Subsistence Practices and Social Routine in Neolithic Southern Europe

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Abstract and Keywords

This chapter focuses not on the role of colonizing farmers or indigenous foragers in introducing domesticates to Neolithic southern Europe, but on the important and more soluble problems of the nature of land use and its wider ramifications and consequences. With allowance for the vagaries of archaeological preservation and investigation, Neolithic communities were largely dependent on small-scale, intensive 'gardening' of staple grain crops. Livestock contributed manure, traction, and dietary protein and variety (meat and dairy produce). Wild resources played a minor dietary role, but hunting was regionally important to social reproduction and landscape enculturation. Meat from livestock was central to commensal reinforcement of collective solidarity in the face of tensions arising from household-level storage of staple crops and perhaps ownership of land. Radical changes in cultural landscapes, social relations, and ideology accompanied the inception of farming, and domesticates were as important to early farmers' political economy as to their subsistence.

Keywords: Neolithic, southern Europe, early farmers, land use, staple crops, livestock, garden cultivation, commensality

Introduction

'SUBSISTENCE' practices in Neolithic Europe are often subordinated to debate over the agents of Neolithization. This debate equates migrating farmers versus acculturated foragers with rapid versus gradual establishment of farming, a packaged versus piecemeal Neolithic, and 'economic' versus 'ideological' underpinnings of subsistence change. Framing subsistence as a reflection of origins, however, ignores its potential for inferring the *consequences* of Neolithization, which are both more significant for understanding long-term social development and more accessible archaeologically. Whilst farmer origins can only be resolved through ancient human DNA, the rhythms, taskscapes, and sociality of

subsistence practice offer rich insights into the construction and development of Neolithic societies and social identities.

Fig. 20.1. Sites in south-east Europe mentioned in the text.

1, Kalythies; 2, Knossos; 3, Alepotrypa; 4, Kouveleiki; 5, Franchthi; 6, Kastria; 7, Zas; 8, Kefala; 9, Kitsos; 10, Skoteini; 11, Theopetra; 12, Youra/Cyclops cave; 13, Makriyalos; 14, Paliambela-Kolindrou; 15, Stavroupoli; 16, Anza; 17, Kovacevo; 18, Slatina; 19, Blagotin; 20, Divostin; 21, Selevac; 22, Vinča; 23, Starčevo; 24, LepenskiVir; 25, Ecsegfalva 23; 26, Méhtelek-Nádas; 27, Polgár-Csőszhalom; 28, Schela Cladovei; 29, Măgura-Buduiasca; 30, Poduri.

Fig. 20.2. Sites in south-west Europe mentioned in the text.

1, Grapceva; 2, Danilo; 3, Prokovnik; 4, Bukovic; 5, Tinj-Podlivade; 6, Nin; 7, Pupicina; 8, Mala Triglavca; 9, Ciclame; 10, Zingari; 11, Edera; 12, Mitreo; 13, Nogaredo al Torre; 14, Sammardenchia; 15, Pianca-da; 16, Molino Casarotto; 17, Lugo di Romagna; 18, Neto-Via Verga; 19, La Marmotta; 20, Villaggio Leop-ardi; 21, Masseria di Gioia; 22, Mulino Sant'Antonio; 23, Passo di Corvo; 24, Scaloria; 25, Santa Tecchia; 26, Rendina; 27, Ipogeo Manfredi; 28, Torre Sabea; 29, Grotta della Madonna; 30, Grotta del Cavallo; 31, Grotta dell'Uzzo; 32, Grotta del Genovese; 33, Arene Candide; 34, Sion Planta; 35, Clairvaux Station III; 36, La Balme de Thuy; 37, Le Chenet des Pierres; 38, La Grande Rivoire; 39, Pendimoun; 40, Fontbrégoua; 41, Baume Ronze; 42, Baume d'Oulen; 43, Combe Obscure; 44, Roucadour; 45, Portiragnes; 46, Abeu-rador; 47, Grotte Gazel; 48, Font Juvénal; 49, Bélesta; 50, Dourgne; 51, Pico Ramos; 52, El Mirón; 53, La Vaquera; 54, La Revilla del Campo; 55, La Lámpara; 56, Chaves; 57, Bauma Serrat del Pont; 58, Cova 120; 59, La Draga; 60, Camí de Can Grau; 61, Cova Fosca; 62, Ereta del Pedregal; 63, Cova de la Sarsa; 64, Arenal de la Costa; 65, Jovades; 66, Mas d'Is; 67, Niuet; 68, Cova del Or; 69, Cova de las Cendres; 70, Cerro de la Virgen; 71, Nerja; 72, Cueva del Toro; 73, Cueva de los Murciélagos; 74, Valencina de la Con-cepción; 75, Zambujal.

This chapter explores Neolithic subsistence practices, land use, and landscape transfor-mation in southern Europe, using relevant datasets such as human skeletal remains for diet, and plant and animal remains for husbandry practices. Because of regional differ-ences in archaeological evidence, formation processes, and research priorities, we focus first on south-east (Greece and the north Balkans—Fig. 20.1) and then south-west Europe (from Dalmatia, through Italy and southern France to Iberia—Fig. 20.2). We conclude by considering what light subsistence practices may shed on social routines at various tem-poral and spatial scales.

(p. 386) Food remains on late Mesolithic sites across this large area indicate hunting of in-digenous mammals (e.g. red deer, boar), fishing and shellfish-gathering (near coasts, lakes, and rivers), and collecting of nuts, fruits, and seeds. Occasional claims of domesti-cates in Mesolithic levels of caves or rock shelters (e.g. Cyclops and Theopetra, Greece;

Abeurador, Fontbrégoua, Dourgne, and Gazel, France; Costa, Spain) appear to be based on misidentification or stratigraphic mixing. At most early Neolithic sites, especially in south-east Europe, bones of domestic sheep, goats, pigs, and cattle predominate alongside cereal and pulse grains; most, if not all, of these domesticates were introduced from south-west Asia. Human skeletal evidence for diet and nutritional health (e.g. Bonsall et al. 2004; Le Bras-Goude et al. 2006; (p. 387) (p. 388) Papathanasiou 2003; Triantaphyllou 2001) offers a coarser, but consistent, picture of radical change in human diet between the late Mesolithic and early Neolithic across much of southern Europe. This transition, in the seventh millennium BC in Greece and sixth millennium in the north Balkans and west Mediterranean, was rapid. Whether it occurred in any one region within a single human generation or over a few centuries is less clear, but apparent examples of *gradual* change from hunting to herding may again reflect stratigraphic mixing (Bernabeu et al. 2001). Because of the uneven availability of absolute dates, much of the discussion here of the subsequent three to four millennia of the Neolithic uses relative chronology: early (EN), middle (MN), late (LN), and perhaps final (FN) Neolithic. These phases do not have the same absolute dates across southern Europe, although EN usually refers to the first centuries following the Mesolithic–Neolithic transition.

