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INTERNATIONAL  
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I.C.A.M.A.S.

CO-OPERATIVE RESEARCH NETWORK

ON

IMPROVEMENT OF BROWSE PRODUCTION  
IN MEDITERRANEAN EVERGREEN  
SCLEROPHYLLE BRUSHLANDS

PROCEEDINGS  
OF THE 1ST MEETING  
HELD AT CHANIA - CRETE - GREECE

NOVEMBER 12-13, 1987

MEDITERRANEAN AGRONOMIC INSTITUTE OF CHANIA  
DEPARTMENT OF ENVIRONMENTAL AND RENEWABLE  
RESOURCES

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## SUMMARY OF DISCUSSIONS

### I. Introduction

1. The 1st meeting of the Co-operative Research Network on "Improvement of Browse Production in Mediterranean Evergreen Schlerophylle Brushlands" took place in the Mediterranean Agronomic Institute of Chania, Crete, Greece, on 12-13 November, 1987.
2. The meeting was attended by 9 experts representing 6 Mediterranean countries (Greece, Italy, Morocco, Spain, Turkey and Yugoslavia). The list of participants is at the end of this bulletin.

### II. Opening of the Meeting

3. The Meeting was opened by Mr. A. Nikolaidis, Director of the Mediterranean Agronomic Institute of Chania, who described briefly the objectives of the Co-operative Research Network initiated by his Institute, welcomed all participants to the meeting and promised full support for the project.
4. Professor R. Morandini, Scientific Advisor of ICAMAS, then took the floor and pointed out that ICAMAS is interested in research as well as education, but new projects should not conflict or duplicate projects already undertaken by other international organisations. He suggested that before going into specific research topics on Mediterranean brushlands, the present situation must first be described.
5. Finally, Professor L. Liacos, Chairman of the Co-ordinating Committee, introduced the theme of the meeting by stressing the importance of Mediterranean brushlands for domestic and wild animals, for hydrological and soil conservation purposes, for recreation and other uses as well as the strong need for their proper improvement and management. He indicated that there is a lack of knowledge on several aspects of brushland utilisation while research results already obtained in some countries are not known in other countries for lack of proper communication. This situation will certainly be improved by the co-operative effort undertaken by the M.A.I. of Chania.



### **III. Country Reports**

6. Experts from the countries represented at the meeting described the brushland situations in their countries, the past and present research projects, the Institutions and persons involved and their proposals for future action. The full reports of five experts are included in this bulletin.

### **IV. Field Trip**

7. The participants took a short field trip to the Skine village community where a pilot project on maquis management is to be established by the M.A.I. of Chania for the practical training of students of Mediterranean forestry as well as for research. The participants also visited the Omalos region and the entrance to the National Gorge of Samaria.

### **V. Concluding Session**

8. The meeting ended with a long discussion about the future action of the Network. The main conclusions and recommendations are contained at the end of the bulletin.

# EVERGREEN SCLEROPHYLLE BRUSHLANDS IN GREECE

**Prof. Vasilios P. Papanastasis**  
**University of Thessaloniki, Greece**

## INTRODUCTION

Evergreen sclerophylle brushlands are an important vegetation type in Greece. Their exact area is not well known but it certainly exceeds the 500.000 ha, is about 4% of the country (Mavrommatopoulos 1985).

Although they are a relatively small percentage (10-15%) of the entire rangeland area, evergreen sclerophylle brushlands are a vital grazing resource for domestic animals, especially goats. Greece has about 4,5 million goats which use these brushlands the whole year round but mainly in the autumn and the winter periods, when no other grazing resource is available.

Providing forage for goats is only one of the multiple uses of evergreen brushlands (Liacos 1982). They are also important habitat and browsing areas for wildlife and game animals; they constitute watersheds yielding invaluable water; they hold and protect the soil from erosion; they produce fuel-wood, charcoal, honey and fruits; they provide environmental quality and outdoor recreation; they preserve genetic resources; and they secure plant and animal diversity and stability. All these functions of evergreen brushlands make them one of the most important Mediterranean ecosystems of Greece.

