Forest cover, agricultural intensity and population density in Roman imperial Boeotia, central Greece

John Bintliff

Summary

The land use history of central Greece in the Roman era is analyzed through a case-study of the province of Boeotia, where historical research can be linked to continuous intensive archaeological field survey since 1978. A detailed examination of vegetational history and the nature of contemporary vegetation by RACKHAM (1983) provides the botanical foundation. Estimates for proportional woodland and other land uses are given for Classical Greek, Early Roman and Late Roman times.

Zusammenfassung

In einer Fallstudie über die Region Böotien wird die Agrargeschichte Zentralgriechenlands in der römischen Epoche studiert und historische Forschungen mit intensiven archäologischen Felduntersuchungen ("field survey") in Verbindung gebracht. Die botanischen Grundlagen für diese Region stützen sich auf die detaillierte Untersuchung von RACKHAM (1983). Für die flächenmäßige Ausdehnung von Wald und anderen Landnutzungstypen werden Schätzungen für die (griechisch) klassischen, frührömischen und spätrömischen Epochen angegeben.

1. The present-day landscape

The central Greek province of Boeotia is a region some 2580 square kilometres in size within its ancient boundaries, and possesses a Mediterranean climate. Since 1978 a joint team from Cambridge and Bradford Universities has been studying the archaeology and landscape history of the province, employing as the central investigative approach intensive archaeological field survey in selected districts (BINTLIFF & SNODGRASS, 1985, 1988b). Under the auspices of the Boeotia Project RACKHAM (1983) has researched and published a major study of the vegetational history of the region, which I shall use extensively alongside more recent research and the insights from my own archaeological and historical investigations.

The physical landscape (Fig. 1) can be broadly subdivided into a central east-west swathe of lowland plains and lakes, with very recent alluvial and lake soils, bordered especially to its south by a parallel extensive zone of plateau and gentle hill country, essentially soft carbonate rocks of Tertiary age, these two zones being sandwiched to north and south by parallel zones of crystalline limestone mountains bordering the sea.

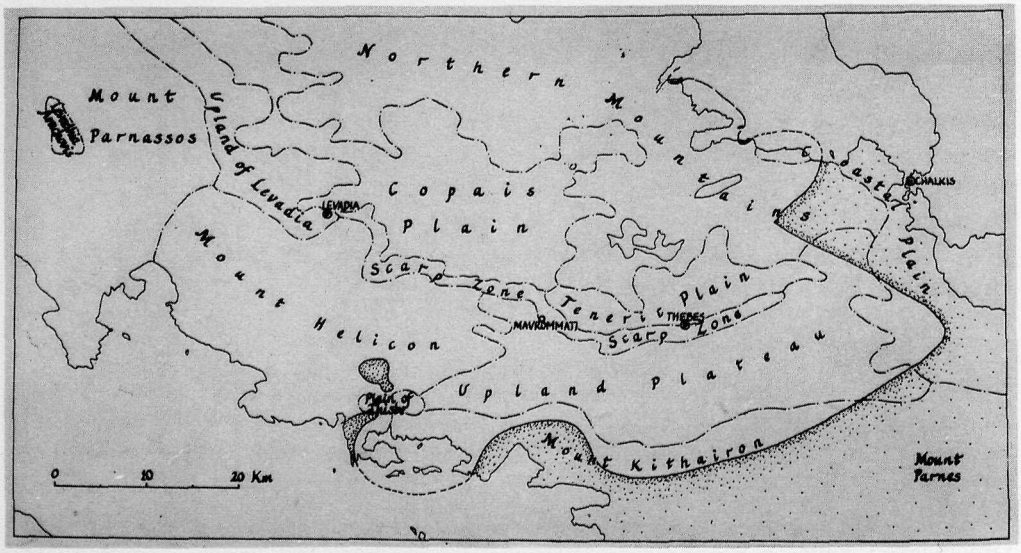

Fig. 1 Boeotia divided into geographical regions. The stipped area marks the northwestern limit of native pine (*Pinus halepensis)* (After RACKHAM, 1983)

Approximately one third of this landscape is currently classified as cultivated: the entire lowland zone and much of the upland soft rock plateaux and hills. One half of the landscape is covered by scrub vegetation: almost all the mountain areas and significant patches of the upland zone. Less than one sixth is occupied by woodland, this being concentrated on the high mountain regions and in an anomalous extensive Aleppo pine forest zone in the hill and plateau country of northeast Boeotia.

