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Segetal plants of winter-annual crop fields in the Aegean islands – viewed in the contexts of landscape and traditional agricultural practice

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Abstract

The segetal flora of rainfed winter-annual crop fields in the Aegean is of particular interest for archaeologists, cultural and ecological historians, botanists and ecologists alike due to the long agricultural history in the Aegean (the most ancient in Europe). Many wild arable plant species are more or less exclusive to this habitat, and some are confined in Europe to this marginal region. We surveyed on several Aegean islands the distribution of plant species indicating traditional cropping practice and the plant composition of such fields with their geomorphological and agricultural setting. We found the highest density of segetal plants on fields of winter-annual cereals and pulses in upland valley basins and plateaus and close to villages integrating arable farming and animal husbandry. Most arable fields are used for non-intensive fodder production. For biodiversity conservation cereal-pulse crop rotation with occasional cultivated fallow is preferable to pure green-cropping and early grazing of cereal-sown fields. Despite numerous recent island records, many species occur on very few fields per island or are rare in the entire Aegean, demonstrably threatened by discontinuity of arable land-use and agricultural intensification.

1. Introduction

The islands of the Aegean (and the adjacent mainland Greece and Turkey) are known as scenery of the onset of European agriculture. The spread of husbandry from its Near East origins reached the Aegean at about 9000 to 8000 years ago (SCHNURBEIN 2014), although the processes involving the beginnings of land cultivation, livestock breeding, island settlement history and human population growth are complicated and far from understood in detail (HALSTEAD & FREDERICK 2000). One should be aware that, given the vicissitudes of human history in the Aegean, few places, if any, are actually likely to be sites of millennia-long continuous agriculture.

Many arable weeds are archaeophytes in the Aegean, plant species considered as being native further east and travelling westward with the expanding prehistoric agriculture. Other species may have been native on the Aegean islands, in naturally more or less disturbed habitats such as scree and river banks, from where they spread into cultivated fields (BERGMEIER & STRID 2014). The exchange of plants and diaspores within different components of the cultural landscape was facilitated by free-roaming livestock, small-scale landscape patterns of fields, margins and rangelands, and cultivation systems with crop-fallow rotation. Until well into the second half of the 20th century the spatio-temporal boundaries of cultivated fields (which may not necessarily be in permanent use) and of open (semi-)natural vegetation have been less sharp than mostly nowadays in Greece and Europe after mechanization. The adaptation of plants to conditions of life on arable land and the evolution of traits and habits to cope with a regularly disturbed and seasonally changing environment are processes that took place not only in the Near East, the cradle of Neolithic agriculture, but likely in every crop cultivation region ever since. This may be demonstrated by modern neophytes introduced in

cultivated systems in the recent past as well as by ‘anecophytes’ – more or less recently speciating taxa ‘at home’ in no other habitat than cereal or other fields (SUKOPP & SCHOLZ 1997).

The distribution of the weeds of traditional agriculture in the Aegean is by no means at random but follows north-south as well as west-east gradients (BERGMEIER & STRID 2014), quite like the biogeographic patterns of other flora species. This fact suggests that the regional biogeography of arable plants is chiefly determined by the natural setting (climate, distance from mainland) while the human impact on species distribution is hypothesized here as being mostly local-scale, with relevant factors such as land-use continuity and intensity and cultivation practice as response to local preferences, geomorphological and soil conditions. This paper aims at describing (1) typical Aegean agricultural landscapes characterized by extant or historical fields of annual crops, (2) the practice of pre-mechanized arable land-use, and (3) the regional distribution of winter-annual arable and crop plants. Segetal plants reflect, in species composition and abundance, historical as well as present-day ways of agriculture. They indicate also the urgent need for supporting traditional land-use practices for cultural and biodiversity conservation (MEYER et al. 2013).