Models and methods

The nature of settlement constrains subsistence options: increasing community size *enlarges* the territory needed for subsistence, whilst sedentary behaviour *restricts* the area exploitable. Accordingly, large sedentary communities need locally concentrated, predictable resources, whilst small mobile groupings can exploit more dispersed, unpredictable options. In south-east Europe, EN sites, concentrated in fertile lowland basins, initially comprised just a few houses, but many developed into deeply stratified and densely inhabited settlement mounds or ‘tells’. These represent long-lived or repeatedly occupied ‘villages’ ranging from several tens to a few hundred inhabitants (Raczky, this volume). Other open sites with more unstable or dispersed residence sometimes developed into ‘flat-extended’ settlements covering tens of hectares, making contemporaneity of housing much harder to gauge; given their large area and short duration, these sites perhaps represent a distinctive form of ‘village’. In the later Neolithic, agriculturally marginal (arid and dissected) parts of southern Greece were colonized by short-lived open sites, often representing a ‘farmstead’ or ‘hamlet’ of one or a few households. In south-west Europe, EN settlements seemingly include equivalents of both small ‘farmsteads’/‘hamlets’ and larger ‘villages’, with the same contrasting implications for subsistence options (Skeates, this volume ch. 41).

Different types of site also shape the survival and contextual resolution of bioarchaeological evidence. Tells provide better conditions for bones and charred seeds than shallow open-air sites, where seasonal wetting and drying affect deposits. Conversely, on shallow sites, pits and ditches cut into bedrock may combine good organic preservation with clearer contextual definition than is normal in complex tell deposits, although the latter more often preserve invaluable burnt occupation levels. In caves, stable temperatures aid

organic preservation, but natural and cultural reworking may conflate deposits. Moreover, caves often had specialized functions (burial, stabling, storage), in contrast to open-air habitation sites. These differences are critical given that evidence for Neolithic settlement and subsistence is overwhelmingly derived from open-air sites in south-east Europe, but extensively from caves and rock shelters in the south-west. (p. 389) A further issue affecting archaeobotanical evidence is the predominance of *charred* preservation in southern Europe. At rare sites with charred *and* waterlogged preservation, charring clearly favours stored plant foods used year-round against those eaten in season. Rarity of charred wild plant foods implies that these were not stored staples, therefore, rather than that they were not consumed.

Models of prehistoric farming in southern Europe have often focused on two perceived characteristics of pre-mechanized farming: extensive cereal agriculture, with plough oxen and tilled fallow; and large seasonally transhumant herds of goats and especially sheep grazing lowland stubble and fallow fields in winter and mountain pastures in summer. These practices were shaped as much by historical contingencies (e.g. inegalitarian land tenure, urban markets), however, as by environmental constraints and technology. Whilst extensive farmers and large-scale herders specialized in 'cash crops' (wheat, olive oil, wool, cheese), smallholders practised more intensive, integrated husbandry of a variety of crops and animals, ploughing with cows and/or digging manually, engaging in labour-intensive weeding and cereal–pulse rotation, and producing food and raw materials primarily for domestic consumption. The following discussion explores whether Neolithic land use better matches the large-scale, extensive, specialized or small-scale, intensive, diversified end of this spectrum. Per unit of cultivated land or livestock, 'intensive' husbandry is associated with higher yields, but also higher labour inputs, such that 'extensive' husbandry on a large scale is the usual basis of *surplus* production. (Spring sowing of untilled lake or river margins has been claimed to achieve the ideal combination of *low inputs* and *high yields*, but recent, opportunistic cases of 'floodplain cultivation' resulted in frequent failures as well as occasional bumper harvests.) For domestic self-sufficiency, intensive cultivation on a modest scale is adequate, although animal husbandry is less productive per unit of land than crops so that only a large-scale, specialized herding regime would suffice as the mainstay of subsistence.

On-site archaeobotanical data, from storage deposits and processing by-products, shed light on crop diversity, with implications for ecological and dietary stability, as well as social contexts and routines of consumption. Some crops are linked with particular management practices (e.g. labour-intensive pulses with small-scale cultivation), but most such associations relate to crop varieties rather than species and are of questionable relevance to the past. The ecological characteristics of arable weeds are a better guide to the nature and management of cultivation areas.

Neolithic livestock species have complementary ecological preferences and productive potential. Sheep, as specialist grazers, traditionally converted crop stubble and fallow weeds into manure, whilst goats, cattle, and pigs also browsed or rooted in woodland and scrub. Pigs produce most offspring, followed by goats, sheep, and finally cattle. Sheep

and goats were milked more than cattle in southern Europe, whilst pigs especially provided non-dairy fat for cooking and preserving meat. Cattle provided draught: oxen (castrated males) for big landowners, and cows for smallholders. Finally, sheep wool and goat hair were woven into clothing, bedding, and sacks, though the 'hairy' coat of early sheep was less useful. A mixture of livestock species thus favours herd security and self-sufficiency in (p. 390) a range of products, but conflicting feeding requirements limit the number of animals that can be kept. Conversely, a single species reduces security and self-sufficiency, but facilitates maintenance of large herds and specialization in particular products.

The products offered by an animal also depend on age and sex. Culling patterns cannot demonstrate *actual use* for milk, meat, or wool/traction, but clarify *potential intensity* of use and can be tested against life history evidence: for example, stress-related pathologies in cattle limb bones may reflect use as draught animals. Species composition, mortality, and life history thus shed partial but complementary light on the methods and outcomes of animal management. Similarly, food residues in ceramics may demonstrate processing of milk and non-dairy adipose fat, but shed no light on intensity of use. Preservation (mainly waterlogged) of textile fibres and wooden yokes, wheels, or ploughs provides welcome additional detail, but is unusual in southern Europe. Dental microwear sheds broad light on diet, including perhaps the degree of grazing pressure, in the weeks before death. Diachronic changes in biometry and morphology reflect longer-term effects of management: for example, poor nutrition favours smaller body size and competition between adult males for mates the reverse.

Stable carbon and nitrogen isotope ratios in bone collagen and tooth enamel provide *direct* evidence of human diet, albeit at coarse resolution (e.g. marine versus terrestrial). Attempts to identify terrestrial Neolithic diets as crop or animal-based are problematic since they depend on *local* isotopic signatures in animals *and* plants, and the latter are usually unknown. On-site traces of dung imply availability of 'stall-manure' for distribution and reveal where livestock were sheltered, whilst associated plant remains may shed more detailed light on animal diet than stable isotopes or dental microwear.

