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**PORTUGAL UNIVERSITY
INSTITUTES
DEVELOPMENT PROJECT**

(Contract AID/NE-C-1701)

**REPORT ON
SHORT-TERM STAFF ASSIGNMENT**

**Submitted by
DR. STEPHEN C. BUNTING
College of Forestry
University of Idaho**

October 16 - December 12, 1983

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REPORT ON

SHORT-TERM STAFF ASSIGNMENT

at the

Instituto Universitario de Tras-os-Montes e Alto Douro

Vila Real, Portugal

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INTRODUCTION

I was invited to visit Portugal to advise the Instituto Universitario de Tras-os-Montes e Alto Douro (IUTAD) on research and development programs in relation to prescribed burning and range management. These activities occur primarily on communal (public) lands. Forest management, afforestation, wildfires and village pastoral practices also have a major impact on these lands. All of these factors must be considered when developing research and management programs.

The following report is based on observations and discussions with numerous people while in Portugal. Many opinions of people consulted with are difficult to substantiate due to lack of data. However, all opinions reported here are common among professionals and are believed to be accurate.

Reports on two field trips with the Forest Services are included in the Appendices.

SUMMARY OF ACTIVITIES

October 16

Arrived in Lisbon

October 18-22

Introduction to faculty of IUTAD and research being conducted by the Institute in the areas of fire management, range management, forages, animal science and forestry. Introduction to other facilities of the Institute.

October 25-29

Field trip in Minho Region with Forest Service to examine prescribed burning practices, range and pasture improved and forest management techniques used in this region. The tour was lead by Jose Moeira da Silva (Porto office of Forest Services). Met with Forest Services administrations of Amarante, Viana do Castelo, Moncao, Vieira do Minho and Cabeceiras de Basto.

Prescribed burning is being conducted in this region to reduce the risk of wildfires. Currently prescribed fire is being used to reduce fuels in a 100 m. wide strip along roads and other fire breaks. Burning of larger blocks will be more effective in reducing fuels and may also accomplish other objectives simultaneously. The use of prescribed fire to accomplish other objectives was also discussed. Probably the use of fire could also be used to improve forage quality and in the regeneration of Pinus pinaster following the final cut. Research on the use and cost effectiveness of these practices needs to be done in order to incorporate them into management. A report of this trip was prepared for the Forest Service (Appendix A).

The Forest Services Administrations indicated problems in standardization of data that the Forest Guards were collecting on the prescribed burns. It was suggested that the Forest Services sponsor a workshop for the Guards to train them in the sampling techniques and to discuss the reasons for collecting the fire data. It was decided to have the workshop on November 9, 1982, with myself and Eng. Francisco Rego participating.

November 2-5

Field trip in Tras-os-Montes Region with Forest Services led by Eng. Mota (Vila Real office of Forest Services). Observed use of prescribed fire in the establishment of pastures and in reforestation projects. Met with Forest Services Administrations in Montalegre and Branganca and Eng. Tec. Agr. Pinheiro of Parque Natural de Montezinho. Discussed the current practices used and the need for research in reforestation, forest regeneration, fuel management, prescribed burning and pasture management. A copy of the report of this trip is included as Appendix B.

Currently, prescribed fire is being used as a treatment prior to tilling on areas that are being prepared for tame pasture establishment. Fire is not used as commonly in forest management in this region as in Minho.

Discussed present and planned facilities of Parque Natural de Montezinho. Wildfires are common within the park at this time and create problems in the management of the park and reforestation efforts there.

November 8-12

A one-day workshop was held on November 9 at Vieira do Minho for 15 Forest Guards of the Minho Region. The objective of the workshop was to train the guards on the prescribed fire sampling methods established by the Forest Services and to familiarize the guards with the purpose of the data collection.

The remainder of the week was spent at IUTAD developing sampling procedures for research projects on prescribed burning performed by IUTAD. A lecture was given to the range management class on the range management systems used in the U.S.

November 15-19

An initial study was developed to be done by Eng. Francisco Rego. Study plots were located and the pre-fire vegetation data was collected.

Met with Forest Services at Amarante to discuss and observe current methods of reforestation used. Discussed needed research in reforestation and the possible role of prescribed fire in reforestation and forest regeneration.