RACKHAM describes the predominant scrub vegetation as a mosaic of three plant groups (Fig. 2): the first is "evergreen maquis" or "shrubs" (made up of trees, especially prickly oak, that are undeveloped due to grazing), the second is "garrigue" or "undershrubs" and the third "herbaceous steppe". This scrub covers non-arable land from the coast up to the summits of the lesser mountains and is a consequence of prolonged human disturbance of the landscape. Only the highest mountains, Kithaeron, Helicon and Parnassos, have also an upper zone of fir woods and an uppermost zone of alpine plants, and even here evergreen

oak scrub dominates up to 1400 metres. RACKHAM accounts for the anomaly of plateau Aleppo pine woodland of the northeast as a post-medieval colonization from the Attic border country of a tree taking advantage of frequent anthropogenic fires.

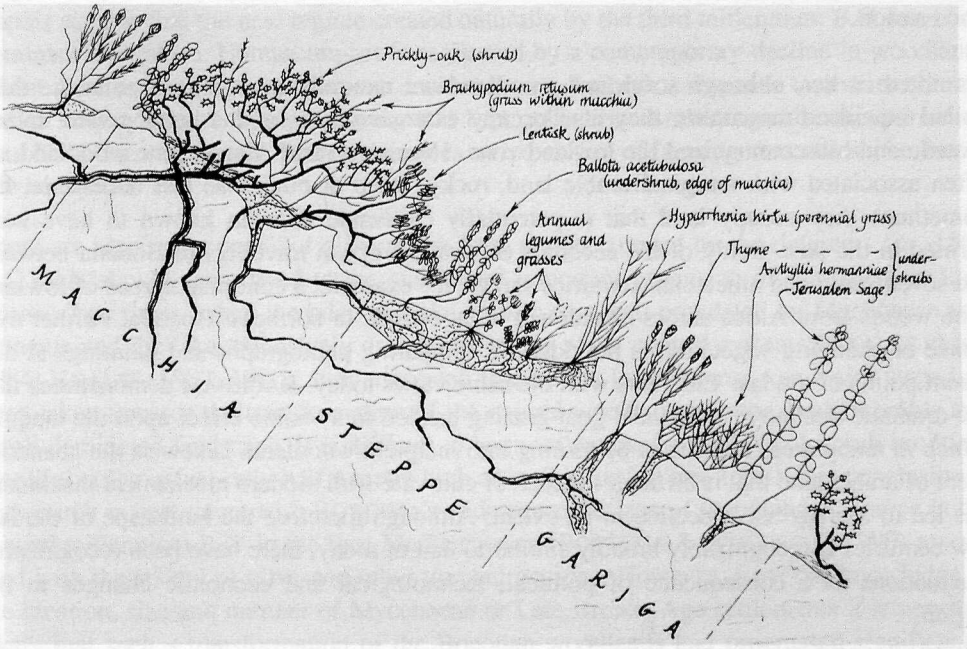

Fig. 2 Schematic vertical section of a rocky slope, showing structure of maquis, garrigue, and steppe (After RACKHAM, 1983)

The traditional model for Balkan vegetation (cp. TURRILL, 1929) considers maquis, garrigue and steppe as successive stages in forest degradation due to human felling and overgrazing by domestic animals. RACKHAM's observations in Boeotia, however, show that the severity of browsing is not correlated with the amount of maquis. When these shrubs, highly palatable to goats, are cut or burnt they recover well by sprouting from the base. In fact the relative distribution of the three varieties of scrub is a reflection of how deep and water-retentive the soils are.