South-east Europe

Plant use and husbandry in south-east Europe

Most archaeobotanical evidence derives from open-air sites and is relatively extensive from Greece, the former Yugoslav Republic of Macedonia (FYROM), and Bulgaria. Despite variable sampling and recovery, crops clearly dominate most assemblages from the EN onwards; edible nuts, fruits, and other wild plants occur frequently, but usually at low levels, and evidence of storage is rare. Crops include several types of wheat (einkorn, emmer, free-threshing), barley (hulled, naked), and pulses (lentil, pea, grass pea, bitter vetch, chickpea), all represented by 'storage' finds in Bulgaria (Marinova 2007) and most likewise in Greece (Halstead 1994). In recent multi-site programmes of intensive sam-

pling and recovery in Greece (Valamoti 2004, 2005) and Bulgaria (Marinova 2006), 'flat' sites with relatively thin occupation layers such as Kovacevo yielded lower densities of charred crop remains than tells with deep deposits. Differences in preservation conditions rather than commitment to agriculture have thus shaped much of the observed variability in archaeobotanical representation of crops.

(p. 391) Burnt houses with *in situ* stores suggest household production and consumption of a range of cereals and pulses. Bulgarian house stores such as those recovered at Slatina (Marinova 2006) suggest that mixed harvests of einkorn and emmer wheat were the dominant staple, stored as ears or spikelets (grains enclosed by chaff) requiring piecemeal dehusking. Harvesting of ears only has been inferred from the heights of weeds (Kreuz et al. 2005; Marinova and Thiébault 2008). In such stores, pulses tend to account for 20–30% by volume relative to cereals—a high proportion compared with recent extensive agriculture.

Early Neolithic (Starčevo-Criş-Körös, sixth millennium BC) settlements from Serbia, south-east Hungary, and southern Romania are predominantly 'flat-extended'. Published archaeobotanical data are sparse but include multiple cereals and pulses. For example, einkorn, emmer, barley (mostly hulled), lentil and pea, as well as wild Cornelian cherry, are known at several Starčevo sites (Borojevič 2006, table 2.5). In Hungary, systematic flotation at Ecsegfalva 23 has yielded einkorn, emmer, and barley, with traces of other cereals and lentil; collected wild plants included water chestnut, strawberry, and hazelnut (Bogaard et al. 2007). Elsewhere, evidence of Körös use of wild plants includes a layer of hazelnut shell in a pit at Méhtelek-Nádas (Gyulai 2007). In Romania, large-scale recovery at 'flat-extended' Măgura-Buduiasca yielded remains of a range of cereals and pulses (Walker and Bogaard 2011). Crop diversity at these north Balkan sites, however, is less than in the southern Balkans and Greece, as typically 'Mediterranean' pulses (grass pea, chickpea) are absent in the earlier Neolithic. The formation of 'tells' in the north Balkan LN/Chalcolithic coincides with a major increase in available data, including burnt house assemblages of diverse crop 'stores' (Gyulai 2007), confirming that the low density of plant remains on 'flat' sites is a function of preservation.

Pollen analyses (Willis and Bennett 1994) and on-site charcoal (Ntinou and Badal 2000; Marinova and Thiébault 2008) suggest very limited clearance of woodland. Arable weed assemblages from the southern Balkans, especially rich in Bulgaria (Marinova 2006), suggest permanent cultivation plots: few woodland taxa but many of disturbed habitats imply plots established for 5–10 years at least (cf. Bogaard 2002). Ecological analysis further suggests autumn sowing, excluding spring sowing of floodplains. Bulgarian assemblages contain the mixture of 'root-/row-crop weeds' and 'cereal weeds' characteristic of small-scale and intensive cultivation (Jones et al. 1999). Sheep/goat dung implies herding near settlements, compatible with small-scale animal husbandry. In the northern Balkans, potential arable weeds at EN Ecsegfalva 23 and Măgura-Buduiasca also suggest long-established, intensively managed plots, which at the former site could be accommodated within areas of dry ground above seasonal floods (Bogaard et al. 2007).

Animal exploitation in south-east Europe

Despite variation in preservation and recovery, faunal assemblages exhibit some recurrent trends, especially when small samples (less than 400 identified specimens) are excluded. Domesticates usually make up more than 95% of the mammals on Neolithic (p. 392) open sites in Greece (Cantuel et al. 2008) and similarly dominate EN assemblages from Anza in FYROM (Bökönyi 1976), through Starčevo (following Legge 1990) and Divostin (Craig et al. 2005) in Serbia, to Ecsegfalva 23 in the Hungarian plain (Bartosiewicz 2007a). In central Greece, evidence for hunting, especially of large game (red deer, boar), increases modestly in the LN (fifth to fourth millennium BC) (von den Driesch 1987) and sharply (to 10–50%) on some Bronze Age open sites. A more rapid increase occurs in the LN (fifth to fourth millennium BC) north Balkans: at Vinča (Dimitrijevič 2008), Selevac (Legge 1990), and Polgár-Csöszhalom (Bartosiewicz 2005). Both large (especially red deer and boar) and small mammals are represented in late Mesolithic levels at Franchthi cave in southern Greece and sites such as Lepenski Vir in the Iron Gates gorge between Serbia and Romania. The contrasting scarcity of EN evidence for hunting recurs from the relatively arid and lightly wooded south of Greece, through the better-watered and more densely wooded valleys of Serbia, to the seasonally inundated Hungarian plain, and so, excluding the Greek islands, is unlikely to reflect availability of game. Interpreting this apparent avoidance of hunting (Bartosiewicz 2005, 60; 2007a, 298–299) in terms of the 'domestic' symbolic concerns of colonist farmers (Hodder 1990) is favoured by EN avoidance of antler for tools or ornaments and the contrasting LN mortuary deposition of ornaments made from boar and red deer teeth in Hungary (Bartosiewicz 2005, 58). Small game, however, is not avoided (von den Driesch 1987): EN sites in Greece (Cantuel et al. 2008) and Anza in FYROM (Bökönyi 1976) have yielded mammals such as hare, fox, cat, marten, and roe deer and wetland sites on the Hungarian plain also an impressive diversity of birds and fish (e.g. Gál 2007; Bartosiewicz 2007b). Similarly, comparison of worked and unworked bone at LN (sixth to fifth millennium BC) Makriyalos in northern Greece reveals that domesticates and *small* game were selected, and *large* game avoided, as raw material for artefacts (Isaakidou 2003). Large game, therefore, normally subject to greater obligations of sharing than small game or domesticates (cf. Barnard and Woodburn 1991), might have been hunted by early farmers, but consumed (collectively?) away from excavated open settlements.