2. Aegean agricultural landscapes

Crop cultivation in the Aegean islands is confined to plains or gently ascending slopes and thus much constrained by the typically mountainous environments with shallow and stony unproductive soils so common for most islands. As shown by extensive centuries-old terraced lands, now abandoned, enormous efforts had been made at times of high population density and intact trade connections to increase the arable land area and productivity (GROVE & RACKHAM 2001; VOGIATZAKIS et al. 2010). With vanishing subsistence farming and the onset of mechanization, and as a result of emigration as chiefly in the 1960s and 1980s, remote and hard-to-reach fields were increasingly abandoned (LIENAU 1976). In history, phases of short- or long-term abandonment occurred no doubt repeatedly in periods that followed times of plague and other population decrease.

In general, Aegean agricultural landscapes may broadly be grouped by the geomorphological environment (steep middle slope; gentle lower slope; plain), geology (hard bedrock; soft bedrock; colluvium or alluvium), and elevation (coastal and lowland plains; upland plains and plateaus (Table 1; Fig. 1). Terraced fields situated at steep hard bedrock slopes (e.g., limestone, granite, andesite) are largely abandoned all over the Aegean islands, often since long, and the time of Greek terrace constructions is still under debate, some of them dating to the Bronze Age (GROVE & RACKHAM 2001; PRICE & NIXON 2005; KRAHTOPOULOU & FREDERICK 2008). Locally, mid-slope and upland terraced fields may have been cultivated up to pre-war times or even after mid-20th century. The distance and the amount of labour and know-how required to maintain the terraces and the walls may have been limiting factors at all times, while in more recent times depopulation and more attractive jobs in others than the primary sector led to large-scale abandonment. Today, cultivations are restricted mostly to fertile valley basins and gentle slopes, preferably in the vicinity of villages. Characteristically for rainfed Mediterranean agriculture, trees (olives, carobs) and cereals were often grown together in a field. In contrast, in the past three decades in the Aegean, while Greece has increasingly become dependent on grain imports, a modern irrigation-dependent cultivar of olive, but also vine, greenhouse vegetables and other marketable mono-crop products have increased enormously replacing former annual crop fields.

Thus, annual crop fields, chiefly free-threshing winter cereals such as macaroni and bread wheat (*Triticum turgidum*, *T. aestivum*), six-rowed and, less commonly, two-rowed barley

Table 1: Characteristics of landscapes with present-day or historical arable fields in the Aegean. Hard: igneous or metamorphic, often calcareous, bedrock; Soft: erosive bedrock such as flysch, molasse, marls, calcium content variable. APCV: Arable plant conservation value.

Geomorphology	Geology	Coastal/lowland	Upland
Steep middle slope	Hard	Widespread and extensive; mostly abandoned terraces; grazed, or rarely cereals sown for green fodder; APCV: low	Widespread and extensive; long-term abandoned terraces; grazed, rarely cereals sown for green fodder; APCV: low
	Soft	Fairly widespread and extensive; not terraced; often cultivated (trees, vine, cereals for green fodder) or abandoned and grazed; APCV: low	Fairly widespread and extensive; not terraced; abandoned and grazed or sometimes cultivated (trees, vine, cereals for green fodder); APCV: low
Gentle bottom slope	Hard	Widespread, extensive; terraced; often urbanized; if cultivated then planted with trees, rarely cereals for green fodder; APCV: varying, locally high	Widespread, extensive; abandoned terraces; grazed, rarely cereals sown for green fodder; APCV: low
	Soft	Fairly widespread and extensive; terraced or not; often urbanized or else cultivated (trees, vine, cereals for green fodder); APCV: varying, locally high	Fairly widespread and extensive; not terraced; grazed or commonly cultivated (trees, vine, cereals for fodder); APCV: varying, mostly low
Plains, valley basins	Alluvium, Colluvium	Fairly widespread but small-scale; mostly urbanized or else cultivated (trees, sometimes cereals for green fodder or grain); APCV: varying, locally high	Infrequent and more or less small-scale; abandoned and grazed or cultivated (mainly cereals for grain); APCV: often high

