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978-0-521-10881-2 - The Wild and the Sown: Botany and Agriculture in Western Europe, 1350-1850

Mauro Ambrosoli

Excerpt

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## *Introduction*

The subject of this book is the elaboration and subsequent spread of new farming methods in Europe between pre-capitalist and modern times. The sources have led us to focus on three key areas – Northern and Central Italy; the region round Paris, plus Provence; and Southern England. The main aim of the work, which has involved interdisciplinary and comparative research, is to bring out the continuous, albeit forgotten links between the past and the present, between the Mediterranean environment and northern societies, capitalist agriculture and the peasant economy, cultured readers and scientists on the one hand and the common run of people on the other. It should be kept in mind that the spread of the agricultural system which, for the sake of convenience, we call the ‘new agriculture’, founded on a continuous crop rotation, on the integration of agriculture with stock-keeping, through the growing of forage and other intercalary crops, was necessarily preceded by a period of learning, supported and spurred on by the reorganization of ancient and medieval botany. By tracing the spread of forage crops (particularly clover, vetch, lupins, sainfoin, Spanish sainfoin and lucerne), we get an instructive picture of the continual re-elaboration of botanical knowledge, at the root of all agricultural activity, set against an economic background dominated increasingly by capitalist farming. Starting from the medieval crisis in agriculture and keeping in mind the many individual solutions that were applied to the new problems, and the fact that they could be solved only by comparing the present of the fifteenth and sixteenth centuries with a past that dated back to Classical times, the work examines the reorganization of modern agriculture with reference to the continual tension between scientists and ordinary people, between landowners and peasants, tenant-farmers, sharecroppers and small landowners, within a framework of farming founded on an unstable equilibrium. The continual exchange between the natural and cultivated environments eventually set up a process of domestication and

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commercialization of plant species, and created a new routine characterized by a thoughtless and dangerous reduction in the number of varieties. The natural history of lucerne before the fifteenth century goes to the heart of the matter surveyed in this book.

The most ancient evidence concerning lucerne is contained in archaeological findings from the first agricultural revolution, dating from 7500 BC, which occurred on the plateau of Iran and in Central Asia, where plants such as wheat (*triticum dicoccum*), barley and wild oats, and animals such as the gazelle, the onager and the pig were domesticated for human consumption. Findings on the site of Ali Kosh, datable between 7500 and 5600 BC, show that the lucerne genus grew there together with other species, such as *astragalus* and fenugreek. Ninety-four per cent of the carbonized seeds found were small clover and/or lucerne seeds, though these amounted to no more than a third of the total weight of the carbonized plants. *Medicago*, *trigonella* and *astragalus* were native to Khuzistan.

There is no botanical difference between cultivated species and weeds. It is man who makes a selection, by cultivation and the choices arising from it, and who labels plants as suitable for food or ornament or merely as weeds. In the case in point, with the spread of wheat and barley, wild leguminous plants and other grasses (*lolium*, for example) were allotted the status of weeds and removed to make room for cultivated cereals. The leguminous plants withdrew either to the mountainsides or along the edges of the cultivated land. They ceased to have a place in human diet around 6000 BC and from then on became food for sheep and goats. In Iran and the Near East *astragalus* and *trigonella* are two of the plants most commonly gathered, even today, as fodder for domesticated goats. *Medicago* was associated since the very beginning of human cultivation with *trigonella* and *Onobrychis crista galli*, Lam., which, together with *vicia narbonensis*, are found on the site of Beidhan (Southern Jordan), dating from the pre-ceramic Neolithic Age. Amongst their weeds, on the same site, were found *Aegilops* sp., *lolium* sp., and *avena ludoviciana*, plants on the rather thinly marked borderline between cultivated crops and weeds. The Middle-Eastern origin of *Medicago* should be remembered and emphasized, as it has not been found on any archaeological excavation sites in Southern Europe, Greece, Macedonia or Bulgaria.<sup>1</sup> Lucerne came down from the Iranian plateau much later, in

<sup>1</sup> See Flannery, in P. S. Ucko and G. W. Dimbleby (eds.), *The Domestication and Exploitation of Plants and Animals*, London 1969.