November 22-26

Continued the pre-fire sampling of the research plots and burned the study plots at Amarante and Pedras Salgadas.

November 29 - December 3

Burned the second set of study plots in Amarante. A conference was held at the Forest Services Office in Porto for the Administration of the Minho Region. The objective of this conference was to discuss the potential role of prescribed fire in the management of the communal lands.

December 6-10

Finalized research plan of Eng. F. Rego. A seminar was given at IUTAD on the vegetation of western U.S. Traveled to Lisbon and met with faculty of the Instituto Superior de Agronomia. A lecture was given to the range management class on range management in the U.S. A university seminar was given on the role of fire in vegetation of western U.S.

Visited Quinta San Pedro and Arrabida to meet with scientists from Instituto Superior de Agronomia and the Universitat Wurzburg to discuss fire and plant physiological research being done at these locations.

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Met with AID personnel to discuss results of short-term visit to Portugal.

December 12

Returned to the United States.

OBSERVATIONS AND RECOMMENDATIONS

The recommendations in this section are a result of my observations and conversations with the Faculty of IUTAD, Forest Services personnel and other individuals involved in the AID Portugal University Institutes Development Project. The majority of my time in Portugal was spent assessing the research needs of northern Portugal in the following areas: (1) prescribed burning, (2) range management, and (3) forest management and afforestation. These are listed as separate categories below, but because all activities are often occurring simultaneously on the same land the distinction between them in the field is not as clear.

I have also included a few general recommendations which will, in my opinion, enable an expansion of the capabilities of IUTAD to better enable the faculty to conduct research.

Prescribed Burning

Wildfires are a major land management problem in Portugal, particularly on the common land. The fires, according to most individuals I spoke with, are primarily man-caused. Fire is used extensively by many people for improving forage quality of pastures and for other agricultural purposes. Many of these probably burn into forested, agricultural and other areas where fire is detrimental. Some people feel that arson may also be a major source of fires. The exact area burned by the various causes is unknown but extensive areas are burned annually. The fires

interfer with a number of activities, particularly the reforestation efforts currently being attempted.

Fire has been used by shepards for many centuries in this region to improve the quality of the forage and increase the animal access to the forage in the shrublands. In general this practice is beneficial to the quality of the area for livestock. However, problems exist with the manner in which some fires are conducted today. Fires occurring in summer cause more damage to the vegetation and may also increase the potential for soil erosion. Controlling fires in this season is difficult and many escape into surrounding forested areas and recently established plantations. Research should be done to determine the effects of prescribed burning at various seasons (spring, summer and fall) and at different frequencies of time. This will enable the development of plans to periodically prescribe burning these vegetation types to maximize productivity and nutritional quality while minimizing soil erosion, plant mortality and danger of escape.

The Forest Services is currently using prescribed burning to reduce fuels on either side of roads and fire breaks. These are intended to be used as lines of defense along which a wildfire can be fought once they are started. The program is only two years old and is still in the developmental stage, but it has already been illustrated that these are effective in controlling wildfires. The Forest Services and IUTAD have initiated a study to determine the effects of these fires on vegetation and soil fauna. More intensive work will be required to determine the fire effects and the interval at which the areas should be burned in order to maintain plant cover and still reduce fuels to acceptable levels.

A major problem faced by the Forest Services is the need to develop prescribed burning guidelines for the Forest Guards. In order to do this, they are collecting fire data on the prescribed burns. In general, the Guards lack the training and equipment to collect many types of data. Eng. F. Rego and myself worked with the Forest Services revising the types of data collected. IUTAD should continue to collaborate with the Forest Services in this area. Some types of information will have to be collected by more highly trained individuals and scientists at IUTAD can assist in this program.

The Forest Services should consider burning larger blocks of forested land in addition to the strips separating these blocks. This will reduce the wildfire hazard on greater areas of forest. The resprouting understory will also have greater nutritional value to livestock. This may make forests more acceptable to villagers on whose communal land many afforestation projects are occurring. More information concerning prescribed fire effects on soils, fuels and vegetation will be needed to incorporate this into the management system.