Sheep are the predominant domesticate, especially in the earlier Neolithic, at open sites in Greece and FYROM and on the Hungarian plain (Bökönyi 1976; Bartosiewicz 2007a; Cantuel et al. 2008; Halstead 1996), although cattle are equally frequent at Divostin in Serbia (Craig et al. 2005). In the LN, sheep give way to cattle or pigs, most rapidly and sharply in the north Balkans (Bartosiewicz 2005; Dimitrijevič 2008; Greenfield 1999; Legge 1990). Cantuel et al. (2008, 287) attribute the EN dominance of sheep (grassland animals) in a more or less wooded landscape to early farmers' lack of expertise, and Whittle and Bartosiewicz (2007, 741) to the cultural conservatism of colonists. Bökönyi (1973, 168) argued that livestock reproduced too slowly for early farmers to adjust herd composition to local environments, but goats and especially pigs are more prolific than sheep and could rapidly have outnumbered them if farmers wished. The dominance of sheep

would be unsurprising, however, if livestock were few and often confined to cleared plots (stubble, fallow, field margins, sprouting cereals) rather than being numerous and ranging widely across the landscape (Halstead 2006). Several lines of evidence are consistent with initially small-scale animal husbandry. First, pollen and (p. 393) charcoal fail to register the impact of early farmers on vegetation. Second, biometric distinction between large wild and smaller domestic cattle and pigs becomes increasingly clear through the Neolithic (von den Driesch 1987; Legge 1990), implying limited interbreeding (as do DNA and aDNA) between domestic and wild populations. The difficulty of isolating modern free-range pigs from wild boar suggests early domesticates were few enough to be herded closely or corralled. Third, dental microwear in sheep and goats from EN Ecsegfalva 23 in Hungary (Mainland 2007) and LN Makriyalos in northern Greece (Mainland and Halstead 2005) reveals a very abrasive diet, implying restriction to heavily overgrazed or freshly cultivated pasture. Early livestock in south-east Europe, therefore, were probably few in number and often enclosed on cleared land—an anthropogenic niche ideal for sheep. Conversely, increasing proportions of cattle and/or pigs in the LN may reflect larger numbers of livestock exploiting the landscape more extensively and, in Greece, *possibly* leaving their imprint in the palynological and geoarchaeological records (Willis 1994; van Andel et al. 1990).

Sheep exhibit a ‘meat’ culling strategy (slaughter of juvenile–sub-adult males, retention of adult females) from Greece (Halstead 1987, 1996; Helmer 2000; Isaakidou 2006) to the north Balkans (Bökönyi 1971, 650; Greenfield 2005; Legge 1990; Bartosiewicz 2007a, 300; Dimitrijevič 2008). Data are sparser for goats and cattle, but ‘meat’ mortality is evident for both at EN–FN Knossos on Crete (Isaakidou 2006) and for cattle at EN Blagotin (Greenfield 2005) and LN Selevac (Legge 1990) and Vinča in Serbia (Dimitrijevič 2008); exceptions (e.g. EN Ecsegfalva 23—Bartosiewicz 2007a) may be due to small sample size. A ‘meat’ strategy does not preclude modest exploitation for secondary products, however, and organic residues in ceramics indicate milking at least in the sixth millennium BC at LN Stavroupoli in northern Greece (Evershed et al. 2008) and EN Ecsegfalva 23 and Schela Cladovei in the north Balkans (Craig et al. 2005). Likewise, at Neolithic Knossos, numerous ‘pathological’ traces in adult *cows* suggest use for traction, albeit on a smaller scale than is possible with *oxen* (Isaakidou 2006, 2008). Similar traces are reported in smaller numbers elsewhere in Neolithic south-east Europe (e.g. Poduri, Romania—Balasescu et al. 2006).

‘Meat’ mortality precludes specialized dairying, however, and this, coupled with initially small-scale animal husbandry, means that the dietary staples were grain crops, although animal produce doubtless improved the nutritional balance, security, and variety of the food supply and was perhaps doubly important because of the social contexts in which it was consumed (see ‘Synthesis: subsistence and society in Neolithic southern Europe’). Livestock were also probably integral to early crop husbandry: manure of animals confined on arable land would have contributed to soil fertility, sheep perhaps controlled the resulting risk of ‘lodging’ (stem collapse) by light grazing of sprouting cereals, whilst cows pulling an ard (scratch-plough) or a sledge loaded with stall-manure could have enabled intensive cultivation on a larger scale. Ploughing also aids timely sowing and so re-

duces the risk of crop failure, particularly in southern Greece where severe summer drought places sowing under acute time stress (Isaakidou 2008). This underlines the importance of early draught cattle at Knossos.

(p. 394) The open settlements in fertile lowlands that dominate the Neolithic record of south-east Europe were probably occupied year-round (e.g. Bartosiewicz 2007a, 2007b; Gál 2007; Halstead 2005), but early farmers must also have ranged regularly beyond their homes and gardens for medicinal plants, raw materials, pasture or game, and social contacts. Such forays are perhaps reflected in the abundance of game (much higher than on the nearby Hungarian plain) at EN open sites in the Iron Gates gorge (Bartosiewicz 2007a). Stable isotopic analysis of human remains here and at Theopetra cave in central Greece suggests a 'Neolithic' diet (Bonsall et al. 2004; Papathanasiou 2003), perhaps reflecting links to nearby settlements with greater arable potential. There is no evidence that EN farmers regularly moved long distances or established distant 'satellite' sites in the context of seasonal herding or hunting.

In southern Greece, sparse EN settlement in fertile valleys expanded in the LN to areas less favourable to grain crops because of low rainfall or poor soils. Alongside established 'villages', small, short-lived sites proliferated and the use of caves increased dramatically. The agriculturally marginal location of many new sites has been interpreted in terms of seasonally mobile pastoralism (e.g. Sampson 1992) and traces of dung indicate penning of animals in Kitsos (Brochier et al. 1992, 48) and Kouveleiki A (Karkanas 2006) caves. At the small open site of Kefala and caves of Kalythies, Kastria, Skoteini, and Zas, goats are more frequent and cattle and pigs less so than at contemporary villages (Halstead 1996, 31, fig. 2), consistent with herding on a scale large enough to require adjustment to local landscape. 'Meat' mortality for sheep and goats again precludes specialized dairying (Halstead 1996), however, whilst isotopic and pathological evidence from human skeletons implies a crop-based diet at both inland (Kouveleiki, Skoteini) and coastal (Alepotrypa) caves and the Kefala hamlet (Papathanasiou 2003). Some caves have yielded remains of cereals and pulses, although it is not clear whether crops were grown locally, whilst others were used for burial; increasing evidence for use of caves perhaps reflects changes in social practices as much as subsistence routines. LN–FN marginal colonization by small open sites and perhaps caves thus seemingly replicated the mixed farming of earlier Neolithic villages. Any expansion in the scale of herding apparently did not weaken dietary dependence on grain crops, although more frequent crop failures in marginal areas probably made livestock more important as an emergency food source.