It might be expected that the cooler and moister climate of the mountains would see a replacement of evergreen by deciduous oak woodland. The dominance of the evergreen oak in scrub form and mountain fir in these zones is ascribed by RACKHAM to their resilience before intense human and grazing impact. Deciduous oaks are rarely found and are almost invariably humanly-managed groves or shady trees amid arable fields.

In summary, the present-day vegetation of Boeotia is essentially the result of national conditions and the ubiquitous grazing, by goats, sheep and to a very limited extent cattle; secondary in importance is the creation of scrub through fuel collection and the formerly important manufacture of dye from the prickly oak. RACKHAM argues that rather than seeing the dominance of scrub as a negative and wasteful feature of the landscape, it can be considered as a relatively stable resource zone that is resilient and not necessarily leading to soil erosion.

As noted earlier, although scrub and woodland are naturally most extensive in the thin-soiled limestone mountains, they also occupy extensive areas of the better-soiled upland plateau and hill country, and the lowland zone. Here scrub and Aleppo pine woodland are often associated with marginal arable land, rocky, steep or otherwise less accessible, but sometimes they occupy land that is potentially cultivable or even known to have been farmed in the past. Study of the accounts of west European travellers to Boeotia between the seventeenth and nineteenth centuries shows, for example, a continual spread of lowland pine woods from Attica across abandoned village lands in northeast Boeotia. Further evidence of changing vegetation is provided by comparing photographs and paintings at different points of the last 150 years with the same views today: RACKHAM demonstrates that the dramatic decline of sheep and goat grazing has led to a visible effect upon the maquis, which in many areas appears to be turning into incipient woodland. Likewise the abandonment of arable land that is difficult to reach or cultivate with modern mechanical machinery has led to a progressive decline in its extent. Although therefore the landscape of the last few centuries is recognizably broadly similar to that of today, there have been recognizable fluctuations as a consequence of political, technological and economic changes in the region.

2. Pollen analysis

At what point in the human settlement of this region was this highly artificial landscape created? Here we are fortunate in possessing detailed pollen evidence from the centre of Boeotia, the drained Lake Copais. A pollen core was taken here in the 1970s by TURNER and GREIG (GREIG & TURNER, 1974; TURNER & GREIG, 1975), whilst two further cores have been obtained in recent years by RITCHIE (cp. ALLEN, 1990; KNAUSS, 1990).

The combined sequences begin in the later part of the Last Glacial and run through the Holocene to around 1500 B.C. The early to mid-Holocene witnesses a deep Lake Copais. Around it deciduous oak woodland is dominant, flourishing on the deeper soils, with evergreen oak on the thinner soils, and a significant area of steppe vegetation on the steepest and rockiest zones. In the mountains deciduous oak woodland with little or no fir would be dominant. The climate appears to be less arid than now.

From the mid-Holocene a major change is observed, particularly at a ^{14}C date in the late fourth millennium B.C. The lake gets increasingly shallower, with abundant aquatic plants, whilst deciduous oak gives way to evergreen oak and the overall woodland component declines considerably. The most recent interpretation (cp. KNAUSS, 1990) suggests a climatic shift towards a more arid climate like today's, changing the lake's regime into a seasonal alternation of shallow lake and marsh. Ancient and early modern descriptions of Lake Copais suggest that the new regime created naturally by the third millennium B.C. has been dominant ever since. Human impact is registered by a contemporary decline in woodland, whilst the rise of evergreen oak over deciduous may be both a response to a drier climate and to human impact through grazing and fuel collection. Archeologically this period of final Neolithic and earliest Bronze Age sees an expansion of farming sites across the Boeotian landscape.

