SILVICULTURAL EDUCATION IN GREECE TODAY AND TOMORROW

HATZISTATHIS, ATH. & ZAGAS, TH.

Aristotle University of Thessaloniki, Department of Forestry and Natural Environment
Laboratory of Silviculture, P.O. Box 262, 54006 Thessaloniki, Greece

Abstract

Since last century, silviculture in Greece has been based on the knowledge and experience of the silviculturally developed countries, mainly those of Central Europe.

This knowledge was adapted to the Greek conditions with satisfactory results.

The Laboratory of Silviculture which belongs to the Department of Forestry and Natural Environment pays attention to the existing silvicultural problems of Greece and other countries and records them. With proper evaluation of these problems in the framework of the present education programme, our Laboratory tries to educate the students of the Department and consult the Forest Engineers.

Special attention is paid to the following subjects:

- The multiple role of natural forest (with priority to their ecological role).
- The rehabilitation of the degraded forest ecosystems (avoidance of the danger of desertification).
- The landscape ecology according to the contemporary needs.
- The protection of the forests and their regeneration mainly after destruction.
- The systematic cultivation of forests and especially of plantations, aiming mainly to safeguard their resistance against various dangers.

1. Introduction

The objective of silviculture, beyond the time and place, independently of the theoretical orientation of the forester, must be the success of maximum and sustainable wood production, as well as the maximum productive, protective and social functions of the forest (Dafis 1989, Matthews 1989).

In the past the duties of the forester who respected silviculture were to analyze the natural and economic factors concerning each stand and then to devise and apply the most appropriate for wood production treatment.

The basic principle on which the forest science was based is the principle of sustainability. In order to be completed the above mentioned principle, two other principles are indispensable: a) that of preservation of the forest as an ecosystem and b) that of conservation and improvement of soil productivity (Dafis 1989, Hatzistathis-Dafis 1989, Zagas-Hatzistathis 1995).

The scientific consideration on which forestry is based are the relations of human society to natural resources and the techniques with which they are exploited in a rational way. So, the scientific management of a forest is defined by the triptych of different considerations, which are: the socioeconomic, technical and bioecological aspects. The above-mentioned different aspects do not coincide always. So, it is necessary to try for the satisfaction of these demands in a symmetrical and right way. Usually there is a competition between economical and technical as well as bioecological aspects. So, it is not strange, that in the times of uncontrolled rationalism (18^{th} - 19^{th} centuries) predominated the economical and technical aspects to bioecological. The result of such a philosophy was the domination of the conception that the forest stands can be regenerated and developed according to our desires

and with the application of agricultural methods. The application of such methods has led to clearcuttings in many countries, artificial regeneration and the establishment of monocultures. The final result of such methods was the reduction of soil productivity, the enfeeblement of health of the stands and the appearance of many epidemic infections.

Many of these wrong views spread widely in Greece as well.

These days we know much more about the life of forest trees, their natural relations, interactions and independence among the soil, climate and forest species. Our students must know today that in the forest management the biological and ecological considerations play a very significant role. Forest students must, also, know how the forest lives without the influence of the human being.

After a period of an accounting forestry, from which we inherited (worldwide) extensive monocultures, we have to emphasize the study of natural laws, which regulate the life of the forests.

Today, with the development of forest ecology we continue to distinguish the forest functions into productive, protective and social, based on new scientific aspects. The protective functions of some forests are of greater importance than their productive functions. The proper management of such protective forests aims to control soil erosion, to increase water supply, to provide habitat for wild plants and animals, to save forest biodiversity, to protect the atmosphere from air pollution, to assist other sensitive ecosystems for ecological balance. Such forests may also be essential parts of very attractive landscapes. The social functions of forests include employment and facilities for field sports and recreation as well (Hatzistathis-Ispikoudis 1992, Zagas-Hatzistathis 1995).

We are all familiar with the above-mentioned views; however, they remain to be important. This is the reason why we emphasize them here as well as during our university lectures.

2. The present condition in Greece

Greece is a country which suffers severely from forest destructions like other mediterranean countries. It is estimated that 2,5 millions ha of productive forests have been destroyed during the last century.

The reduction of forested area as well as the degradation of most of the remaining forests have led to a great demand for wood. The result of the above-mentioned situation was more emphasis to be given to the wood production by reforestation of a great percentage of destructed forests.