## PHYSICAL DESCRIPTION

### **Evergreen Brushland Associations**

One of the main characteristics of evergreen brushlands is their great plant species diversity. This diversity is largely affected by climatic and soil factors as well as by



the degree of human intervention. According to Dafis (1973), evergreen brushlands may be divided into the following:

1. *Oleo-lentiscetum*. This association is found in the eastern and south-eastern Peloponnese, Attica, eastern Greece to the Pelion mountain and in the Chalkidiki peninsula. The climate is temperate semi-arid (Mavrommatis 1980), with annual rainfall of 400-500mm and a long dry summer period of 4-5 months. The soils are diverse, while human intervention is very pronounced. The dominant species of this association are *Olea oleaster*, *Pistacia lentiscus*, *Erica verticillata*, *Myrtus communis* (in wetter sites) and *Quercus coccifera*. In some areas, such as Attica and the Kassandra peninsula, the association is grown as an understorey in *Pinus halepensis* forests.

The productivity for animals of *Oleo-lentiscetum* communities is considerable. Moreover, they are the only grazing resource available during the long dry summer periods, thus becoming indispensable in solving the feed problem for domestic stock, especially goats (Papanastasis 1986).

On the other hand, *Oleo-lentiscetum* communities are highly vulnerable to wildfires due to the dry climate and to the proximity of urban centers. As an understorey in the *Pinus halepensis* forests, these communities help start and spread fires to the crowns, thus resulting in extensive and devastating wildfires which destroy thousands of hectares of Aleppo pine forests each year.

2. *Adrachno-Quercetum ilicis*. This association is found in wetter areas, namely on the lower zone of western Greece and on the eastern coast up to central Greece. It has a temperate subhumid climate (Mavromatis 1980), with annual rainfall of more than 600mm and a summer dry period 3-4 months long. Soils are mostly derived from flysch and human influence is also intense. The dominant species are: *Arbutus unedo*, *A. adrachne*, *Erica verticillata*, *E. arborea*, *Quercus coccifera*, *Phillyrea media* and *Quercus ilex* (in wetter sites). The association is also found as an understorey in *Pinus halepensis* forests (ex. northern Evia) and occasionally in *Pinus brutia* forests.

The productivity for domestic and wild animals is not very high. However, like the previous association, it is vital for providing food for animal stock during the summer. Of particular interest is the importance of this association for soil and water



conservation because it is found on highly erodible soils. Wildfires are also severe, resulting in devastation of large areas every year.

3. *Orno-Quercetum ilicis*. This association is distributed in a higher altitude than the *Adrachno-Quercetum ilicis*. As a result, it has a wetter climate with annual rainfall of up to 1000mm and a summer period 2-3 months long. It is found in western Greece, in the Pelion mountain region and on the coastal zone of Macedonia and Thrace. Soils are diverse, mostly siliceous.

In addition to the species of the previous association, some deciduous shrubs or trees are present, especially *Fraxinus ornus* and *Quercus pubescens* while *Quercus ilex* is more common than in the *Adrachno-Quercetum* association. Moreover, the *Orno-Quercetum* association is grown under *Pinus halepensis* and especially under *Pinus brutia* forests.

4. *Cocciferetum*. This association is found on the island of Crete and in southern Greece; it is characterised by the dominance of kermes oak (*Quercus coccifera*). In northern Greece, kermes oak co-exists with deciduous shrubs, especially *Carpinus orientalis*, resulting in a different association (*Coccifero-carpinetum*). In Crete, it grows up to 1,000m but in the colder regions of the north to no more than 500-600m elevation. The climate of the areas where kermes oak is found is semi-dry with cold winters (Mavrommatis 1980). Soils are mainly calcareous. The association is occasionally found under *Pinus brutia* or deciduous oak forests.

The productivity of Kermes oak shrubs is quite high, particularly for goats, because of its high palatability, vigorous resprouting and resistance to browsing (Liacos and Mouloupoulos 1967, Tsiouvaras 1984). The kermes oak association is vital for the goat industry of Greece, providing food throughout the year, especially in the summer and autumn months.

In addition to their value for grazing, kermes oak brushlands are important hydrological areas and provide fuel-wood and charcoal. Fires are less frequent in this type of association and are commonly set by the shepherds themselves in order to improve the forage production.



## CURRENT MANAGEMENT POLICIES

Evergreen brushlands of Greece are open to domestic animals for grazing. This grazing, however, is done in a traditional way with no provision for sustained yield and management. The system of grazing is communal since most of the brushlands are state-owned and allocated for use to the people living in the local communities. These people exercise their rights irrationally; there is not effective control of the number of animals or of the season and duration of grazing. The result is a serious degradation of evergreen brushlands, characterized by the dominance of unpalatable species or varieties of shrubs and by accelerated soil erosion.

To eliminate unpalatable species, shepherds use the easy and fast method of pastoral wildfires in several parts of Greece. The burned brushlands are subsequently overgrazed, resulting in further deterioration. At the other extreme, some brushlands have become inaccessible to animals because they have grown too dense or too tall due to undergrazing.