South-west Europe

Plant use and husbandry in south-west Europe

Archaeobotanical evidence from Dalmatia has been limited by a research focus on caves in karstic terrain unsuitable for agriculture (Moore et al. 2007a). Crops are therefore lacking even for periods when cultivation is beyond doubt (Forenbaher and Miracle

2005). However, recent large-scale sampling has recovered EN cereals (barley, emmer, (p. 395) einkorn), pulses (lentils, grass pea), flax, and wild fruits from the open settlement of Prokovnik (Moore et al. 2007b) and a similar spectrum from the MN settlement of Danilo (Moore et al. 2007a).

Data from Italy derive mostly from open-air sites, but two caves are noteworthy. At Uzzo in Sicily (Costantini 1989), Mesolithic levels yielded sparse wild legumes, fruits and nuts (strawberry tree, acorn, grape), whilst the earliest Neolithic yielded a range of cereals (einkorn, emmer, barley) and pulses (lentil, grass pea, or vetchling), as well as olive and figs. In north-west Italy, EN remains from Arene Candide include a range of cereal types (Binder and Maggi 2001). The rarity of cereal chaff and weed seeds from central-western Mediterranean cave sites arguably reflects processing at habitation sites elsewhere (Zapata et al. 2004; Peña-Chocarro 2007).

Sparse data from open-air sites in central and southern Italy suggest cultivation of multiple cereals (barley, einkorn, emmer, free-threshing wheat) and pulses (pea, lentil, vetches, broad bean) (Rottoli and Pessina 2007). Waterlogged preservation at sixth millennium BC La Marmotta confirms a similarly broad spectrum, alongside oil-seed crops (flax, opium poppy) and a range of wild plants. Grape remains may suggest viticulture. Together with evidence from Iberia (see below, this section), abundant poppy remains from La Marmotta indicate cultivation of this species within its natural central-west Mediterranean distribution area by the mid-sixth millennium BC. Opium poppy currently provides the clearest botanical case of local domestication in Neolithic Europe.

A similar diversity of cereals (barleys, emmer, einkorn, free-threshing wheat), pulses (pea, lentil, bitter vetch, grass pea), and fruits/nuts (hazelnut, apple, acorn, blackberry, hawthorn, plum, grape) characterizes sites in northern Italy, such as mid-sixth to mid-fifth millennium BC Sammardenchia (Rottoli and Pessina 2007). A burned house at Lugo di Romagna provides a snapshot of household-level plant use, including emmer (in store), barley, free-threshing wheat and a little einkorn, peas, lentils, acorns, and hazelnuts (Rottoli and Pessina 2007). The role of wild plant foods is underlined by frequent concentrations of acorn shell (Rottoli and Castiglioni 2008).

In southern France, the scarcity of archaeobotanical data from EN (Cardial) caves and rock shelters has been linked with slow uptake of farming relative to pottery and domestic animals but probably reflects site type and location (Mills 1984). Though sparse, data suggest use of a range of cereals, including einkorn, emmer, free-threshing wheat, and naked barley (Hopf 1991). Limited archaeobotanical investigation of MN (Chasséen) open-air sites suggests use of bitter vetch and broad bean alongside cereals (Hopf 1991; Marinval 1991). Intensive sampling and flotation at a high-altitude MN (mid-fifth to mid-fourth millennium BC) open-air site, Le Chenet des Pierres in the French Alps, has revealed abundant evidence for cereals (especially naked wheat and barley), pea, opium poppy, arable weeds, and collected fruits and nuts (Martin et al. 2008). Together with regional ethnohistorical and palynological evidence, the assemblage suggests high-altitude

farming as a possible alternative to widely assumed seasonal transhumance between plains and mountains (see ‘Animal exploitation in south-west Europe’).

(p. 396) Open-air sites in Iberia have yielded crop processing residues (chaff as well as grain) lacking at cave sites (Zapata et al. 2004; Stika 2005). The partially submerged later sixth millennium BC open site of La Draga in Catalonia exemplifies the contrasting preservational biases of charring (evidence for cereals and pulses) versus waterlogging (evidence for gathered wild plants) (Buxó et al. 2000; Buxó, pers. comm.). Iberian cave sites co-existed with open settlements and probably served specialized purposes such as animal shelters. Archaeobotanical datasets from EN caves in Catalonia range from a lack of crop remains at Bauma Serrat del Pont to multiple cereal and pulse crops at Cova 120 (Buxó 2007; Zapata et al. 2004). Further down the Mediterranean coast, caves provide most of the available evidence, encompassing cereals, pulses, and wild plants, especially acorns (Buxó 2007; Zapata et al. 2004). In Andalusia, Cueva del Toro yielded a wide spectrum of cereals (emmer, free-threshing wheat, naked barley) and pulses (pea, lentil, broad bean, bitter vetch, grass pea), and Cueva de los Murciélagos mid-sixth millennium BC opium poppy alongside free-threshing wheat, emmer, and naked barley (Peña-Chocarro 2007). In north-central Iberia, La Vaquera cave yielded a range of cereals and two pulses (lentil, vetch) as well as acorns and grapes; a lack of chaff contrasts with finds of chaff and grain at open-air La Lámpara and La Revilla del Campo in the northern Meseta (Peña-Chocarro 2007; Stika 2005). In mostly fifth millennium BC assemblages from caves in north-west Spain, Pico Ramos seems specialized in wild resources, whilst others (e.g. El Mirón) yielded sparse remains of cereals alongside domestic fauna (Zapata et al. 2004; Zapata 2007).

Wood charcoal from caves and rock shelters in north-west Italy and southern France (Thiébault 2001, 2005; Vernet 2005) generally suggests weak EN human impact on woodland in karstic hill and mid-altitude mountain zones. Increased evergreen oak and *garigue* scrub plants from the MN onwards may reflect use of deciduous oak, ash, and other species for leaf fodder. The scale of EN–MN upland herding probably varied across the western Mediterranean but was apparently modest compared with recent practice (see ‘Animal exploitation in south-west Europe’) (Thiébault 2001; Delhon et al. 2009).