(*Hordeum vulgare*, *H. distichon*), wheat-barley mixtures and oats (*Avena sativa*) are nowadays rather infrequent on many Aegean islands, while fields of annual pulses, except for common vetch (*Vicia sativa*), are hard to find almost everywhere. Where extant, fields of winter-annual crops are largely confined to easily manageable alluvial and sloped sites with deep or moderately deep soils with sufficient water supply in winter and spring. Wheat cultivation, mostly of macaroni wheat, is usually intensive, the fields sprayed with herbicides and fertilized to support dense stands, similar to modern agricultural practice almost everywhere in Europe. The yield of most fields, and almost invariably that of barley, oats and vetch, is for the provision of fodder, with the plants either grazed briefly in vegetative state in early winter or in spring, or cut green in spring, or harvested for dry, ripe or sub-ripe grain. Many fields, sometimes terraced fields in difficult terrain, but also at low-terraced gentle slopes or on valley bottoms, or non-terraced irregularly shaped fields over soft bedrock such as neogene marls and flysch, are sown merely for improving the sheep pasture and extending the grazing season at lower elevations. They will be grazed by sheep in April/May when the adjoining phrygana of *Sarcopoterium spinosum* and other dwarf shrubs does not anymore provide sufficient fodder.

Coastal and lowland plains, anyway infrequent on the Aegean islands due to the lack of extensive riparian alluvia, were formerly often grown with vine and cereals wherever deep and drained non-saline soils were available. The rainfed agricultural lands have largely been lost to urban and touristic development or frequently to intensive olive plantations, greenhouse vegetable cultivation and other marketable products such as seed potatoes for the European



Fig. 1: Aegean landscapes with arable fields. Clockwise, from top left: Historical field terraces on steep mid-slope, limestone, island of Kasos. Irregularly shaped non-permanent grazed barley fields plowed into *Sarcopoterium spinosum* phrygana on gentle slope, molasse, island of Limnos. Upland valley basin with cereal fields and pulses rich in segetal plants, surrounded by limestone mountains covered with phrygana, colluvium, Avlona, island of Karpathos. Gently sloped fields, today mostly grown with olives and vine, neogene marls, Archanes, Crete.

market as on Naxos. One of the most extensive such lowland alluvial plains is the fertile Mesara Plain of south central Crete which was found treeless by the botanist and traveller F. W. Sieber in the early 19th century who noted that the Mesara Plain produced the highest grain yield (SIEBER 1823: 52, “*Das meiste Getreide liefert jedoch das Thal von Gortyna oder Mes-sarah.*”). Over the past decades, however, the plain has increasingly been planted with irrigated olive trees of the *Koroneiki* cultivar.

The most prominent Aegean cereal field complexes in traditional agricultural practice may be encountered on upland valley basins and plains. They are among the most valuable for segetal plant diversity conservation. Surrounded by mountains of metamorphic (e.g., gneiss, marble, quartzite) or igneous rock (e.g. granite, andesite) and filled with debris and colluvia, such plains, often karst-generated endorheic plateaus known as *oropédio*, are favourable for agriculture. At altitudes between 200 and over 1000 m a.s.l. they may have been cultivated since millennia, although many and in particular the highest and remote ones are today abandoned, entirely or in major parts, probably for reasons of climate or shortage of labour. When accessible and during periods with high demand, with fertile soils and favourable climate, land-use may have been more or less continuous and all-encompassing. On the famous Lasithi Plateau in east central Crete, at an average altitude of 840 m a.s.l., cultivation has been much intensified in the 20th century, from drought-resistant cereals and pulses to irrigated crops,