Once an evergreen brushland is burned, the Forest Service declares it an area to be artificially reforested and livestock grazing is prohibited. This prohibition, however, is rarely enforced because of the high demand for forage by the goats which roam without control in these areas.

## NATIONAL RESEARCH PROGRAMS

Although the first research projects started in the '50s, intensive investigation into the improvement and management of evergreen brushlands was initiated only in the mid '70s when several experiments were established. The main emphasis was put on kermes oak brushlands, which are the most important type, while only a few aspects of the other associations were investigated. The research also covered the brushlands grown as understoreys, mainly under *Pinus brutia* forests and secondarily under *Pinus halepensis* forests.

The main objectives of the projects were to investigate:

- a. the morphology, ecophysiology, productivity and nutritive value of kermes oak;
- b. ways and means of improving the productivity of kermes oak brushlands and managing them properly for goats;



- c. the succession and reconstitution of the vegetation in wildburnt brushland;
- d. the effect of prescribed burning and goat grazing on the understorey brush species and on the growth of the overstorey in *Pinus brutia* and *P. halepensis* forests.

The Institutions and persons involved in the projects are:

**Institutions:**

1. Laboratory of Range Science  
Department of Forestry and  
Natural Environment  
University of Thessaloniki,  
Thessaloniki
  
2. Section of Range Management  
Forest Research Institute  
Ministry of Agriculture  
Vassilika, Thessaloniki

**Research Teams:**

- Dr. L. Liacos, Prof. emeritus (ecology)
- Dr. A. Nastis, Assoc. Prof. (nutrition)
- Dr. V. Papanastasis, Assoc. Prof.  
(ecology)
- Dr. V. Noitsakis, Assist. Prof.  
(ecophysiology)
- Dr. C. Tsiouvaras, Assist. Prof.  
(utilization)
- Dr. Z. Koukoura, Lecturer (physiology)
- Mr. J. Ispikoudis, Res. assist.  
(recreation)
- Mrs. M. Yiakoulaki, Res. assist.  
(nutrition)
  
- Mr. P. Platis, Res. Forester (inventory).
- Mr. Th. Papachristou, Res. Forester  
(nutrition).

Tables 1 and 2 present the projects which have been completed or are in progress and the papers which have been published.



**Table 1. Research projects on evergreen brushlands**

No	Title	Principle Investigator	Status
1	Identification and productivity of kermes oak range types.	L. Liacos	Completed
2	Conversion of kermes oak brushlands to grassland with prescribed fire and seeding of improved range plants.	L. Liacos	Completed
3	Comparison of productivity for goats of several kermes oak brushland forms.	V. Papanastasis	Completed
4	Nutritive value of kermes oak foliage at various phenological stages.	A. Nastis	Completed
5	Effects of various clipping intensities on production of kermes oak.	C. Tsiouvaras	Completed
6	Effects of several light intensities on production and nutritive value of kermes oak.	Z. Koukoura	Completed
7	Effects of fertilization of kermes oak brushlands.	V. Papanastasis	Completed
8	Succession and management of burned evergreen brushlands.	V. Papanastasis	Completed
9	Water relations of kermes oak under environmental and clipping stress.	V. Noitsakis	In progress
10	Control of undergrowth in the Mediterranean forests by use of prescribed fire and grazing.	L. Liacos	In progress
11	Effects of goat grazing on the understory of <i>P. halepensis</i> forest.	L. Liacos	In progress
12	Relation of density and shrub height with production in kermes oak brushlands as determined by air photos.	P. Platis	In progress
13	Effects of goat grazing on <i>Pinus brutia</i> plantations.	A. Nastis	In progress
14	Intake and production of goats consuming kermes oak with supplementation.	Th. Papachristou	Completed
15	Forage quality of herbaceous vegetation in evergreen brushlands.	M. Yakoulaki	Completed
16	Diet composition of goat grazing in evergreen brushlands with various densities.	Th. Papachristou	In progress
17	Intake of goats grazing in various densities of evergreen brushlands and methods of management to increase production.	M. Yakoulaki	In progress