Caves used as animal pens (*grottes bergéries*) have been identified from dung deposits and shed deciduous teeth (see ‘Animal exploitation in south-west Europe’). Archaeobotanical analysis of burnt dung layers at early fifth to mid-third millennium BC La Grande Rivoire suggests leaf and twig foddering using oak, ash, lime, and hazel, echoing evidence from Alpine Foreland lake villages (Delhon et al. 2008) and supporting previous charcoal- and pollen-based inferences at cave sites across the French Alps (e.g. Thiébault 2005). Given the opportunistic nature of gathering *twig* fodder during winter/early spring, and the high labour costs of gathering and storing *leafy* fodder, evidence of both practices at upland and lowland/lakeshore sites suggests herding on a small scale. The same may be argued for south-east Spanish caves (Badal 2002, 143).

South-west European weed assemblages are generally too sparse for in-depth ecological analysis, but the taxa attested suggest established plots rather than shifting cultivation (e.g. Rottoli and Pessina 2007; Stika 2005; cf. Bogaard 2002). Relatively abundant evidence from LN Clairvaux Station III, Chalain in the French Jura suggests cereal husbandry akin to intensive ‘gardening’ (Lundström-Baudais 1986).

(p. 397) Animal exploitation in south-west Europe

Although faunal analysis has focused on caves and rock shelters, fairly consistent evidence is emerging from lowland open settlements. In Dalmatia, lowland EN–MN (sixth millennium BC) villages at Pokrovnik, Danilo, Nin, and Tinj-Podlivade resemble those in Greece and the eastern Balkans: very sparse evidence for hunting (mainly small game at Pokrovnik and Danilo) and heavy dominance of sheep, which exhibit ‘meat’ mortality (Legge and Moore 2011; Miracle 2006; Mlekuz 2005). In southern Italy, early Neolithic (sixth to fifth millennium BC) ditched enclosures as at Passo di Corvo, Rendina, and Santa Tecchia (see Skeates, this volume ch. 41) likewise have little evidence for hunting and sheep/goats account for 50–65% of domesticates, with sheep/goats and cattle at Torre Sabea again matching ‘meat’ mortality (Vigne 2003). The nature of animal exploitation at many smaller open settlements is largely unknown. In lowland central Italy, domesticates predominate in small samples from EN (sixth millennium BC) open settlements at Villaggio Leopardi and La Marmotta (Cassoli and Tagliacozzo 1995). On the coast of southern France, the EN open settlement at Portiragnes displays little hunting and specialization in sheep that exhibit ‘meat’ mortality (Tresset and Vigne 2007; Vigne and Helmer 2007, 25, fig. 6). In Spain, there is growing evidence for EN *open* settlements, which include substantial ditched enclosures as at Mas d’Is (Bernabeu et al. 2003), but faunal evidence is still sparse. Domesticates make up 93% of the sample from EN La Draga, with sheep/goats most abundant and mortality among sheep/goats and cattle conforming to a ‘meat’ strategy (Saña 2000).

With EN open settlements displaying scarcity of game, predominance of sheep (/goats) over cattle and pigs, and ‘meat’ mortality, faunal as well as archaeobotanical evidence broadly resembles that from south-east Europe and a similar regime of small-scale, integrated mixed farming has been suggested (Bernabeu et al. 1995, 269–281; Robb and Van Hove 2003). Early predominance of sheep is often less marked than in south-east Europe (though most Italian assemblages are small or cover broad temporal spans), but coastal sites in southern France and eastern Spain, specializing in sheep, have been interpreted as ‘beachheads’ of colonist farmers (Vigne 2000).

Later Neolithic open sites to varying degrees display the more even balance of domesticates seen in south-east Europe. In Dalmatia, sheep(/goats) were heavily dominant in the EN, but drop to *c*. 60% of domesticates at FN Bukovic (Miracle 2006). In Italy, at MN–LN Masseria di Gioia and FN Neto-Via Verga, small samples are again inconsistent. Southern Iberia is more informative, though LN–Copper Age (fourth to third millennium BC) open sites must be compared with EN caves such as Cendres, Nerja, Or, and Sarsa (Pérez Ripoll 1999). At the latter, sheep are the commonest domesticate, followed by pigs, with

goats and cattle scarce, whilst on later open sites these four species are fairly evenly represented. Although the EN caves were apparently not specialized herding sites (see below, this section), the trend from sheep at EN caves to goats at later open sites, which does not match *local* grazing conditions, suggests an (p. 398) *overall regional* expansion of animal husbandry (Pérez Ripoll 1999, 98), as has tentatively been proposed for LN south-east Europe. Charcoal data, however, suggest that the combined impact of crop and livestock husbandry on local vegetation was modest until the third millennium BC (Badal et al. 1994). Mortality data for the LN–Copper Age show high proportions of juvenile and sub-adult deaths for combined sheep and goats, consistent with management primarily for meat. An exception is third millennium BC Arenal de la Costa, where goats outnumber sheep and many animals reached old age. Together with much higher adult male survivorship for sheep than goats at third millennium BC Cerro de la Virgen, Valencina de la Concepción, and Zambujal, this implies management for different goals: sheep for meat (and conceivably wool); goats for milk (Pérez Ripoll 1999). The survival of most cattle to adulthood (with 20–40% achieving old age at fourth millennium BC Jovades and third millennium BC Ereta del Pedregal, Arenal de la Costa, and Cerro de la Virgen) and high proportions of adult males (including probable castrates) favour traction, as do ‘traction pathologies’ (Pérez Ripoll 1999). Unfortunately, faunal evidence is insufficient to explore the relationship between animal husbandry strategies and different types and sizes of sites.

At Molino Casarotto (*c.* 5000 BC) in the Alpine foothills of north-east Italy, lake-side huts with ceramics are associated with sparse remains of domestic animals and crops, but abundant red deer, boar, and gathered water chestnuts (Jarman 1971), whilst EN (sixth millennium BC) open sites further east, at Piancada and Nogaredo al Torre, are overwhelmingly dominated by domesticates. Only regional-scale analysis of seasonality and *human* mobility will clarify whether Molino Casarotto represents limited adoption of domesticates by foragers or seasonal foraging by farmers. In north-east Spain, EN open sites with domesticates and caves with mainly wild fauna (e.g. Chaves, Fosca) raise similar questions. Likewise, on the Atlantic coast of north-west Spain, domesticates are increasingly documented from the fifth millennium BC, but wild plants and animals predominate at some sites (González Urquijo et al. 1999). In the extremely heterogeneous western Alps, however, where domesticates predominate at EN open sites in valleys (e.g. Sion Planta), it seems implausible that caves with mainly wild animals (e.g. La Balme de Thuy) represent independent groups of foragers (Chaix and Sidi Maamar 1993).