However, recently under the light of forest research and the practical experience, we have been led to the principle of less interference to natural ecosystems. The essential thing is that the objectives should be clearly defined and the treatments must be fit to this kind of thinking. Therefore it is necessary for the students of Forestry to know how to use the common sense. This will be easier through practice work in the forest.

Most of our forests today are irregular, as far as the structure and stock are concerned and degraded because of mismanagement, fires, uncontrolled cut-felling e.t.c. Under such conditions we try to teach new foresters how to start thinking silviculturally; that means that at the beginning they have to do a right diagnosis on the situation and development of every stand. Such a right diagnosis needs a precise and complete description of every stand. For silviculture every stand is something unique and unrepeated, therefore on a good diagnosis and description depends the success of the objectives and the effectiveness of the silvicultural measures or treatments. In silviculture we believe there are no rules and standards, every stand is a separate case (Dafis 1989, Hatzistathis-Zagas 1992).

The academic programme of the Department of Forestry and Natural Environment includes 10 semesters. In the first four semesters, courses of general knowledge are offered; from the fifth semester we start offering special silvicultural knowledge to our students.

The Laboratory of Silvuculture offers the following courses:

- Forest Ecology in the 5th semester
- Applied Silviculture in the 6th semester
- Nurseries - Reforestations in the 8th semester
- Urban Forestry in the 8th semester
- Protection of Nature and Landscape Architecture in the 9th semester
- Special Applied Silviculture in the 9th semester (the silviculture of fast growing species is, also, included).

Beyond the above-mentioned courses, our students have to get practical work for two years in the summer in two experimental university forests; the first one consists of conifers and the second one consists of coppices of evergreen and deciduous broadleaves.

This practice is completed with educational trips at typical forests and is continued in local Forest Service Administrations.

In order to speak more precisely, the categories of forests which we have in Greece are the following:

1. The degraded mediterranean forest ecosystems consisted from evergreen broadleaves and some xerophytic conifers.
2. The decidous broadleaved forests consisted from:
   the oak forests mainly coppices and
   the beech forests mainly high forests.
3. The forests of mediterranean conifers, consisted of *P. nigra, Abies cephalonica* and *A. borisii regis.*
4. Some boreal forests consisted from *Picea abies, Pinus heldreichii*, *P. silvestris* and *A. borisii regis.*

From the above-mentioned it is clear that there are three serious silvicultural subjects in Greece.

a. The restoration of degraded forest ecosystems.
b. The conversion of coppices into high forests and
c. The improvement of irregular high forests.

The main problem of the artificial silviculture is the selection of the proper species.

3. Thoughts for tomorrow

Today, as the population of different countries is concentrated in urban areas and is more affluent, the pressures caused by their restricted space, stimulates demand for outdoor recreation and increases interesting wild plants and animals. All these factors can lead to controversy about forestry, which must be considered when applying silvicultural treatments and in forest planning generally.

From that point of view silvicultural systems play a great role to the visual character of the landscape. So, the clear cuttings look like forest destruction (a drastic intervention in the forest ecosystem) rather than a proper treatment of forest renewal. Especially in hilly or mountainous areas clear cuttings and strip fellings can be highly visible to the public. Such pictures of felling coupes when are laid out without sensitivity make negative impression.

Today, we can distinguish roughly three different tendencies in silviculture, which are:

1. The natural silviculture.
2. The artificial silviculture (plantations silviculture) and
3. The silviculture of fast growing species.

3.1 Natural silviculture

The natural silviculture aims to the creation of such a situation in the forest, that continually ensures, and to the maximum possible degree, those of the presuppositions that are fitted to the forest and its productivity.

The success of the economic objective, as well as the sustainable fulfiment of other silvicultural obligations presuppose a constant and intentional stand structure, a high soil productivity and reasonable treatments. Conclusively, the reasons for which a contemporary (up to date) silviculture must draw up lessons, from a natural forest for the development of its techniques, are the following:

a). The continual preservation of site productivity, which can guarantee the sustainability and which is ensured in a better way, according to the natural laws.

b). The forest species can find in the natural forest those environmental conditions which are similar to their biological properties. So, they have in the forest their maximum vitality.

c). In the natural forest exists an antagonistic balance between the species; so, it is possible to conserve the mixture of the stands with only a little care.

d). Natural forests can be regenerated naturally and continually.

e). In natural stands the conditions are more favourable for a successful silvicultural cultivation.

f). In natural stands no action is necessary to conserve the forest as an ecosystem. The natural forest acts without any expenses and our silvicultural interferences can succeed the maximum possible result (Zagas 1992, Zagas-Hatzistathis 1995).