**Table 2. List of published papers on evergreen brushlands (listed in chronological order)**

- \*1. Liacos, L. and Mouloupoulos, C. 1967. Contribution to the identification of some range types of *Quercus coccifera* L. Forest Research Center of N. Greece, no. 165. 54 p.
2. Liacos, L. 1973. Present studies and history of burning of Greece. Proc. Tall Timbers Fires Ecology Conference, 13. Tallahassee, Florida, 65-95.
3. Papanastasis, V. and Biswell, H.H. 1975. Seeding rate-cover relationships of annual ryegrass seeded on burned brushlands. J. Range Manage. 28(5): 402-406.
4. Papanastasis, V. 1976. Factors involved in the decline of annual ryegrass seeded on burned brushlands in California. J. Range Manage. 29(3): 244-47.
5. Liacos, L. 1977. Fire and fuel management in pine forest and evergreen brushland ecosystems of Greece, p. 289-298. Proc., Symp. Environmental Consequences of fire and fuel management in Med. ecosystems. Palo Alto, Calif. USDA-For. Service, Gem. Techn. Rep. WO 3.
- \*6. Nastis, A. 1977. Conversion of shrublands to grasslands. Daskika Chronica 16: 393-397.
- \*7. Papanastasis, V. 1978. Early succession after fire in a maquis-type brushland in Northern Greece. The Forest 30(79-80): 19-26.
8. Papanastasis, V. 1978. Potential of certain range species for improvement of burned brushlands in Greece. Proc. 1st Inter. Rangeland Congress: 715-711.
- \*9. Tsiouvaras, C .N. 1978. Twig diameter-length-weight relations of *Quercus coccifera* L. Annals of Agr. and Forestry School. University of Thessaloniki, Vol. 21: 137-152.

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\* Papers in Greek with English summaries.



10. Liacos, L. 1980. Livestock grazing in Mediterranean forests. In: Incontri internazionali: Problemi della conservazione e ricostruzione della copertura forestale. Palermo, Italia, 6-11 October.
- \*11. Liacos, L., Papanastasis, V. and Tsiouvaras, C. 1980. Contribution to the conversion of Kermes oak brushlands to grasslands and comparison of their production with improved brushlands. *Forestry Research* 2(1): 97-142.
12. Papanastasis, V. and Liacos, L. 1980. Productivity and management of Kermes oak brushlands for goats, p. 275-381. In: *Browse in Africa* (H.N. Le Houerou, ed.) ILCA, Addis Ababa, Ethiopia.
13. Liacos, L. 1982. Grazing management of evergreen brushlands in Greece p. 2870-275. *Proc. Dynamic and Management of Mediterranean-type Ecosystems*. San Diego, Calif. USDA-For. Service, Gen. Techn. Rep. RSW-58.
14. Nastis, A.S. and Liacos, L.G. 1982. Consumption, digestion and utilization by yearling goats of oak (*Quercus coccifera*) foliage at three phenological stages. p. 622. *Proc. Dynamics and Management of Mediterranean-type Ecosystems*, San. Diego, Calif. USDA - For. Service, Gen. Techn. Rep. PSW-58.
- \*15. Nastis, A. 1982. Nutritive value of oak browse (*Quercus coccifera* L.) foliage for goats at various phenological stages. Dissertation. Thessaloniki.
16. Papanastasis V. and Pittas, A. 1982. Reseeding of burned Mediterranean brushlands in Greece, p. 624. *Proc. Dynamics and Management of Mediterranean-type Ecosystems*, San Diego, Calif. USDA - For. Service, Gen Techn. Rep. PSW-58.
17. Liacos, L., Nastis, A. and Tsiouvaras, C. 1983. Forage value of selected brush species. Work group - Tables of forage values of Mediterranean plants and by-products. Saragossa, Spain.



## PROPOSALS

Evergreen brushlands are an important natural resource not only in Greece but in all Mediterranean countries. According to Le Houerou (1973), their area exceeds the 10.0 million ha where goats seek their food almost the year round. Moreover, they are valuable multiple-use regions for wildlife, water production, fuel-wood, fruits, soil protection and outdoor recreation.

Despite the differences among the Mediterranean countries both in physical and socio-economic aspects of evergreen brushlands, there are common problems which can be solved much more effectively if a joint research effort is undertaken. Such problems include the water economy and evergreen shrubs as related to grazing, their nutritive value, the role of prescribed fire in improving the brushlands and the systems of proper grazing.

To carry out this joint effort, a Group of researchers should be formed to decide on the exact agenda of the subjects to be pursued. This Group should meet regularly, for example, every two years, to exchange ideas and experiences.

The Mediterranean Agronomic Institute of Chania should become the Co-ordination Center of the program. The final goal should be to create a research unit on evergreen brushlands within the M.A.I. where young scientists and experienced researchers can meet to conduct research, possibly in connection with the students of the Mediterranean Forestry Course.

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