chiefly potatoes. Upland basins and plains may be very different in character, depending on altitude, precipitation, surrounding bedrock, and land-use (or neglect). Small-scale garden-like agriculture in earth-filled dolines, once common on the mountains of the larger islands and the mainland, should be mentioned here but is hardly practiced anymore. If cultivated, the corn, straw and green crops of upland plains are chiefly for fodder. Yet on local demand, even on non-intensively treated small-scale fields, crops of wheat and pulses for human consumption may be produced, e.g. on the plain of Avlona, not far from the village of Olimbos near the northern end of the South Aegean island of Karpathos (see also HALSTEAD & JONES 1989). Present-day fields with the appearance of ridge and furrow (*Wölbäcker*) were observed only in upland valley basins on the islands of Kasos, Crete and Samos (Fig. 2). The respective plains have in common and are characterized by heavy soils which are wet in winter or even temporarily flooded in places. It is not documented how the fields looked like in times of pre-mechanized agriculture but it seems likely that they were tilled deliberately ridge and furrow to ensure reasonable crop yields after both wet (on the ridges) and dry winter and spring months (towards the furrows), thus avoiding total crop failure.

3. Pre-mechanized farming in the Aegean

The following notes greatly benefit from Paul Halstead's first-hand experience of peasant culture of the recent past (HALSTEAD 2014). Knowledge about pre-mechanized farming in the Aegean is one of the keys to understand not only present-day local and regional farming practice and traditions but also adaptive traits of wild plants in Mediterranean farmland ecosystems. Former Aegean subsistence farming on family basis integrated agriculture and stock-breeding. Seasonal transhumance-like migrations of herds of sheep and goats were, and still are, practiced where extensive summer pasture for herding exists in the mountains, such as on the large Aegean islands of Crete and Euboea and on the mainland. Residential livestock was grazed in phrygana and woodlands in the vicinity of the villages and on stubble fields and fallows. Utilization of common resources such as pasture, water and fuel wood was rule-based, and cooperation among family households regarding human and draft animal labour, storage and tools was a matter of agreement. Barley, wheat and pulses were the chief field crops. Immanent hazards of crop failure were further compensated, to some extent, by annual and spatial variation in seed-corn selection and land management, by short-term decision-making (e.g., green crop vs. grain crop), crop diversification ('poly-cropping') and by producing a certain amount of marketable products whenever possible (FORBES 1976a; HALSTEAD & JONES 1989). The annual cycle of arable farming in the Aegean may roughly be summarized as follows (chiefly from HALSTEAD 2014 and other sources cited below):

- Plowing of stubble fields in autumn required two draft animals, 0.1-0.3 ha/day, depending on terrain and whether cows or oxen. Steel plows and wooden ards (scratch-plow) have probably been used in parallel well into the 20th century, the former on heavy soil and when the soil was to be turned, the latter on light soils and, with harrowing, immediately before broadcast sowing (FORBES 1976b; PALMER 1998). The traditional scratch plow left more stubble on the soil surface and uprooted less plants, including biennial and perennial species.
- A household's need for corn per year was 1000-1500 kg, corresponding to 2-3 or 1-1.5 ha, depending on yield. The demands of straw as winter fodder for two draft animals corresponded to about 2 ha of winter barley; supplementary feeding needed at times of plowing and threshing with oats/barley for mules/horses and bitter vetch (*Vicia ervilia*) for cattle (HALSTEAD 2014).



Fig. 2: Fields on the bottom of the upland plain of Argos, island of Kasos. Note the ridge and furrow relief of the fields in the foreground.

- Sowing of cereals and most pulses for chickpeas (*Cicerietinum*, which is a summer crop) in autumn/early winter starting with broad bean, common vetch and grass pea, followed by barley, wheat and lentils (HALSTEAD & JONES 1989), exceptionally (due to higher risk of crop failure) in late winter / early spring.
- Obligatory cereal-pulse rotation, every few years cultivated fallow, sometimes with summer crop (LIENAU 1976).
- Reaping (with sickle) of winter cereals end of May/early June to mid/late June, depending on latitude and altitude, in the order barley – *migádi* (wheat-barley maslin) – wheat – oats, later (after threshing) summer crops (chickpeas, beans). Sheaves were dried in the fields or immediately transported to the threshing floor (Fig. 3).
- Threshing in July, with cows, donkeys or mules, took some hours or days; threshing sledge frequently used. Seed corn and corn for human consumption were sieved (2-2.5 mm mesh size), pulses often hand-picked.
- Fields were fertilised by dung left by animals grazing the stubble after the harvest (PALMER 1998).