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700 BC, being listed as *aspastu* or *aspasti* among the plants that grew in the garden of the Assyrian king Merodachbaladam, in Babylonia. The name itself reveals its Persian origin, and it remained the same in the inventory of King Merodachbaladam, who boasted that he had acclimatized, in the region between the Tigris and the Euphrates, plants such as lucerne, horticultural plants such as garlic, leeks, cress and lettuce, as well as spices such as cardamom, coriander and hyssop.<sup>2</sup> It seems, however, that these species were only cultivated in the king's garden, not yet in the field. But, here again, it seems that lucerne did not grow alone. When it was transplanted, fenugreek, a semi-parasite and weed, was taken with it. Thus, from the time when it was first cultivated and began to spread from one region to another, lucerne has always had fenugreek as a fellow-traveller, growing side by side with it in a variable relationship of dominance or subjection, closely linked with agricultural work. *Aspastu* means literally 'forage for horses', and with this name (or equivalent variations) lucerne spread on the one hand through Syria and on the other through China, while it was also native to regions like Afghanistan and Pamir. Lucerne is a debt that Chinese agriculture owes to the ancient Sassanid Empire, together with Persian horses.

When General Can'k'ien's mission brought pure-bred Persian horses back to the Emperor Wu (140–87 BC), they also brought seeds of the plant that served them as forage, lucerne, or *mu su* in the Chinese translation from the Persian (126 BC). Again in this case, the Imperial gardens were the centre of domestication and diffusion of lucerne. The Chinese also discovered lucerne in Kashmir during the same period. Later it was cultivated in the gardens of another Emperor Wu (265–90 AD) and the horses used in the postal service were fed on it. The book of agronomy *Ts'i min you su*, of the fifth century AD, gave rules for its cultivation. Lucerne continued to spread through China, used both for cattle and horses, and even for the human population in times of famine. In China, connected from the start with the celestial horses and the care that the Emperors took over their rearing, it was mostly cultivated intensively, which delayed crossbreeding of the species. Only towards the end of the sixteenth century (AD) were plants identified which might be wild species of *Medicago sativa*, i.e. lucerne (for example, *medicago denticulata*, *lupulina* and *minima*). There was never

<sup>2</sup> See V. Hehn, *Kulturpflanzen und Haustiere in ihrem Übergang aus Asien nach Griechenland und Italien . . .*, Berlin 1894, 6th edn, O. Schrader and A. Engler eds., pp. 390–401; see also B. Meissner, *Babylonien und Assyrien*, Heidelberg 1920, p. 210.

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any confusion with fenugreek, the seeds of which were always associated with imports and foreigners.<sup>3</sup>

It is essential to remember that lucerne spread eastwards and westwards from the Iranian plateau at practically the same time. It reached China and crossed the Mediterranean in the fifth century BC, at the time of the Persian Wars. Mentioned by Aristophanes in the *Knights* (v. 606), it was only in the fourth century that lucerne (*poa medike*) appeared in the western world, rather hidden away in the scientific treatise of Theophrastus. Theophrastus, pupil and follower of Aristotle in Stagira, opened his school in Athens in 317–307 BC. He was known chiefly for his writings on botany, *De causis plantarum* and the *Historiae plantarum*, for which he collected a huge amount of data on the effect of cultivation on genetic change in wild species. Theophrastus based his research on the external characteristics of plants, the roots, leaves, flowers, seeds and fruit, taste and smell. He went on to examine the propagation of plants, the difference between wild and cultivated trees, the problem of genetic mutation, and so on. Unfortunately, he did not produce a systematic herbal. He mentioned lucerne because of the way its characters change if sheep graze and leave their droppings on it for long periods. Elsewhere in the work lucerne is included among the plants that improve in taste and quality after cutting. The same passage speaks of it being mown as forage for animals, saying that mowing produces a better crop and prevents bloat in sheep.<sup>4</sup>

However it is only in the Latin writers on agriculture, the *Rerum Rusticarum Scriptores*, that we come to the more substantial, lasting work on lucerne and forage crops bequeathed to us by the ancient world. Varro, Columella, Palladius, even Virgil and the Elder Pliny, all speak of the cultivation of meadowland or lucerne. The plant was introduced into Italy in the first century BC; thus Cato the Elder, the first of the Latin writers on agriculture (second century BC), makes no mention of it

<sup>3</sup> See E. Bretschneider, *Botanicon Sinicum*, Shanghai 1893, III: *Botanical investigations into the Materia Medica of the ancient Chinese*, pp. 16–18, 402–3, and the irreplaceable work by B. Laufer, *Sino-Iranica. Field Museum of Natural History*, publ. 201, X series, vol. XV, Chicago 1919, pp. 208–19, 446–7. Concerning Chinese agriculture see also J. Needham, *Science and Civilization in China*, vol. VI (with the collaboration of Lu gwei-djen and Huang hsing-tsung), *Biology and biological Technology*, I: *Botany*, Cambridge 1986, pp. iii, 163–4, 341, 500; II (by F. Bray): *Agriculture*, Cambridge 1984, pp. 4, 293.