There are significant peaks of olive in the final period covered by the diagrams (ca. 1500 B.C.) that should correspond to the even more important expansion of settlement in Late Bronze Age times, when the edge of Lake Copais was well-populated by Mycenaean settlements and the lake extensively drained by major water control systems (KNAUSS et al., 1984; KNAUSS, 1987, 1990). It is suggested that by the Late Bronze Age major steps had been taken towards the transformation of the natural woodland into the modern arable and scrub-dominated landscape. It is difficult to be more precise as prickly oak scrub produces plentiful pollen when only half a metre high as well as in full tree form. This conclusion is very much in agreement with BOTTEMA's widespread horizon of woodland clearance in the second millennium B.C. in the East Mediterranean (BOTTEMA & WOLDRING, 1990) associated with the spread of olive and other tree cultivations. However, from our knowledge of the location, size and number of Mycenaean or Late Bronze Age settlements it is very unlikely that such a transformation of the Boeotian woodlands had progressed significantly outside of the most fertile districts of the lowlands and uplands, such as Lake Copais. It is therefore to the succeeding Iron Age and the Classical period of the fifth to fourth centuries B.C. in Boeotia that we must turn in our search for the origins of the modern landscape over the region as a whole.

3. History and archaeology

In fact if we begin with the ancient writers we must approach the Classical period indirectly, since our sources for the appearance of Boeotia in antiquity date from the following era, the third century B.C. to the second century A.D., i.e. from Hellenistic and Early Roman times.

In the fragmentary travelogue of Herakleides Kritikos (third century B.C.), the "Geography" of Strabo (first century B.C.) and the travel guide of Pausanias (second century A.D.), a consistent picture of Boeotia emerges, and one which is comparable to today's landscape. Essentially all the lowland and intermediate upland plateau and hill country is open and under mixed farming use, except for rocky hills and the lower mountain slopes

which are scrub-covered; on the higher mountains there are woods. Groves of trees in the lowland and upland are rare enough to evoke specific mention, and are usually managed. Particularly notable in this respect is the sacred wood of giant deciduous oaks noted by Pausanias at Alalkomenai near Lake Copais. Yet there are suggestions in at least one area, eastern Boeotia, that the area of cleared land had been even more extensive in the preceding Classical period. Here, where these authors record a series of deserted small towns and villages, there is mention of woodland, very probably lowland pine, and thickets. It is interesting to recall that this district was also a focus of village depopulation in recent centuries to the advantage of the Aleppo pine, after a flourishing in the sixteenth century A.D.

It is a universal comment of our ancient authorities that Boeotia reached its climax of populousness and military power during the late Classical era, the fourth century B.C., subsequently to suffer decline in both respects. The ancient reputation of Boeotia likewise emphasized the essentially agrarian basis of the provincial economy. In the late nineteenth century BELOCH employed ancient sources on manpower to estimate the peak fourth century B.C. population of Boeotia as between 150,000 and 200,000 people (BELOCH, 1886), a figure unsurpassed to this day. Despite subsequent criticism of such high estimates, a revaluation of specific sources such as the organisation of the federal army as preserved on the "Oxyrhyncus Papyri" suggests a fourth century population of the order of 165,500 people (BINTLIFF & SNODGRASS, 1985).

The plausibility of such dense populations, higher than in any other period including the present, can now be supported from the results of our intensive archaeological field survey of over 40 square kilometres in southwest Boeotia (in the territory of the ancient cities of Thespiae and Haliartos), and most recently several square kilometres of the land belonging to ancient Hyettos city in northern Boeotia. Apart from the two towns of Thespiae and Haliartos, and the agro-town of Askra, there are 110 definite, 13 probable and 5 possible settlements in the 40 square kilometre sector for the Classical to Early Hellenistic centuries. Moreover the cities themselves were also densely populated, as can be seen from our urban surface survey at Askra, Haliartos and Thespiae. Relating the estimated total population of each city state of Boeotia from the historic sources to the size and number of archaeological sites suggests that something like 72% of the population were town and village dwellers, the remainder living out in the country in innumerable small farms and hamlets (BINTLIFF, 1990).