In the natural forest the increment is simply a mean for the conservation of the forest. The rhythm of the forest life and the laws which follows it are not influenced, because of our demands for maximum and optimum wood production. Therefore the only thing we have to do, in the economic forest, is to replace the *natural selection* by the *economical selection* and through the silvicultural treatments we must try to increase the value of the stands and to conserve this value sustainably.

Of course, it is possible, according to the site and the forest species, to change the degree and the kind of the mixture, without any essential disturbance of bioecological balance of the ecosystem. It is, also, possible to replace some indigenous species with exotics or to introduce some of them "as to be extended in hospitality" under one condition, of course, not to act harmfully to the site.

New foresters have to know, also, that during the introduction of exotics, it is necessary to keep a natural structure of the stands and not to change the natural degree of mixture of the species, because the silvicultural behaviour of a species depends on the degree of mixture, on the mixed species and on the structure of the stand (Dafis 1989).

It is very important for the young foresters, as well, to know that plant distribution as related to geography seems to depend on climatic factors as well as on the soil factors. But the kinds and distributions of plants we now observe have come about gradually, as a result of long-continued historical processes and therefore problems of evolution are inextricably bound up with those of forest ecology (Hatzistathis-Iskipoudis 1992).

In addition, much more attention must be paid to the importance of the forest for physical and mental health functions, especially in densely populated areas of developed countries.

So, measures like establishing special trails, quiet and peaceful areas for thinking, dreaming and absorbing by nature, introducing beautiful and attractive trees with nice colours, textures, flowers, fruits e.t.c. must be forseen from such a kind of forest management. The establishment of completely protected areas, where nature is left to follow its process and maintaining valleys, rocky outcrops, water-fall e.t.c. features, is necessary today from silvicultural point of view.

All of the above mentioned measures increase the importance of the forest ecosystem to the urban people, who is living in bad and ugly conditions.

3.2 Artificial silviculture (Plantations silviculture)

As far as the artificial silviculture is concerned, this must be used in our country and we are teaching our students a special course on reforestations. The conditions for such a silviculture are favourable, because of the following reasons:

a). There is a great number of completely or partly deforestated areas as a result of wildfires, overgrazing, wars or illegal clear cuttings.

b). The restoration of degraded ecosystems, especially in the evergreen, plantsociological zone, which is impossible in some areas by natural methods.

c). The abrupt increase in demanding timber, as a result of improved economic and living conditions (Hatzistathis-Dafis 1989).

The important problems which we have to cope with and we are trying to pass trough education of artificial silvicultural are the selection of species and the different problems of new stand establishment (site preparation, spacing and production of planting material). The species which will be introduced artificially in a site must be biologically adapted to ecological conditions of the site and, of course, they must suit to our special objectives.

Unfortunately, the extreme degradation of soils led to monocultures of frugal conifers at the moment. In the future we have to elaborate methods to regenerate these stands, as well as to improve the structure and biodiversity of these pure artificial stands.

Of course, the environmental conditions are not favourable for an intensive cultivation of these artificial stands. The impossible use of intensive exploitation in such areas with low quality soils and deficit of soil moisture can be attributed to the following reasons:

a). High expenses of reforestations and to high expenses of soil preparation.

b). Care of the young stands is very laborious and expensive job.

c). Small possilibity of selection, because of the small number of trees per ha.

d). Low value of wood products which come from cultivating (intermediate) cuttings.

e). High expenses for stand protection of physical and biological dangers, which are very common in artificial stands.

The central concept in considering selection species problems in reforestations is adaptation; every organism adapts to the environment in which it thrives. This adaptability is a property of the phenotype, because it is the phenotype that is directly exposed and tested by a given condition of life.

The above-mentioned view, first proposed by Darwin over a century ago and since then greatly elaborated and improved, may be expressed briefly as follows, according to Epstein (1972):

"The range of potentialities of the phenotype is defined by its genetic constitution, the genotype. Changes in the genotype occurring randomly, i.e., mutations, modify the potentialities of the phenotype and these innovations are then subjected to the screening action of natural selection. Those mutations that make individuals better adapted, or more fit for their environment, make in successive generations a proportionally greater contribution to the gene pool of the population than mutations that tend to make them less well adapted. So, through an immense pool of latent variability and natural selection, new forms can come to the fore in response to changes in the conditions of life".