<sup>4</sup> See Theophrastus, *De causis plantarum*, transl. by B. Einarson and G. K. Link, Loeb Classical Library, London–Harvard 1976, Introduction, *passim*; II, 15.6; idem, *Historiae plantarum*, VIII, 8.7.

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although he speaks at length of meadows; while Varro (second to first century BC) and the others do speak of it.<sup>5</sup> Perhaps Columella contributed unwittingly to its etymological uncertainty by writing that lucerne was a fodder crop appropriate for sick cattle ('aegrotandibus pecudibus'). For his part, Pliny the Elder (first century AD) explained the name with reference to the Persian origin of the plant, adding that it had passed through Greece at the time of the Persian Wars, around 400 BC. The rules for the cultivation of lucerne were never very different from those outlined by Columella (first century BC). The land, he explained, was to be ploughed for the first time in October, ploughed again at the beginning of February, and finally, in March, divided up into areas ('in morem horti') of three metres by fifteen, for manuring. The lucerne was only to be sown at the end of April (at the rate of about half a litre of seed per plot). Tilled in this way the land looked much more like a garden with flower beds than a field. The farmer could use the paths between one plot and another both for irrigation and for weeding and hoeing. The cultivation of lucerne as described by Columella became highly labour-intensive but repaid its cost by high productivity – one *jugerum* (slightly smaller than a statute acre) provided forage for three horses for a year. The *Rerum Rusticarum Scriptores* also associated lucerne with a number of other forage crops – spring oats and barley, vetch, clover and fenugreek. But only lucerne enjoyed a privileged position, being the only grass cultivated with an almost horticultural technique. According to Palladius (fourth or fifth century AD) the calendar for the cultivation of lucerne was as follows: in February, ploughing and tilling of the field to be sown; in April, sowing and tillage; the lucerne to be mown from May on, as needed; in September, rotation of sesame and lucerne; in November, the lucerne given to the sheep as dry fodder. Although the *Rerum Rusticarum Scriptores* had dealt with the plant at length, they had not given a description of it. It was Dioscorides, a Greek doctor serving in the Roman army in Asia Minor in the first century BC, who left us a scientific description of it in his treatise *Materia Medica libri V*, one of

<sup>5</sup> Of the vast bibliography on the *Rerum Rusticarum Scriptores* we indicate only the following passages by M. P. Cato, *De agricultura*, VIII, XXVII, LIII, LIV (on meadows); M. T. Varro, *De re rustica*, II 1.17, 2.19; L. I. M. Columella, *Res rustica*, II 7.1, 10.24, 10.26, 12.6; VI 38.4; VII 3.19, 4.2; XI 2.75; T. R. A. Palladius, *Opus agriculturalae*, *Febrarius*, VI; *Aprilis*, I; *Septembris*, VII; *November*, XIII; P. Vergilius Maro, *Georgicon libri IV*, I 215; C. Plinius Saecundus, *Naturalis historiae libri XXXVII*, XVIII 26.

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the most famous works of ancient times.<sup>6</sup> Lucerne, he wrote, looked like clover but grew higher and straighter and produced pods with a curious spiral shape (*siliquae corniculatae*). Unfortunately, he did not state the colour of the flower (perhaps because he rightly considered that it was not important) and this was to make it more difficult to identify the plant during the Renaissance. While the *Materia Medica* described a total of four hundred plants, it did not give a list of the species that are weeds of lucerne, since Dioscorides was more interested in the medicinal properties of the species than in their agricultural uses. However, he did speak of plants such as fenugreek, *onobrychis* (today classified as *hedysarum* sp.) and *polygala* (today *onobrychis* sp.). The Classical world, to a lesser extent the medieval world – though Dante (*Inferno*, IV, 140) mentions him among the great figures of Greece – and above all the Renaissance, were to find in Dioscorides a master to be first imitated, then surpassed. Unfortunately, the complete text of the *Materia Medica* in the Greek original was buried deep, for centuries, in a very few libraries, such as the Vatican Library, and it was only after Aldo Manuzio's edition, published in Venice in 1499, that the study of this master of ancient thought could be taken up again.