Open-air sites devoted largely to hunting are also known from the LN, as at fourth millennium BC Roucadour or Mulino Sant’ Antonio (Albore Livadie et al. 1987–88) in the hills of southern France and southern Italy respectively. In southern Italy, ceremonial deposition of deer crania in the Ipogeo Manfredi and of wild animal bones in Grotta Scaloria, and use of deer canines as personal ornaments, all underline the symbolic importance of game (Robb 2007, 128). In north-east Spain bones of wild animals are selected in fourth millennium BC graves at Camí de Can Grau (Gibaja 2004). Painted human and animal representations in southern Italian caves, such as Grotta del Genovese, suggest a link between hunting and rites of social reproduction (Pluciennik 2002; Skeates 1994). The same may be argued for the potentially LN rock art in eastern Spain (McClure et al. 2008). The

performance of these rites at a distance from agricultural settlements presumably played a part in regional-scale social integration and landscape enculturation (e.g. Bernabeu et al. 2003).

(p. 399) The use of caves to shelter livestock is widely attested in southern France, eastern Spain, northern and southern Italy, and along the eastern side of the Adriatic (e.g. Boschian and Montagnari-Kokelj 2000; Brochier et al. 1992). A distinction must be drawn, however, between the presence of dung with rich cultural material (e.g. Font Juvénal rock shelter, south-west France—Brochier 1991, 306), implying management of livestock among other activities, and thick layers of dung with little cultural material, reflecting specialized use for penning livestock. In southern France, specialized *grottes bergéries* seem particularly characteristic of the MN (fifth to fourth millennium BC) Chasséen period, with more mixed use attested before and afterwards (Brochier 1991, 2006). Corralling of livestock in caves likewise began, or intensified, a few centuries into the local Neolithic at Edera, Zingari, and perhaps Pupicina in the Istrian karst (Boschian and Montagnari-Kokelj 2000; Forenbaher and Miracle 2005), at Arene Candide on the coast of north-west Italy (Courty et al. 1991), and at Cendres in eastern Spain (although loss of cultivable land to rising sea level may have been a factor in the last case). From a few centuries after the inception of farming, therefore, in several regions of south-west Europe, livestock were sheltered in caves in greater numbers or for longer periods and, at Cendres, charcoal registers their impact on local vegetation (Badal 2002). MN livestock numbers remained well below the level needed to create the ‘degraded’ landscapes of the recent past, however, and at Bélesta cave in the Pyrenean foothills did not significantly transform vegetation until the Bronze Age (Brochier et al. 1998).

The scarcity of cultural material in *grottes bergeries* implies primary human habitation elsewhere. Moreover, whilst shed milk teeth (fallen from *live* animals) are present in some of these caves (e.g. Baume Ronze), their absence in others implies removal of at least part of the herd (Brochier 2006; Helmer et al. 2005) for at least part of the year. ‘Home’ settlements were perhaps not adjacent to the caves given that accumulations of dung were left *in situ* rather than removed to fertilize arable plots (Brochier 2006, 141), but hints of year-round slaughter at caves across the region (Forenbaher and Miracle 2005; Helmer et al. 2005, 180; Rowley-Conwy 1991) imply a distance that could be covered in hours rather than days. Caves with Neolithic evidence for penning of livestock are mostly at low to medium altitudes (0–600m) and several have faunal evidence (newborn lambs or kids, shed deciduous teeth of young adult sheep or goats) of late winter–early spring use (Forenbaher and Miracle 2005; Helmer et al. 2005; Rowley-Conwy 2000). Possibly livestock were removed in late winter from open settlements, where very young lambs and kids are scarce (Helmer et al. 2005), to safeguard growing crops or to shelter in caves from cold weather (especially important for pregnant/lactating females and newborn offspring). Neolithic flint scatters have been found above 1900 m in the southern French Alps (Walsh et al. 2006), close to potential summer pasture, but faunal remains from mid-altitude caves provide as much evidence of hunting as herding (e.g. Chaix and Sidi Maamar 2003). There is no hint that MN *grottes bergeries* were integrated in long-distance transhumant pastoralism (Brochier 2006) and some subsequently saw more intensive

habitation and a more diverse domestic animal fauna, suggesting use as (or proximity to) mixed farming residential bases (Brochier 2006, 147–148). The same (p. 400) trend is apparent east of the Adriatic, at Pupicina (Forenbaher and Miracle 2005) and perhaps Grapčeva (Miracle 2006), and in southern Greece, at Zas. *Grottes bergeries* may thus represent a short-term phase in the expansion of mixed farming, rather than the development of specialized pastoralism.

Milk residues have been found in EN pottery from Mala Triglavca rock shelter in Slovenia (Soberl et al. 2008), and early lamb or kid mortality consistent with intensive 'milk' management at several caves across the region from Ciclami, Edera, Mitreo, Pupicina, and Zingari at the head of the Adriatic (Miracle 2006; Mlekuz 2005) to EN Arene Candide (Rowley-Conwy 2000) and MN Combe Obscure (Vigne and Helmer 2007) further west. 'Milk' mortality could be an artefact of seasonal use of caves, around lambing/kidding time, but is encountered in caves with evidence of slaughter in other seasons too (Mlekuz 2005). Moreover, contrasting levels of infant mortality for sheep and goats at EN–MN Arene Candide (Rowley-Conwy 2000) and EN Baume d'Oulen (Helmer et al. 2005) suggest a real difference in management goals (as also in LN–Copper Age southern Iberia—see above, this section). Relatively enriched stable nitrogen isotope ratios from Neolithic humans at EN–MN (sixth to fourth millennium BC) Arene Candide and, to a lesser extent, EN (sixth millennium BC) Pendimoun are consistent with diets high in animal protein (Le Bras-Goude et al. 2006).

Dairying yields more energy per animal than consumption of meat alone, but is more labour-intensive and riskier. Neolithic sheep and goats exhibit 'meat' mortality at Cavallo, Madonna, and Uzzo caves in southern Italy (Tagliacozzo 1993, 2000) and at most such sites in southern France (Vigne and Helmer 2007). 'Milk' mortality profiles are restricted to the earlier Neolithic in several caves at the head of the Adriatic (Miracle 2006; Mlekuz 2005), at Arene Candide in north-west Italy (Rowley-Conwy 2000), and (for cattle as well as sheep/goats) in open settlements of the lower Alpine valleys. Dairying was perhaps characteristic of the inception of farming, when limited clearance restricted numbers of livestock, and gave way to less labour-intensive 'meat' management when expanding clearance allowed larger herds (Legge 1981; also Rowley-Conwy 2000).