3.3 Silviculture of fast growing species

This kind of silviculture has developed too much in many tropical and subtropical countries of Asia, South Africa, Australia and New Zealand and in quite good and of high quality as well as flat soils. Of course, the sustainability in this kind of silviculture is possible to be preserved with artificial means, like soil fertilization, irrigation, intensive site preparation, thinning, pruning and stand protection of fungies and insects with agricultural methods.

It is quite clear that such kind of silviculture looks only for timber-production and is succesfull only under the following presuppositions:

a). Flat and quiet fertile soils with favourable soil moisture conditions.
b). Possibility of preservation of soil fertility with agricultural methods (fertilization, irrigation e.t.c.)
c). Use of proper species (Populus, Eucalyptus e.t.c.).
d). Use of mechanical means for low cost production (Hatzistathis-Dafis 1989).

Unfortunately, in our country there are only few areas with such a high quality sites which are extented along the rivers of the country.

Based on the above-mentioned as well as on our experience we have reached the conclusion that major emphasis should be given to the following education subjects in our country:

- To the maintenance of ecosystems and vitality and inter-relation of lifeforms within the forest ecosystem.
- To protect natural forest types, species in danger, soil against erosion, forest climate and its impact on surrounding landscape with natural methods of reclamation (Hatzistathis et al 1996).
- To improve biologically and aesthetically the artificial monocultures of frugal conifers with introduction of some more attractive broadleaves.
- To elaborate methods of natural regeneration of the above monocultures.
- To continue the reclamation of degradated mediterranean ecosystems according to our experience which is, the pursuit of more stable ecosystems than more productive and unstable (Hatzistathis-Zagas 1992, Zagas 1994).
- To ensure the economic sustainability through the sustainable forest ecosystems.
- To increase the importance of the forest for physical and mental health and for creating attractive forest by varied forest structures, textures, colours e.t.c. (Hatzistathis-Ispikoudis 1992).

4. Bibliography

Dafis, S. (1986). Forest Ecology. Editions Giahoudis - Giapoulis. Thessaloniki. pp. 443. (In Greek).

Dafis, S. (1989). Applied Silviculture. Editions Giahoudis - Giapoulis. pp 258. Thessaloniki. (In Greek).

Epstein, E. (1972). Mineral nutrition of plants:principles and perspectives. John Wiley and Sons Inc. N. York - London - Sydney - Toronto.

Hatzistathis, A. & Dafis, S. (1989). Forest Nurseries - Reforestations. Editions Giahoudis - Giapoulis. Thessaloniki. pp. 264. (In Greek).

Hatzistathis, A. & Ispikoudis, J. (1992). Protection of Nature - Landscape Architecture. Editions Giahoudis - Giapoulis. pp 417. Thessaloniki. (In Greek).

Hatzistathis, A. & Zagas, Th. (1992). Restoration of degraded forest ecosystems. Proceedings of meeting "Management of degraded forest ecosystems". Forest Administration Service of E. Macedonia and Thrace. Xanthi. p 28-36. (In Greek).

Hatzistathis, A., Zagas, Th., Goudelis, G., Gkanatsas, P. & Tsitsoni, Th. (1996). Thinning treatment effects on stand structure and quality of holm oak coppice. Proceedings of second Balkan Scientific conference on study, conservation and utilisation of forest resources. Vol. I. pp. 11 - 16, Sofia.

Matthews, J. (1989). Silvicultural Systems. Oxford Science Publications.

Zagas, Th. (1994). Die natuerliche Bewaldung im Elatia-Gebirge (Griech. Rrodope). Schw. Zeitschrift fuer Forstwesen. Nr. 3. S. 229 - 240.

Zagas, Th. (1994). Entwicklung der immergruenen oekosysteme nach waldbrand in Athos. Silva Gandavensis. Nr. 59. S. 57 - 67.

Zagas, Th. & Hatzistathis A. (1995). Ecological management of productive forest ecosystems. Proceedings of Congress: "Natura 2000" WWF. Athens. pp 109-118. (In Greek).