The importance and commercial value of lucerne in the ancient world was such that it was included in Diocletian's edict *De pretiis rerum venalium*, which regulated the sale of its seed at 150 *denarii per modium*, together with that of hay (30d), hemp (80d) and vetch (80d).<sup>7</sup>

In practice, the late Classical and medieval worlds knew the botany of Dioscorides through the herbal of Apuleius Barbarus (fifth century AD), the only herbal that has come down to us from Classical times. It has often been reproduced incorrectly and incompletely in medieval manuscripts (even when the pictorial standard is high), as in the well-known Bodley MS 130, from the Abbey of Bury St Edmunds. No entries on lucerne appear in the manuscript tradition.<sup>8</sup> The *Etymologiae* of Isidore of Seville (570–636 AD), directly inspired by Pliny the Elder's *Natural History*, mentions lucerne, but the author's knowledge seems to derive entirely from books, though his interest may indicate an attempt

<sup>6</sup> For the numerous textual problems concerning *Materia Medica* see the edition of Pedacios Dioscorides, *De Materia Medica libri V*, II 5 (M. Wellman ed., Berlin 1906–14).

<sup>7</sup> See S. Laufer (ed.), *Diocletians Preisedikt*, Berlin 1971, p. 100.

<sup>8</sup> See C. Singer, 'The herbal in antiquity and its transmission to later ages', *Journal of Hellenic Studies*, 47, 1927, pp. 1–52; R. W. T. Gunther, *The Herbal of Apuleius Barbarus* (Ms Bodley 130), Oxford 1925.

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to put a stop to the semantic wavering between *medica* and *melica*, which was to contribute to its disappearance in the West during the Middle Ages.<sup>9</sup> Dioscorides' text, re-elaborated in Latin in the eighth century under Longobard influence, provides us with two points of the greatest interest, because of the variations in the original text and the place where it was composed, certainly in the Benevento area despite the Longobard influence (*b* and *v* are constantly inverted in the titles of the text, as is the rule in the dialects of Southern Italy). Moreover, in the chapter on lucerne (chap. X) it states 'Of *medica*, that is *sulla*' ('De *medica* id est *sulla*').<sup>10</sup> That is, *medicago* was substituted by the more resistant, semi-wild species, *sulla*, which is *hedysarum*, or Spanish sainfoin, typical of the dry Mediterranean area (Calabria, Sicily, Spain). The scribe and interpreter of Dioscorides' text was adding and perhaps explaining the most difficult plants to his Germanic patrons; but he was explaining in terms of the flora of his own region. For the species clearly described by Dioscorides he substituted another, which does not look like clover (Spanish sainfoin looks more like vetch) and which was later to be confused with *onobrychis*, 'which donkeys eat too' ('*quae herba et asini comedunt*', as the text runs). This is the Latin version of Dioscorides most frequently copied in manuscript form and finally printed in 1481. The most illustrious owner of the Latin MS 337, now housed in Munich, was Marcello Virgilio, a Florentine doctor and Humanist. He realized that the Longobard Dioscorides was a corrupt edition which showed little respect for the original, and so he did not have the text of the manuscript printed, preferring the older Latin version, which was a more faithful rendering of the Greek original.<sup>11</sup> Soon after this came another Latin book produced outside Italy, Palladius' *Opus agriculturae*, copied in the oratory of Troyes in the Ile-de-France, in fine Merovingian script of

<sup>9</sup> See Isidorus, *Etymologiae sive originum libri XX*, XVII 4.8 (W. N. Lindsay ed., Oxford 1911).

<sup>10</sup> See K. Hofman and T. N. Auracher, 'Der Longobardische Dioskorides der Marcellus Virgilius', *Romanische Forschungen*, 1, 1883, pp. 49 ff., especially pp. 49–51, 157; continued by H. Stadler, 'Dioskorides Longobardus (Cod. Lat. Monac. 337)', X, 1899, pp. 181 ff., 369 ff., especially p. 228, the chapter on lucerne; XI, 1899, pp. 1 ff.; XIII, 1902, pp. 161 ff.; XIV, 1903, pp. 601 ff. Ms. Lat. 337 was acquired by the Hof- und Staatsbibliothek of Munich thanks to a series of gifts, from Marcello Virgilio to Salnuccio Sangimianese, from him to Cardinal Capuano hence to a Widmestadt and to a Johan Rebauer, chemist, in Munich, who died without an heir on 25 November 1557. This is the text which was printed in the Latin *editio princeps*: Dioscorides, *Opera*, Venetiis 1478.