A number of Pinus pinaster stands that were killed by wildfires were observed to have considerable pine regeneration that had become established after the fire. Some young stands were so dense that extensive thinning will be required. However, the major regeneration technique practiced after a final cut in Pinus pinaster is to replant manually. While plantations may increase the quality of the trees, little selectivity of seed sources is now being done and plantation stock supplies are limited at this time. There is potential for using prescribed fire and other silvicultural practices to enhance natural regeneration. This would reduce the demand for plantation stock which are currently needed for use in the afforestation projects. Little infor-

mation is available to the Portuguese Forest Services on natural regeneration techniques at this time.

Reforestation and Forest Management

Many conflicts between the local villagers and the Forest Services have developed as a result of the afforestation projects on the communal lands. These projects are often put in with little or no consultation with the village that also uses this land. These lands, especially those near the villages, are an important source of forage for livestock. Villagers are aware that the maturing dense forest will often reduce the forage productivity of the area. Many foresters also are of the opinion that all livestock should be kept out of the forests. The villagers feel that the increasing area of forests will eventually result in decreased livestock forage which is already limiting in many areas. As a result the herders do not cooperate with the Forest Services and do not keep animals out of the young plantations. Browsing, especially by goats, is damaging to many stands. Some people also feel that the plantations are intentionally burned to keep the forest from developing. I am not sure of this, but lack of cooperation between the Forest Services and many villages is often apparent.

I believe a number of things could be done to increase cooperation. The Forest Services must realize that the use of the communal lands are an important aspect in the traditional pastoral system used by the villages. In some areas the availability of forage is limiting, and in other areas it is not. An inventory of the use of communal lands for grazing would be helpful in planning of afforestation projects. Forest establishment in areas where forage is not limiting would have a higher probability of acceptance by the local people.

Forests in areas where forage is limiting or those very close to villages could be managed differently than they are at this time. Forests in many parts of the world, especially pine forests, are often managed to produce both timber and livestock forage. Research should be initiated to determine if reducing the tree density and increasing the rotation length will result in a more favorable understory vegetation for livestock than those currently occurring under the present forest management. Forests with a more productive understory will more likely be accepted by the people.

As indicated earlier, shepards frequently use fire to improve forage value of the shrublands. These fires often are a source of wildfires that burn into forests and new plantations. A more active participation on the part of the Forest Service and IUTAD in this burning will contribute to the afforestation effects. It will enable better control of the timing of these fires and thereby reduce the likelihood of escape. It will also increase the productivity of these shrublands if used correctly and will decrease the grazing pressure on the new plantations. Considerable research will be needed to determine the best use of prescribed fire in these plant communities.

Range Management

It is impossible to completely separate range management, forest management and prescribed burning on the communal lands since each is so affected by the other. Many recommendations concerning the research needed to improve forage quantity and quality have been made in previous sections. However, some other comments concerning range management more specifically should be made.

Currently, efforts are being made to convert shrub dominated areas in grasslands. This usually involves very intensive vegetation management practices including: prescribed fire, cultivation, seeding, liming and fertilization. These practices raise a number of interesting questions which need to be answered in order to best invest the limited capital available for forage improvement.

The longevity of these converted grasslands is unknown. It is estimated by some that in eight to ten years shrubs will have re-invaded these areas. The productivity and longevity of these projects should be evaluated in order to determine a cost effective means of improving forage.

The soils of northern Portugal are low in fertility and high in pH and respond well to liming and fertilization. However, this is expensive and not feasible for most villages unless the project is subsidized. Other methods of vegetation management need to be developed that are within the means of the local economy to support. Also, the intensive practices are technically feasible on the better sites but are not practical on larger areas because of steep slopes or rocky, broken topography. On many of these areas, research on management practices that increase the natural vegetation's productivity will be more useful than attempting to convert this vegetation to grasslands by intensive means. The potential productivity is such that labor and capital intensive practices are not justified. Better utilization of natural vegetation will probably be more effective in increasing livestock production on these sites than conversion to grasslands.

There are several potential areas to be investigated which could increase the productivity of the shrublands. As stated previously,

prescribed burning is commonly used by the shepards. Research in the timing, frequency and effects of burning should be done to improve the effectiveness of this practice. In some areas, the herbaceous component of the plant communities is nearly absent. The forage quality and productivity may be increased if herbaceous species could be found that would reproduce once they are introduced. This would be particularly beneficial to areas grazed by cattle or sheep. On goat ranges, there would not be any significant benefits of a more diverse herbaceous component since goats are primarily browsing animals.