A complementary approach to identifying the intensive agriculture of the Classical era is to map the density of contemporary pottery spread like a carpet over the landscape as a result of manuring (BINTLIFF & SNODGRASS, 1988c). Such carpets are focussed around farmsites and on a much larger scale around ancient cities. There are two periods which account for almost all the so-called "offsite" or manuring pottery in this area - the Classical and the Late Roman. In our most recent work at Hyettos however, the large plain beside that city has almost entirely Classical pottery marking its most intensive cultivation. Yet another

way to map such ancient farming zones is through trace element soil chemistry (BINTLIFF et al., 1990). Along a transect running for 4 kilometres across arable land towards the ancient city of Thespiae, a continuous series of soil samples shows a rising trend in lead values which indicates manuring residues increasing towards the city.

The estimated peak populations of the fourth century B.C. would have required a much larger proportion of land under cultivation than the one third currently in use. I would calculate at least one half of the region must have been given over to cereal, olive and legume cultivation. This implies that some of the land now covered by scrub was then cultivated, to enlarge the present arable area one and a half times; at least one third of present scrubland in fact should have been cultivated then.

There is indeed evidence for an unprecedented expansion of cultivation: the discovery of Classical farms and villages in areas presently little exploited or covered in scrub. It is therefore very probable that RACKHAM is correct in dating the establishment of the characteristic modern landscape of Boeotia to the Classical epoch, with only minor modifications subsequently. We would hypothesize therefore for around 400 B.C. some half of the landscape under cultivation, a third scrub and a sixth woodland for the region.

As mentioned earlier, the ancient travellers and geographers depicted Boeotia as entering into a dramatic and long-lasting decline in Late Hellenistic and Early Roman imperial times, a view strongly reinforced by the histories of Polybius. All these authorities provide a consistent story of depopulation, the desertion or shrinkage of cities and villages, civil disorder, and the breakdown of justice. Indeed much of southern Greece merits a similar description for this period. Till recently ancient historians have been highly sceptical about the accuracy and honesty of these sources (cp. HENNIG, 1977, for example). This is curious when a similar picture can be extracted from contemporary inscriptions, which provide the following kinds of crisis indication: evidence of food scarcity, city insolvency, and manpower shortages (cp. BINTLIFF, 1991).

Nonetheless, it is again from survey archaeology that the accuracy of this scenario has been put to the test, with quite spectacular results. In our 40 square kilometre survey zone in southwest Boeotia for example, definite settlements of the Late Hellenistic and Early Roman period number only 38, a third of the Classical density. The rural population has not migrated to the cities, for they too have shrunk dramatically - and Haliartos after its sack by the Roman army in 171 B.C. is not reoccupied even as a village site till medieval times.

This catastrophic decline is equally evident from other recent regional field surveys throughout southern Greece. It has been pointed out that Greece suffered a series of crippling wars and tax exactions in the final centuries B.C., which not only directly sapped local economic surpluses and other forms of wealth but more devastatingly created depopulation through military losses and enslavements (a model persuasively employed by HOPKINS for the decline of the free farming population in Republican Italy in his book

"Conquerors and Slaves", 1978). But the evidence suggests that the problem began even earlier, from the end of the fourth century B.C.

A powerful additional factor has been revealed through geomorphological studies in Attica, Euboea and the Argolid - ecological disaster. There is well-dated evidence from all these regions for a major episode of soil erosion following the Classical period, which must have had a very serious long-term effect on crop yields and population levels (POPE & VAN ANDEL, 1984; PAEPE et al., 1980; RUST, 1978).

Thus, cumulative pressures may have been responsible for the drastic decline of the region by the Early Roman imperial period. It is nonetheless not at all straightforward to estimate the effects of these changes on vegetation history. We have already cited contemporary ancient sources to suggest that surprisingly only minor modifications may have taken place in the extent of woodland and scrub compared to open land in the post-Classical period. Moreover there are a handful of Boeotian cities, including Tanagra and Thespiae, which contemporaries exempted from the list of ruined towns typical for the region as a whole. Thespiae also has Roman inscriptional and literary evidence suggesting a flourishing centre of international businessmen and wealthy foreign residents.