<sup>11</sup> See Marcellus Vergilius, *P. Dioscoridou De Materia Medica libri V. . . Commentarius doctissimi M. V. . .*, Cologne 1529.

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the ninth or tenth century. Where the word *medica* occurs for the first time, it has a marginal note: ‘sorghum, like melick grass’ (‘surgus ut meliga herba’).<sup>12</sup> Clearly, sorghum (*Surghum vulgare*), another African and Indian plant that was spreading over the Mediterranean area after the Islamic conquest, was taking the place of lucerne.<sup>13</sup> The scribe of Troyes was following a pattern not unlike that of his colleague of Benevento; both of them were substituting a plant more familiar to them for an unknown one. But whereas in the first case, Spanish sainfoin was simply a distant, wild variety of lucerne, in the second it was the transformation of *d* into *l* (*medica* into *melica*) that led to the false identification of a now-forgotten species with a more recent one frequently found in the fields of medieval Europe.

In the Byzantine world, however, the Classical tradition continued unbroken in the *Geoponics*, a collection of earlier writers compiled by Cassianus Bassus, by order of Constantine, Emperor of Byzantium (probably Constantine Porphyrogenitus). Although the date of this composition is extremely uncertain – somewhere between the seventh and eighth century AD – lucerne often appears in it both as a cure for sick animals and as a means of increasing the yield of milking cows; it is mentioned together with cytisis (*Medicago arborea*), fenugreek, oats and clover.<sup>14</sup> Unknown to Western agronomy until the translations brought out by sixteenth-century publishers, the *Geoponics* were never to become a fundamental text for Western technique, serving mostly as a source drawn on by many authors.

It is also interesting to compare the European documents so far examined, with experience gained in the Eastern Mediterranean. Syrian writers, of whom we will mention only Bar Serapion here (Ibn Serabin in Arabic), had access to the Greek texts of Dioscorides, Galen, Paulus Aegineta or the Syrian translation of Dioscorides, the above-mentioned

<sup>12</sup> See Montpellier, EM, ms 305.

<sup>13</sup> On the diffusion of sorghum see A. M. Watson, *Agricultural innovation in the early Islamic world. The diffusion of crops and farming techniques, 700–1100*, Cambridge 1983, pp. 9–14 and the bibliography. Sorghum (in Italian also known as *meliga*) (*Sorghum bicolor*) should not be confused with millet (*Milium effusum*) and panic (*Panicum miliaceum*), another grain of Indian origin, widespread in the Mediterranean region during the first millennium BC and known to ancient authors. See Chap. 1, note 13.

<sup>14</sup> See H. Beckh (ed.), *Geoponica sive Cassiani Bassi Scolastici de re rustica eclogae*, Leipzig 1895: *medike*, III 1.8, 2.4; XVI 9.4; XVII 8.1, 14.6; XVIII 2.6; *trifullos*, II 4.1; X 77.6; XII 17.1; A. Toynbee, *Constantine Porphyrogenites and His World*, Oxford 1973.



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*Geoponics* and the Arabic translation of the book on agriculture by Junius (i.e. Iunius Moderatus Columella). In these texts the same name was given to several kinds of forage crop, melilotus being both melilotus proper and fenugreek. *Handaquq* stood both for lucerne (*medike*) and for clover (the *trifullon* of the *Geoponics*), at least as long as they were used as green forage; but in Egypt and Syria the same word *handaquq* was also used for *trigonella* and *melilotus* in the wild state. In the southern oases *medicago* was called *abede*, while it became *cadab* in the Fezzan area and the small oases. Lucerne was called *barsim* in Cairo, as in central and southern Syria. This great variety in the nomenclature, which bears witness to the continual presence of lucerne, fenugreek and melilot, and the substitution of one for the other, shows that the name *handaquq* indicated a type of forage rather than a botanical species.<sup>15</sup>