Little work has been done in Portugal on determining carrying capacities or developing grazing systems for the communal lands. However, since most animals are herded and then brought back to the villages or corrals (kraals) at night, there are good opportunities to develop grazing systems for this region. These systems must be compatible with the traditional pastoral practices. Consequently, western systems should not be adapted directly. They should be adapted to the vegetation and social customs of Portugal.

University and Faculty Development

The IUTAD faculty is primarily comprised of enthusiastic and ambitious individuals trying to do research. However, the ability of the faculty to do research is severely limited by lack of support facilities. The library is small and current information is difficult to obtain. Without current literature, development of competitive research proposals is difficult. Preparation of manuscripts from research is also difficult. Literature review sections that are considered adequate for scientific journals cannot be written without sources of current literature. Consequently, the faculty has difficulty keeping up with other research in his

field, obtaining grants or publishing the results of his own research. This lack of information cannot help but interfere with classroom instruction as well. The library may be the most limiting factor to many types of research.

The computer facilities are not adequate to handle the data and statistical programs involved in doing today's research. The facility needs to be upgraded as soon as possible. The faculty also needs better access to vehicles for field research and more field equipment. Much of this same field equipment is also needed for student instruction.

Travel to international meetings and research stations needs to be encouraged and supported as much as possible by the University. Interchange of ideas with colleagues in the same field is essential to continued professional development of the faculty. Current research in countries as near as Spain may be relatively unknown to scientists in Portugal.

While I was in Portugal Ing. Francisco Rego and myself held two workshops with the Forest Services personnel; one in Vieira do Minho for forest technicians and another in Porto for forest administrators. I would encourage the continuation of this type of interchange by the Department of Forestry. This will allow more rapid transfer of information to the management people and will keep the faculty of IUIAD more in touch with the problems that more urgently need to be resolved. It will also encourage cooperation between IUIAD and the Forest Services in research activities.

RESEARCH INITIATED

A research study was initiated by Eng Francisco Rego and myself while I was in Portugal. The study is designed to determine the effects of spring and fall prescribed fire, and summer wildfires in the Pinus pinaster forests. Spring and fall are the most feasible times of the year to do prescribed burning and most wildfires occur in the summer period.

Specific objectives of the study are:

- 1) Determine fire effects of spring, fall and summer fire on understory vegetation;
- 2) Determine the frequency of prescribed fire to best optimize:
 - (a) reduction of fuels thereby lowering the risk of crown wildfires
 - (b) forage quality and productivity of the understory vegetation
- 3) Determine effects of fire on the biological and chemical soil properties;
- 4) Study the use of prescribed fire in enhancing natural regeneration of Pinus pinaster prior to the final cut.

Study plots were established at Vieira do Minho, Amarante and Pedras Salgadas. Three plots were burned following the pre-fire sampling. Other areas will be sampled and burned this spring. The Portuguese Forest Services is cooperating on the study and Eng. F. Rego will continue work on the project. It is hoped that I will be able to return to Portugal in one to one-and-one-half years to observe the progress made in this research project.

SUMMARY

There exists in northern Portugal a potential to increase the production and utilization of forages on the communal lands. The major limiting factor is the lack of basic information on these shrublands and forests, and an effective means to transfer information to the land management agencies or to the villages. Information concerning productivity, animal carrying capacity and soils is desperately needed. A land classification system has been initiated but this needs to be developed more fully.

At this point, efforts to increase forage productivity are primarily directed toward converting shrublands to grasslands by very intensive agricultural practices such as tilling, fertilization and liming. However the low productive potential and topography of the region limits the area where this is feasible. In some instances, these intensively managed grasslands are not compatible with the traditional pastoral systems used in some regions. I would recommend research be initiated to develop vegetation treatment practices and grazing systems to better utilize the existing shrublands. Prescribed fire, in my opinion, has high potential as one of these practices. It is a traditional method used by shepards but the use needs to be refined to be compatible with other land uses such as forest management and reforestation.

The lack of cooperation between the Forest Services and the villages is a limiting factor in the current afforestation efforts. IUTAD can be instrumental in assisting the Forest Services with the selection and development of sites for afforestation. Research is needed to develop forest management practices which are more compatible with other uses of the communal lands, particularly grazing.