4. Aegean annual crops and segetal plants

In the recent past as well as on present-day fields in the Aegean, as elsewhere in the Mediterranean and Near East, crops have been grown for human consumption (cereals: wheat, wheat-barley maslins; pulses: lentils, peas, chick-peas, broad beans, black-eyed beans) and as a feed for livestock and poultry (cereals: barley, oats; pulses: common vetch, grass pea, lupins, formerly bitter vetch) (HALSTEAD & JONES 1989; JONES & HALSTEAD 1995; PALMER 1998; HALSTEAD 2014). While cereals are still common (although land-races, distinct cultivars developed and maintained by farmers under local conditions, have become rare or extinct in the Aegean islands), pulses are rarely encountered nowadays (except for common vetch, a regular component of crop rotation), and some have only been recorded as casual relics of cultivation (Table 2).



Fig. 3: Former threshing floor on wind-exposed terraced ground, now abandoned, island of Karpathos.

Table 2: Traditional annual pulses in present-day Aegean agriculture (HALSTEAD & JONES 1989; own observations from 2017/18). s, summer crop; w, winter crop. Frequency of cultivation and as naturalized relict of former cultivation: +++, common; ++, occasional; +, rare.

		Human food	Fodder, poultry feed	Cover crop, green manure	Frequency of cultivation	Found nat- uralized as relict of cultivation
<i>Cicer arietinum</i>						
Chick pea, Kichererbse	s	×			++	
<i>Lathyrus ochrus</i>						
Winged vetchling, Flügel- Platterbse	w	×	×		+	+
<i>Lathyrus sativus</i>						
Grass pea, Saat-Platterbse	w		×		+	
<i>Lathyrus clymenum</i>						
Spanish vetchling, Purpur- Platterbse	w	×			++	+
<i>Lens culinaris</i>						
Lens, Linse	w	×			+	+
<i>Lupinus albus</i>						
White lupin, Weiße Lupine	w		×		+	
<i>Lupinus angustifolius</i>						
Narrow-leaved lupin, Schmalblättrige Lupine	w		×		+	+
<i>Lupinus luteus</i>						
Yellow lupin, Gelbe Lupine	w		×		+	
<i>Pisum sativum</i>						
Pea, Erbse	w	×	×	×	++	+
<i>Vicia ervilia</i>						
Bitter vetch, Bitter-Wicke	w		×		† (extinct)	+
<i>Vicia faba</i>						
Broad bean, Dicke Bohne	w	×	×	×	+++	+
<i>Vicia sativa</i>						
Common vetch, Saat- Wicke	w		×	×	+++	+++
<i>Vigna unguiculata</i>						
Black- eyed bean, Augenbohne	s	×			++	

The proportion of synanthropic wild plant taxa is much higher in the Aegean island floristic regions than in Greece as a whole (Table 3), doubtlessly due to the much higher diversity

Table 3: Number of vascular plant taxa and proportion of synanthropic taxa in Greece and in the Aegean floristic regions.

	Taxa	Proportion (%) synanthropic taxa
Greece (mainland and islands)	6600	23,9
North Aegean	2004	43,9
West Aegean	2136	42,5
Central Aegean (Cyclades)	1768	46,5
South Aegean (Crete and Karpathos)	2240	41,3
East Aegean	2541	43,7

of natural habitats on the continent. The Aegean does not differ much in its proportion of threatened wild arable plant species from Greece as a whole (Table 4), indicating similar threat factors acting on arable plants both on the islands and the mainland, specifically land-use change (irrigation crops, permanent crops, green cereals for early grazing only), intensification (application of herbicides, synthetic fertilizers) and urbanization (BERGMEIER & STRID 2014).

Table 4: Numbers of the obligate segetal plants associated with winter-annual crops in Greece, the Aegean and the Aegean floristic regions of the West (WAe; 1), North (NAe; 3), East (EAe; 6), South (SAe; 3) and Central Aegean (CAe; 10) (in brackets the numbers of islands evaluated). The assessment of IUCN Red List categories follows BERGMEIER & STRID (2004) and refers to Greece, not to the Aegean.