In the thirteenth century, which marked a return to original writings on agronomy, there was again considerable debate and division in European agronomic thinking, between the Spanish and Italian peninsulas in the Mediterranean, and between Northern and Mediterranean agriculture. Hence, while St Hildegard of Bingen recorded the agricultural properties of clover, no mention whatever was made of clover, lucerne or sainfoin in the *Opus ruralium commodorum* of the Bolognese Pier de' Crescenzi, the collection on agronomy which is the equivalent of Dante's and Thomas Aquinas' systematic re-ordering of medieval thought. However, the absence of lucerne in the Italian botany of this time is compensated for by the presence of melilots and fenugreek, which are to some extent weeds and parasites of lucerne and which take its place when tillage is discontinued.<sup>16</sup> Thus even Rufinus, a Florentine botanist, author of a herbal, probably compiled before 1287, which groups and describes specimens on the lines of Dioscorides, Macer, the *Circa Instans*, the masters of Salerno, Isaac and a few others, knew neither lucerne, onobrychis, melilot nor fenugreek. Yet Rufinus unexpectedly turned his attention to 'cockshhead' (*caput galli*), which from the description of the flower might be identified with Spanish sainfoin or sainfoin proper<sup>17</sup> (described as *Onobrychis caput galli*, Lam. by French botanists). In contrast, Arab-Andalusian agronomy in the Spanish peninsula moved

<sup>15</sup> See I. Low, *Aramaische Pflanzennamen*, Leipzig 1881, pp. 5, 11, 18, 19, 94–5, 421–2; on Bar Sarapion see G. Sarton, *Introduction to the History of Science*, Washington 1949, vol. II, p. 229.

<sup>16</sup> See below, Chap. 2 for the bibliography on Pier de' Crescenzi.

<sup>17</sup> See L. Thorndike, *The Herbal of Rufinus, edited from the unique manuscript*, Chicago 1946, n. 26.

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away from the two- and three-year rotation prevalent in Europe from the tenth to thirteenth centuries. Crops were grown intensively for several years, then the fertility of the soil was built up again by planting lucerne and clover. From such authors as Ibn-Al-Awwâm, Ibn Bassal and Abû-l-Khayr we can reconstruct the fundamental details of an agricultural system in which continuous crop rotation was possible thanks to the practice of a tilled fallow, which took the place of manuring by breaking up the soil very finely. Lucerne (*fisfisah*), Alexandrian clover (*kurt*), grey peas (*nadjil*) were planted on the fallow land and well irrigated, then mown once or twice a year. These legumes were presented not only as a botanical species, wild or cultivated, but as crops fully integrated into the agricultural cycle, substituting tillage and manuring, as pointed out above. Leguminous plants were being chosen on the lines of Classical agronomy, according to what was best for the cereals, giving preference to short-rooted species, such as vetch, lentils and lupins. Broad beans were given preference as green manure, since they could be harvested before being ploughed into the soil. Andalusian agronomists, better botanists than other Europeans, integrated their knowledge of the properties of plants into the agricultural system, by studying the Classics.<sup>18</sup>

Outside the Classical tradition, Anglo-Norman agriculture produced its own treatises in the thirteenth century. They were widely read among the administrators of the great estates, both of the nobility and of the Church. However, they focused on corn-growing, sheep, and the collection of rent and feudal dues. We shall search in vain in the pages of Walter of Henley, in the rules laid down by Robert Grosseteste, Bishop of Lincoln, for any reference to grasses, to forage or botany in general. The abundance of the natural grassland of England, where meadows and woods covered so much of the country, restricted interest in forage crops, even though clover is a species native to the British Isles.<sup>19</sup>

The natural history of lucerne is like that of other forage crops, clover, trefoils, fenugreek, sainfoin, melilots and Spanish sainfoin. When it is founded on historical documents, it always reveals a continuous chain binding these species, and a connection between them and cultivation. It

<sup>18</sup> See L. Bolens, *Les méthodes culturelles au moyen-âge d'après les traités d'agronomie andalous: traditions et techniques*, Geneva 1974.

<sup>19</sup> See D. Oschinski, *Walter of Henley*, Oxford 1979, *passim*. For an analysis of historical evidence regarding the ecology of medieval pastures and lands otherwise used for grazing, such as woodlands and commons, see now O. Rackham, *The History of the Countryside*, London 1986, pp. 62 ff., 119 ff., 282 ff., 305 ff., 328 ff.