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Wildfires are a major problem of these lands, burning extensive areas every year. Research has been initiated to determine the role of prescribed fire in fuel reduction and in the improvement of quality and productivity of forage. This research will be possible through the cooperation of IUTAD, University of Idaho, the Portuguese Forest Service and Purdue University.

APPENDIX A

**Conclusions and Comments About the Visit to Minho to
Observe the Use of Prescribed Burning**

APPENDIX A: Conclusions and comments about the visit to Minho to observe the use of prescribed burning (October 25-29, 1982)

1. RESEARCH

1.1 Actual Research

- Discussed needs for simplifying and standardizing the sampling systems to include in the files. For that purpose, a meeting will take place with the Forest guards responsible for the burns for further instructions.
- Discussed research in order to assess the best fuel and weather conditions, for an effective burn, without damaging the overstory.

1.2 Research to be Done

- Priority to the research on fire intensity and frequency in order to:
 - a) Reducing fuel loads
 - b) Improve grazing activities
 - c) Avoid excessive erosionThese studies should go together with others involving biological and chemical properties of soils.
- Discussed needs for research on the effect of prescribed burns at stimulating natural regeneration of pine forests, analysing density and growth of pine seedlings in forests close to the final cut, comparing situations where fire was used with control areas.

2. SOME COMMENTS

- Observed fire adaptation of Quercus sp. (native and exotic), exceeding the adaptation of other broad leaved trees, such as Betula spp.
- About the use of prescribed burning the following recommendations are made:
 - a) Priority to the use of prescribed burning in firebreaks and along the roads, replacing the burns in draws
 - b) Needs for changing the distribution areas of the burns for 20 m. above and 50 m. below the roads
- Observed appearance of Ips, probably not related with prescribed burns. Suggestions:

- a) Discussed importance of a study on the biological cycle of Ips in order to decide the best time to act
- b) Remote sensing should be tried to make possible a more efficient detection and control.

Steve Bunting
Moreira da Silva
Francisco Rego

ATTACHMENT B

Report on the Visit to Tras-os-Montes (Terra Fria)

APPENDIX B: Report on the Visit to Tras-os-Montes (Terra Fria)
(November 4-5, 1982)

1. OBJECTIVES

- To observe problems related to use of prescribed fire, establishment of pastures and reforestation in this region
- To define priorities of future research

2. ORGANIZATIONS

- Direccao Geral do Ordenamento e Gastao Florestal (Eng. Mota, Eng. Tec. Agr. Barreira, Eng. Tec. Agr. Neves)
- Parque Natural de Montezinho (Eng. Tec. Agr. Pinheiro)

3. LOCATIONS VISITED

Boticas

- Observation of the effects of wildfire on shrub vegetation
- Discussed effects of shrub vegetation on tree establishment and growth

Serra do Barroso e Cabreira

- Establishment of pastures by means of combinations of prescribed burning, seeding, fertilizing, liming and tilling

Salto

- Observed establishment of pastures underneath Betula sp.; discussed need for thinning, cultivation and burning
- Visited tree nursery

Enroute to Chaves

- Observed trial on the importance of phosphorus and calcium on pasture establishment

Braganica (Parque Natural de Montezinho)

- Discussed different plant communities within the "Parque"
- Discussed effects of wildfire on natural vegetation
- Observed plantations of trees, discussed site preparation techniques with special consideration on prescribed burning
- Observed new pastures with more intensive seed bed preparation for hay production
- Visited future facilities planned by "Parque" administration

Serra da Nogueira

- Discussed occurrence of fire in Quercus pyrennaica
- Discussed use of oak for fuel and lumber
- Discussed introduction of Pseudotsuqa sp., Abies sp., and Picea sp., in oak vegetation

4. POTENTIAL RESEARCH PROGRAMS IN THIS REGION

- Effects of shrub competition of tree growth
- Effects of fertilization and liming in pasture establishment
- Economic analysis of current pasture establishment techniques versus periodic prescribed burning of natural vegetation
- The role of fire in the natural vegetation in the "Parque" including the effects of climate, soil and grazing in the distribution of plant communities
- Develop management techniques for Quercus pyrennaica

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Francisco Rego