	... in Greece	...on the Aegean islands (proportion in per cent)	Obligate segetal plants				
			WAe	NAe	EAe	SAe	CAe
Total	138	96 (70 %)	57	67	83	69	45
Threatened (VU, EN, CR)	68	48 (71 %)	23	24	40	34	19
VU (Vulnerable)	46	34 (74 %)	19	19	27	26	14
EN (Endangered)	15	10 (67 %)	4	5	9	6	4
CR (Critically endangered)	7	4 (57 %)	-	-	4	1	-
NT (Near threatened)	27	20 (74 %)	12	20	17	14	11
LC (Least concern)	29	21 (72 %)	20	21	18	19	18
Unclear status (DD)	13	8 (62 %)	1	2	7	3	1

A compilation of published (RAUS 1991; SNOGERUP & SNOGERUP 2001; SNOGERUP et al. 2001; BERGMEIER 2005, 2006; KLEINSTEUBER et al. 2016; STRID 2016) and unpublished data of 20th and 21st century contributors to the Flora Hellenica database and specifically data collected by Bergmeier and Meyer between 2013 and 2018 on the distribution of segetal plants on the Aegean islands revealed that (1) for many islands no recent records of arable weeds are available; (2) in general, large islands harbour more arable plants than smaller islands; (3) islands at the margins of the Aegean Sea (close to mainlands) accommodate more arable plant species than Central Aegean islands (Table 4); (4) for several arable plant species, a different threat rating towards higher Red List categories for the Aegean than for Greece as a whole would seem appropriate, e.g. *Adonis annua*, *Agrostemma githago*, *Asperu-*

la arvensis, *Bifora testiculata*, *Cerastium dichotomum*, *Fumaria densiflora*, *Neslia apiculata*, *Roemeria hybrida* and *Turgenia latifolia*. This latter point is firstly due to the smaller reference area and, secondly, because several species with northern or eastern range reach their distribution limits somewhere in the West, North, or East Aegean (BERGMEIER & STRID 2014; STRID 2016). Some segetal plant species are represented in the Aegean only by pre-21st-century records: *Bellevallia ciliata*, *Consolida hispanica*, *Roemeria hybrida*, *Silene muscipula*, *Valerianella orientalis*, *Vicia ervilia*, *Vicia serratifolia*. Several obligate segetal plants are, within Greece and Europe, more or less confined to the Aegean islands (*Bongardia chrysogonum*, *Euphorbia arguta*, *Euphorbia microsphaera*, *Lathyrus gorgoni*, *Lathyrus hierosolymitanus*, *Lolium subulatum*, *Medicago blanchiana* subsp. *bonarotiana*, *Ranunculus asiaticus* var. *sanguineus*, *Silene fuscata*, *Tulipa agenensis*, *Tulipa clusiana*, *Tulipa doerfleri*, *Tulipa raddii*, *Vicia galilaea*). Most examples apply to species reaching the Aegean only on the East or South Aegean islands, such as *Medicago blanchiana* (Lesvos, Chios, Samos, Kos, Rodos; Fig. 4), *Silene fuscata* (Samos, Rodos) and *Euphorbia microsphaera* (Karpachos, Kasos), and the tulips *Tulipa agenensis*, *T. clusiana* and *T. raddii* which occur only on Chios;



Fig. 4: Rare arable plants of winter cereal fields in the Aegean. Clockwise, from top left: *Lolium subulatum*, Karpachos. *Lolium temulentum*, Kasos. Bulb-rich cereal field with *Leontice leontopetalum*, fruiting, Karpachos. Barley field with *Allium nigrum* and *Gladiolus italicus*, Samos. *Medicago blanchiana*, Samos.