Solving these apparently contradictory indications for the state of the region in Early Roman imperial times is perhaps not too difficult, and ALCOCK (1989) in a recent paper has suggested a satisfactory resolution. During the centuries of depopulation and crisis, much of southern Greece came into the hands of wealthy indigenous landed families, who formed alliances with similar magnates from Italy. Land and labour were cheap, and with enough capital and contacts, (and here we may note the significant role of Italian businessmen or *negotiatores* at Thespiae and elsewhere), large estates could be easily purchased from impoverished cities and their citizens. In such circumstances it is unlikely that these estates were either intensively cultivated or produced major surpluses, yet on this large scale they could yield perfectly adequate livelihoods for the elite concerned. Life for the remaining smallholders would have been much more difficult, economically depressed and squeezed by the expansion of great estates. It is therefore possible to reconcile the fact that both Antoninus Pius and Hadrian had to adjudicate between the citizens of Koroneia and Thisbe in disputes over the ownership of high mountain pastures that formed their mutual borderlands on Mount Helicon, with the letters of Hadrian to Koroneia advising its citizens how to deal with the encroachment of foreign magnates on their lands, all this at a time when population levels were not very high in town or country. Significantly in the second and third centuries A.D. the emperors undertook specific incentives to encourage farmers to recultivate land in southern Greece.

Archaeologically there is evidence that the surviving rural sites of this period were usually larger than Classical farms, plausibly representing estate centres rather than family farms. Certainly inscriptions and literary references support the importance of a landed elite of mixed local and Italian stock.

Both of the latter sources of history become rare and of limited help after the fourth century A.D., and it is therefore essentially an archaeological breakthrough from field survey that reveals a remarkable transformation in the settlement pattern during the final centuries of the Late Roman period in southern Greece. As this period begins around the sack of Rome in the early fifth century and lasts until the mid seventh century A.D., it is sometimes called Early Byzantine, yet it is undeniably a continuous development of Eastern Roman empire culture with its roots in the second to third century A.D. The chief feature of note is a striking revival in rural settlement - in southwest Boeotia 76 definite sites are recorded, a recovery to some two thirds of the Classical total - but most of these settlements are larger than their Classical predecessors and it is quite likely that the total rural population was actually equal to or surpassed the Classical level. Urban recovery was more patchy however: Thespiae city is barely larger than its Early Roman shrunken area, still sheltering within and beside its 12 ha forth or early fifth century A.D. emergency defences. The agro-village of Askra in contrast, is as large if not more extensive than in the Classical period.

Table 1 Estimated land use in ancient Boeotia

Period	Land use proportions		
	open land/cultivated	scrub	woodland
Classical/Early Hellenistic 5th - 3rd cent. B.C.	1/2 (Intensive arable dominant)	1/3	1/6
Late Hellenistic/Early Roman 2nd cent. B.C. - 4th cent. A.D.	1/2 (Low intensity arable combined with pasture)	1/3	> 1/6
Late Roman 5th - 7th cent. A.D.	1/2 (Intensive arable dominant, but a mosaic with low intensity and pasture use areas)	1/3	< 1/6
Modern Boeotia	1/3 (Intensive arable dominant)	1/2	< 1/6

It is still too early in our research into the scanty historic sources and the more plentiful archaeological material to attempt to model the nature of the Late Roman economy and social structure in Boeotia, although large farms or villas and a strong participation in international trade are clearly indicated. As for the relative proportions of land in cultivation, under grazing, or under scrub and woodland, it seems likely that much of the land kept open but used extensively in the Early Roman period (for grazing and sporadic cultivation), may now have returned to intensive arable lands and orchards. This would imply a similar overall balance to the Classical and Early Roman period, i.e. half the landscape open for some form of cultivation or open grazing, one third scrub and around one sixth woodland, but with a shift within the open landscape category towards more arable and less pastoral usage. In table 1 I present in summary form my hypothetical estimates of the proportions of

land in Boeotia in various use categories during the period 500 B.C. - 600 A.D., together with the current land use proportions for comparison.

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Address of the author:

Dr. J. Bintliff, Reader in Archaeology, Durham University, 46 Saddler Street, Durham DH1 3NU, U.K.