Synthesis: subsistence and society in Neolithic southern Europe

Stable isotope evidence of the Neolithic human diet in southern Europe points to subsistence on terrestrial plants and animals, the remains of which are overwhelmingly from domestic cereal and pulse crops and livestock. Livestock were exploited for milk as well as meat and, alongside wild resources, contributed to a more diverse and balanced diet. Prevalent 'meat' mortality precludes widespread specialized dairying, however, and implies primary dependence on crops—especially for 'village' communities. At a (p. 401) few caves on the northern margins of the west Mediterranean, however, sheep and/or goat approximate to a 'milk' pattern, especially in the EN. Apparently not just an artefact of

seasonal mobility, this might reflect greater dietary reliance on livestock where cultivation was unreliable, as human stable isotope data from Arene Candide perhaps imply.

Evidence of indoor storage, principally from burnt levels on south-eastern tells and rare south-western waterlogged sites, suggests diversified crop production by small residential groups or 'households', whilst dehusking by-products of hulled wheats on open-air sites are consistent with piecemeal, household-level food preparation. Some Mediterranean pulses did not initially spread to the north Balkans, but farmers grew a wide range of grain crops, thus spreading labour and risk and introducing dietary diversity. Labour-intensive pulses hint at small-scale cultivation, consistent with low anthropogenic impact on local and regional vegetation in charcoal and pollen records, respectively; crop weeds also suggest stable and probably intensive cultivation. Temporal and regional variability in archaeobotanical data arguably reflect differential preservation and retrieval, rather than differences in crop husbandry.

Cattle mortality usually approximates to a 'meat' strategy, but together with 'traction pathologies' suggests draught oxen in south-east Spain in the LN–Copper Age, compatible with Sherratt's (1981) fourth to third millennium BC 'secondary products revolution'. Data from Crete, however, indicate much earlier use of draught *cows*, consistent with small-scale tillage and thus intensive crop husbandry, and suggesting particular reliance on draught cattle where autumn sowing was under greatest time stress. In south-east Europe, early dominance of sheep suggests small-scale herding tied to arable land; later increases in pigs, cattle, or goats may reflect larger numbers making wider use of the landscape, although dental microwear in both periods implies close confinement on disturbed or overgrazed land. In the south-west, species composition displays a similar trend; differences in some regions may partly be due to sampling. Wild animals are scarce on most open settlements, but better represented at some caves and rock shelters especially in the west Mediterranean, where hunting is also celebrated in rock art. Use of wild animal teeth as ornaments in south-west and south-east Europe, however, and the introduction of wild animals to Aegean islands, suggests more widespread cultural significance. Use of caves for burial and herding is better documented in south-west than south-east Europe, probably reflecting regional differences in social reproduction rather than land use; in both regions caves sheltered small-scale, short-distance herding with limited impact on the regional landscape.

With domestic storage and intensive crop husbandry in stable clearings, households probably enjoyed recurring rights to cultivated plots, even if a larger 'village' community undertook clearance, enclosure, and defence. Household control of plots and produce would have reduced risk of underproduction in the face of highly seasonal demands for hard labour, but threatened collective cohesion. Neolithic societies in southern Europe asserted domestic independence through architectural elaboration of houses and communal solidarity through enclosure, burial, and other rites emphasizing collective identity. Rituals in caves confirm that collective identity was bound up with control of the wider cultural landscape, beyond enclosed gardens.

(p. 402) Elaborate ceramic ‘tableware’ stresses the importance of formal commensality. In contrast to domestic storage of staple crops, most livestock were killed too old, and so too big, for consumption by a single household, but carcasses were processed intensively (Halstead 2007; Saña 2000, 160). *Pre*-depositional dispersal of carcass parts at EN–FN Knossos and EN Paliambela-Kolindrou suggests widespread distribution of meat (Isaakidou 2007). Since most domesticates *could* have been slaughtered younger and smaller, they were arguably raised *for* consumption by large social groups. The animals slaughtered ranged from small lambs to large adult cattle, however, so the consumption of meat, and of beverages such as wine or milk (Urem-Kotsou et al. 2002; Valamoti et al. 2007), was probably a vehicle for competition as well as solidarity. At LN Makriyalos, northern Greece, a pit with remains of hundreds of butchered animals, standardized serving vessels, and individualized cups simultaneously signals collective solidarity and intra-communal competition (Pappa et al. 2004). Commensality presupposes surplus, probably intrinsic to grain production in the highly seasonal and somewhat uncertain climate of southern Europe (Halstead 1989). Given unpredictable harvests and labour supply varying over the domestic cycle, early farming households will periodically have under- or overproduced relative to their needs. Surplus grain of limited ‘shelf-life’ could have been used to recruit labour or to fatten livestock for consumption at a feast that would earn political capital and so help recruit labour in future. Although of secondary dietary importance, therefore, livestock were central to Neolithic political economies and their articulation with staple crop production.

Conclusion: from pattern to process

The traditional model of sudden change from mobile Mesolithic foragers to sedentary Neolithic farmers has rightly been questioned. To a surprising degree, however, south-west Asian crop and livestock species were adopted rapidly and as an integrated package across southern Europe. The transition was doubtless gradual and piecemeal on the timescale of human agents, but available temporal resolution obscures this, and much purported evidence for gradual transition may be illusory. Hunting played an important role in Neolithic social reproduction and landscape enculturation, but not normally in subsistence. Neolithic settlement patterns varied regionally and diachronically, as did subsistence practices, but regional variability in archaeo-botanical and faunal data is mainly shaped by archaeological formation processes and research traditions. Available evidence suggests Neolithic populations across southern Europe subsisted primarily on cereal and pulse crops, probably grown under small-scale, intensive, and stable conditions. Livestock were of secondary dietary significance, though integral to crop production and social interaction. Adoption of south-west Asian domesticates was linked with unprecedented forms of social integration (household, local community), property (domestic control of stored (p. 403) crops and probably arable plots), and cultural landscape (often focused on relatively long-lived settlements), making discussions surrounding the relative role of economy and ideology in Neolithization meaningless; much of the elaborate material culture of Neolithic southern Europe may represent strategies for mediating tensions inherent to the new and dynamic social order, domestic economy, and ideology. Despite

adopting a largely common set of domesticates, Neolithic societies across southern Europe exhibit considerable regional, and sometimes local, diversity in strategies of residence, social reproduction, and landscape enculturation. Whether colonists or acculturated foragers were the biological ancestors of Europe's earliest farmers is currently unanswerable, but in any case sheds little light on EN social formations, let alone those that developed over the following three or four millennia. The agency of early European farmers is evident in their diverse mediations of the tensions and contradictions inherent to Neolithic economy and ideology, not in obedience to environmental constraints or cultural templates.

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