Tulipa doerfleri, in contrast, is a narrow endemic of Central Crete. Some species, such as *Lolium subulatum* and *Bongardia chrysogonum*, once may have been more widespread in southern Greece but are now restricted to just a few Aegean islands, or only one (Chios) in the case of *Bongardia*. It further appears, although no such quantitative evaluation has been made

except for the island of Limnos (unpubl. data), that the number and abundance of threatened species is dependant on a small proportion of fields where present arable farming practice is close to the characteristics of pre-mechanized farming.

5. Conclusions

Although different from ancient and historical farming, extant small-scale agriculture on the Aegean islands allows ethnobotanical, ecological and economic insight and glimpses into the recent pre-mechanized past, and according to (pre)historians perhaps even into the more distant past (JONES 1987; JONES et al. 1999; HALSTEAD 2014). The integration of arable farming and livestock husbandry, the focus on winter-annual cereals and pulses, occasional wheat-barley mixed crops, sowing of own seed corn, the presence of terraced fields and ridge and furrow and the variable shape of fields in the landscape are characteristics of early and historical agriculture in the East Mediterranean, traits which are still common-place today, at least locally (WAGSTAFF & AUGUSTSON 1982; JONES & HALSTEAD 1995; BOGAARD 2005). The plant composition of such traditional agriculture is mostly indicative of winter-annual farming (BERGMEIER 2005; 2006), further for biogeography (North, East, South, or Central Aegean floristic region) and distinct soil conditions (light vs. heavy, well-drained vs. seasonally wet). The plant remains, if identifiable at species or at least generic level, are thus valuable indicators for archaeological research on the characteristics of early and historical agriculture (JONES 1992). Further, fields with numerous segetal plants of traditional agriculture are more likely than others under non-intensive, more or less continuous and constant land-use throughout long periods of time. They may be home to relict land-races of local crops and have a strong probability of hosting crop wild relatives of domesticated and cultivated plants.

To maintain the sociocultural, scientific and biodiversity conservation values of the most prominent fields it is essential to prioritize conservation efforts and to focus on fields with

- No herbicide application and at most moderate amounts of manure;
- Continuity of cultivation, hence close to a village, not normally remote;
- Rotation involving cultivated fallow and winter-annual crops;
- Short-term fallow tolerated, yet abandoned fields to be tilled again;
- Low or variable sowing density;
- Shallow tillage especially on heavy soils;
- Small-scale variable relief of soils tending to be wet (ridge and furrow);
- Stubble grazing and short-term grazing of winter seeds (manure, diaspore dispersal) but no grazing of milk-ripe crops.

Zusammenfassung

Die Segetalflora der mediterranen Winterregengebiete und insbesondere der Ägäis, als einem Gebiet frühester europäischer Ackerkultur, ist für Forschungen auf den Gebieten der Archäologie, Kulturgeschichte, historischen Ökologie, floristischen und biogeographischen Botanik und Vegetationsökologie von besonderer Bedeutung. Viele Ackerwildkräuter sind mehr oder weniger eng an den Lebensraum Acker gebunden, und einige von ihnen sind in ihrem europäischen Verbreitungsgebiet auf die Ägäis beschränkt. Wir haben die Verbreitung und Häufigkeit von Ackerwildkräutern auf mehreren Inseln der Ägäis untersucht und setzen sie in Beziehung zur geomorphologischen Lage der Äcker in der Kulturlandschaft und ihrer Bewirtschaftung. Die höchste Artendichte und die meisten gefährdeten, seltenen Arten fanden wir auf Hochebenen, in Beckenlandschaften und auf ortsnahen Äckern mit hoher Kontinuität

der landwirtschaftlichen Nutzung. Äcker in ortsferner Lage, die nur noch sporadisch zur Beweidung eingesät werden, sind dagegen arm an Segetalarten. Ackerwildkräuter, darunter wilde Verwandte von gezüchteten Arten, sowie Landrassen unter den angebauten Getreide- und Hülsenfruchtarten sind die genetische und biologische Basis für die kulturhistorische Bedeutung und mögliche Zukunft der traditionell bewirtschafteten Ägäis-Äcker.

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