovinos - Doutor E. Ubilla, Schering, Madrid
- 15.30 h - O Parto Induzido - Prof. Doutor M. Meirinho, Universidade de Lisboa.
- 16.30 h - Notas sobre Gemelaridade Ovina - Dr.^a M.J. Barrisco, Universidade de Évora
- 17.00 h - Café
- 17.15 h - Fecundação Competitiva em Ovínos - Dr. J.L.T. Nunes, Universidade de Évora
- 17.45 h - Fisiologia Tubária (Proposta de Investigação Integrada) - Doutor Nuno Potes, Universidade de Évora

Dia 12 de Maio - Samora Correia, dependências da Companhia das Lezírias

- 9.30 h - Aspectos Práticos da Reprodução Controlada de Equínos - Dr.^a M. J. Barrisco, Universidade de Évora
- 11.00 h - Considerações sobre a Reprodução dos Equínos - Doutor N. Potes, Universidade de Évora

NOTA: Todas as comunicações serão seguidas de discussão

ATTACHMENT C

Table 1

Sheep Performance Testing Program Adjustment Factors
(and How to Use Them)

Table One *Sheep Performance Testing Program Adjustment Factors (and How to Use Them).*

Birth-rearing	Age of dam		
	One year	2 years or over 6 years	3-6 years
Ewe Lamb			
Single raised as single	1.22	1.09	1.00
Single raised as twin	1.33	1.20	1.11
Twin raised as twin	1.33	1.20	1.11
Twin raised as single	1.28	1.14	1.05
Triplet raised as triplet	1.46	1.33	1.22
Triplet raised as twin	1.42	1.28	1.17
Triplet raised as single	1.36	1.21	1.11
Wether			
Single raised as single	1.19	1.06	.97
Single raised as twin	1.30	1.17	1.08
Twin raised as twin	1.30	1.17	1.08
Twin raised as single	1.25	1.11	1.02
Triplet raised as triplet	1.43	1.30	1.19
Triplet raised as twin	1.39	1.25	1.14
Triplet raised as single	1.33	1.18	1.08
Ram Lamb			
Single raised as single	1.11	.98	.89
Single raised as twin	1.22	1.09	1.00
Twin raised as twin	1.22	1.09	1.00
Twin raised as single	1.17	1.03	.94
Triplet raised as triplet	1.35	1.22	1.11
Triplet raised as twin	1.31	1.17	1.06
Triplet raised as single	1.25	1.10	1.00

*Example: To find *adjusted 90-day weight and adjusted 90-day weight ratio* of a single born and reared ram lamb from a 4-year-old ewe that weighed 75 pounds at 87 days of age, when all ram lambs in flock have an adjusted 90-day weight of 66 pounds, make the following calculations:

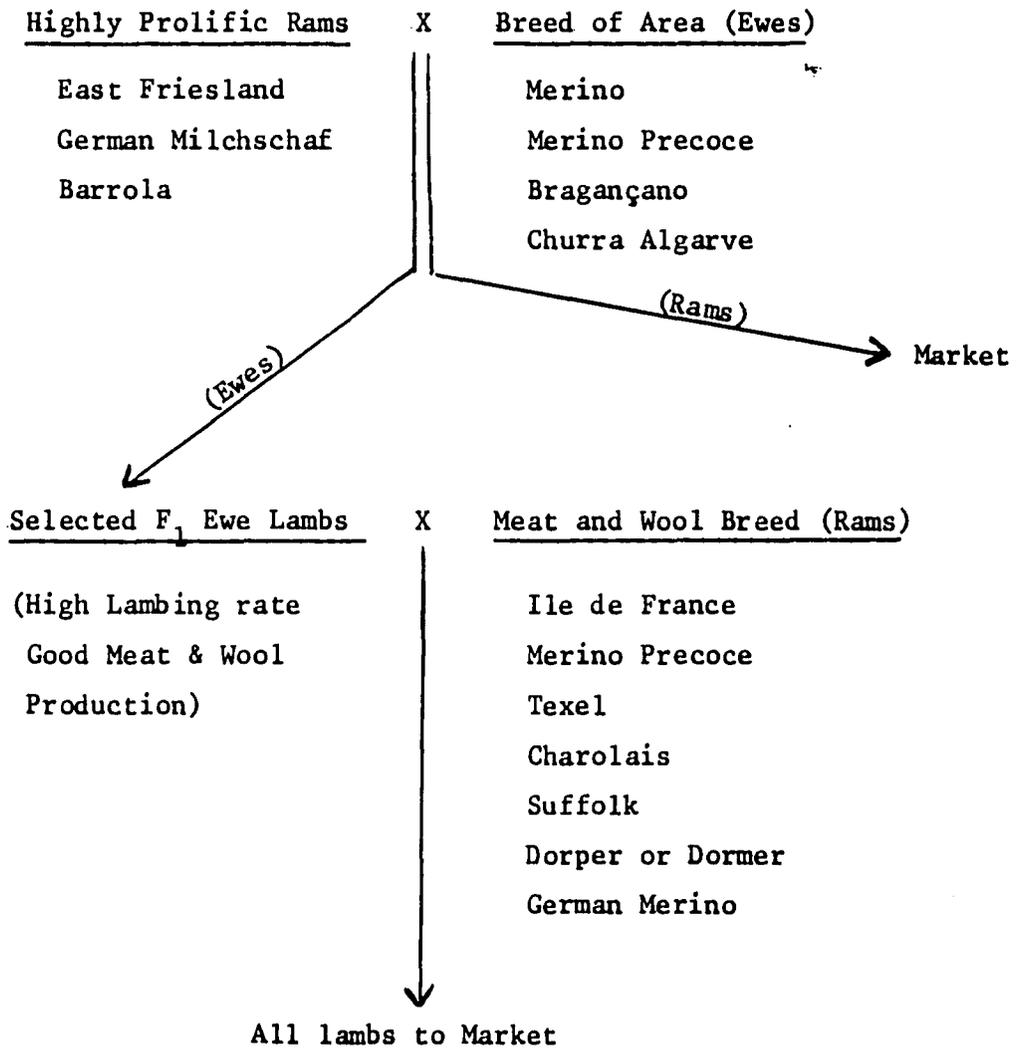
- (1) WPDA = 75 lbs./87 days = 0.862 lbs./day
- (2) Act. 90-day wt. = 0.862 lbs/day x 90 days = 77.6 lbs. = 78 lbs.
- (3) Adj. 90-day wt. = 77.6 lbs. x 0.89 (adjustment factor)
= 69.1 lbs. = 69 lbs.
- (4) Adj. 90-day wt. ratio = 69 lbs/66 lbs. (ram lamb average)
= 104.5 or 105

ATTACHMENT D

Crossbreeding Plan for Portugal
For Meat (Carne) and Wool (Lã) Production

Attachment D

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



ATTACHMENT E

**Crossbreeding Plan for Portugal
for Milk Production (Leite)**

Attachment E

CROSSBREEDING PLAN FOR PORTUGAL
FOR MILK PRODUCTION (LEITE)

