

EVALUATION OF FOREST ECOSYSTEM FOR WATER AND WOOD PRODUCTION

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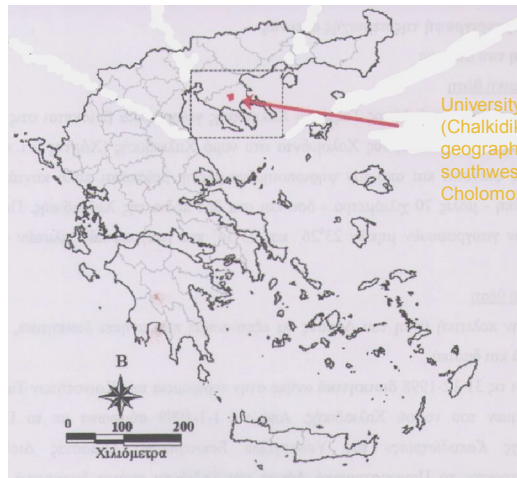
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Aim of this work

to evaluate two forest uses:

- the wood production and
- the water production

AREA OF INTEREST



University forest of Taxiarchi (Chalkidiki, North Greece) geographically situated at south and southwest aspects of the mountain Cholomonta.

Climate: terrestrial Mediterranean with short, warm and dry summers and moderate winters.

Geology: The larger percentage of the area is covered by limestone and mica schist.

Soil: acid, the depth varies from 5 to 100cm.

Primary forest species: *Quercus conferta* και *Quercus delachampii*

MATERIALS AND METHODS

In order to evaluate the two forest uses we followed the Multiple Decision Support System and we applied the method of the Analytic Hierarchy Process (AHP).

- The data concerning the elevation, the slope, the basic rock, the constitution, the soil depth, the percentage of canopy, the current increase of the growing stock per stand, were derived from the Forest Management Plan (2002-2011).
- the map of the forest sections of the University Forest was used, which were separated in 15 zones of four sections. The separation of the zones was done because consistency check can be done for a maximum of fifteen criteria since the Ratio Index (RI) comes from tables with this specific number of criteria
- At the beginning, the criteria-factors which influence the production of wood and water were determined.

The problem of estimation of the multiple criteria was faced with the following steps:

- definition and composition of the problem
- the generation of the alternatives
- the choice of a set of evaluation criteria
- the identification of the preference of the decision maker
- the choice of total preference
- In frame of the AHP the **pairwise comparison method** was selected.

Pairwise comparison method

This method includes comparisons between pairs in order to formulate a ratio table. The pairwise comparison method involves the following:

- creation of pairwise comparison matrix
- evaluation of criteria weights
- test of consistence ratio.
- Criteria weights are accounted for each one of the factors, with the next step being to account the weight for every alternative solution for these factors.

- The next step was to account their relative weights and the following step is to find out the weights of zones in order to discover their significance.
- **Wood production** in a forest depends on several factors such as the **ground**, the **aspect**, the **relief** and the **forest species** and these factors were used as criteria.
- **Water production** in a forest depends on four factors, namely the **climate-precipitation**, the **relief**, the **ecological substratum** and the **vegetation** and these criteria were used.

RESULTS

Table 1. Pairwise comparison of the criteria which influence wood production

	Ground	Elevation	Aspect	Relief	For. species
Ground	1	8	5	5	8
Elevation	0,125	1	0,333	0,25	4
Aspect	0,2	3	1	2	5
Relief	0,2	4	0,5	1	5
For. species	0,125	0,25	0,2	0,2	1

From this table, the weights of the criteria were derived with their values being: ground; 0.550, aspect: 0.180, relief: 0.155, elevation: 0.078 and forest species: 0.037.

The estimations which were done had a suitable consistency ratio as $CR=0.094 < 0.10$, a precondition which must be fulfilled.

Table 2 Table of pairwise comparison between the criteria influencing the water production

	Precipitation	Vegetation	Geol. substratum	Relief
Precipitation	1	4	6	7
Vegetation	0,25	1	3	4
Geol. substratum	0,167	0,333	1	3
Relief	0,143	0,25	0,333	1

As previously in wood production, the method was applied in the case of water production . From this table, the weights of the criteria were derived with their values being: precipitation: 0,601 , vegetation:0,224 , geological substratum:0,116 , and relief:0,059.

Conclusions

- Pairwise comparison method is very significant because it takes into account all the factors which influence the problem under consideration and gives an overall value (the weight for their description).
- These values allow an easiest comparison between the factors and help to resolve the complexity of forest ecosystems.
- The factors which influence the production of wood (in rank of importance) are land, aspect, relief, elevation and (at the end) forest species.
- Water production, is influenced (in rank of importance) by precipitation, vegetation, geological substratum and relief.

Conclusions

- The zones 1, 7, 8, 11, 12 and 15 have a greater value weight for wood production, whereas the zones 2, 3, 4, 5, 6, 9, 10, 13, and 14 have greater value for water production.
- The zones which promote the wood production occupy the 39,62% of the overall area of University Forest of Taxiarchy and the zones which have bigger participation in water production occupy the 54,49% of the overall area.

